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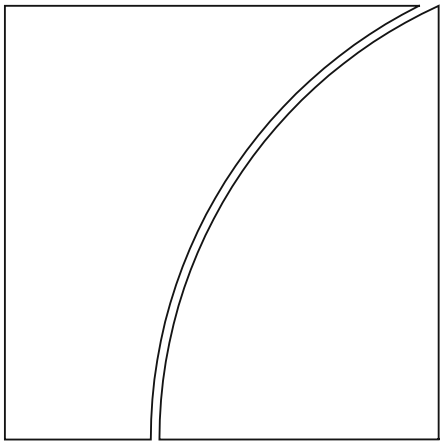

Longevity risk transfer markets: market structure, growth drivers and impediments, and potential risks

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THE JOINT FORUM

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Executive summary

Ageing populations pose serious social policy and regulatory/supervisory challenges in many countries. Not only are people living longer, but longevity risk – the risk of paying out on pensions and annuities for longer than anticipated – increasingly calls into question whether existing "saving for retirement" products are sustainable.

Total longevity risk is significant when measured from a financial perspective, with each additional year of life expectancy adding about 3–4% to the present value of the liabilities of a typical defined benefit pension fund (IMF (2012)). Estimates of the total global amount of annuity and pension-related longevity risk exposure range from $15 trillion to $25 trillion (CRO Forum (2010) and Biffis and Blake (2012)). Hence, risk holders will have to pay over an additional $450 billion to $1 trillion in aggregate for each year that they underestimate longevity.

To manage this risk, pension funds in some countries are increasingly looking to transfer their longevity risk, often across national borders. Basically, three types of transactions are being used to transfer longevity risk, each differing in the types of risk transferred and the categories of risk created:

- A **buy-out** transaction transfers all of the pension plan's assets and liabilities to an insurer in return for an upfront premium. Hence there is full risk transfer (investment and longevity, plus inflation in the case of indexed plans). However, pensioners become exposed to the risk of the insurer's failure (as opposed to that of the sponsor or pension guarantor).[1]
- In a **buy-in**, the pension plan sponsor retains the assets and liabilities, but pays an upfront premium to an insurer to receive periodic payments matching the pension payments. In this case, the risk transfer is only partial because there is still counterparty risk to the insurer, and the sponsor remains directly responsible to the pensioners.
- In a **longevity swap (or insurance)** transaction, periodic fixed payments are made to the swap counterparty (or (re)insurer) in exchange for periodic payments based on the difference between the actual and expected pension or annuity mortality experience. In some cases, the payments are based on the mortality experience of standardised population cohorts ("index swaps"). As in the case of a buy-in, there is counterparty risk and the sponsor remains directly responsible to pensioners, but retains the investment risk.

Longevity risk transfer (LRT) markets are a more or less uncharted territory for analysts and academics as well as for supervisors. The aim of this Joint Forum report is to give a first and preliminary analysis of the size and structure of the LRT markets, and the factors affecting their growth and development. It will also seek to raise awareness of the associated potential risks and cross-sectoral issues for market participants, policymakers and supervisors.

[1] However, in the United States bought-out liabilities can be put back to plan sponsors if the insurance firm does not meet the US Department of Labor Interpretive Bulletin No. 95-1 "safest available annuity" standards. In Germany, even when the plan is organised via an external fund or insurance company, it is still the employer who remains liable (the so-called "ultimate liability of employer" pursuant to Section 1 (1) of the German Law on Retirement Pensions (BetrAVG)).

Until recently, virtually all LRT activity had occurred in the United Kingdom, but 2012 saw three large non-UK transactions – a $26 billion pension buy-out deal between General Motors and Prudential Insurance, a €12 billion longevity swap between Aegon and Deutsche Bank, and a $7 billion pension buy-out between Verizon Communications and Prudential.[2] However, impressive as these volumes are, they represent only a small fraction of the market's aforementioned multi-trillion dollar potential size.

An important explanation for the small size of LRT markets is the relatively lenient regulatory treatment of longevity risk in pension funds compared with the regulatory treatment accorded to (re)insurers' longevity risk in many jurisdictions. Other obstacles to LRT include selection bias ("lemons") risk, and in the case of some longevity swaps, basis risk (see Chapter 4.2).

While LRT markets are not large enough to present systemic concerns yet, their massive potential size and the growing interest from investment banks in mobilising this risk make it important to ensure that these markets are safe, both on a prudential and a systemic level. In that regard, the Joint Forum puts forward the following recommendations:[3]

1. **Communicate and cooperate:** Supervisors should communicate and cooperate on LRT internationally and cross-sectorally in order to reduce the potential for regulatory arbitrage.
2. **Understand longevity risk exposures:** Supervisors should seek to ensure that holders of longevity risk under their supervision have the appropriate knowledge, skills, expertise and information to manage it.
3. **Assess relevant policies:** To inform their policy towards LRT markets, policymakers should review their explicit and implicit policies with regard to where longevity risk should reside. They should also be aware that social policies may have consequences for both longevity risk management practices and the functioning of LRT markets.
4. **Review longevity risk rules and regulations:** Policymakers should review rules and regulations pertaining to the measurement, management and disclosure of longevity risk with the objective of establishing or maintaining appropriately high qualitative and quantitative standards, including provisions and capital requirements for expected and unexpected increases in life expectancy.
5. **Ensure adequate risk-bearing capacity:** Policymakers should consider ensuring that institutions taking on longevity risk, including pension fund sponsors, are able to withstand unexpected, as well as expected, increases in life expectancy.
6. **Monitor market developments:** Policymakers should closely monitor the LRT taking place between corporates, banks, (re)insurers and the financial markets, including the amount and nature of the longevity risk transferred, and the interconnectedness this gives rise to.
7. **Pay attention to tail risk:** Supervisors should take into account that longevity swaps may expose the banking sector to longevity tail risk, possibly leading to risk transfer chain breakdowns.
8. **Collect adequate data:** Policymakers should support and foster the compilation and dissemination of more granular and up-to-date longevity and mortality data that are relevant for the valuations of pension and life insurance liabilities.

[2] Transaction volumes are measured in terms of underlying assets.

[3] The terms "supervisors" and "policymakers" are as defined in Joint Forum (2010), that is, the former encompasses all supervisory and/or regulatory authorities whereas the latter has a broader scope and may also include legislative authorities.

Chapter 1 – Introduction

1.1 Mandate

The Joint Forum has in the past done extensive work on risk transfer markets, focusing predominantly on credit risk transfer. This report on longevity risk transfer (LRT) complements the Forum's previous work. The aim of the present report is threefold. First, it provides a comprehensive picture of the market for LRT. Second, it investigates the incentives that drive insurers, pension funds, banks, reinsurers and other parties to participate in LRT markets (or not). And third and finally, it assesses the potential risks and cross-sectoral issues arising from LRT, for pensioners, market participants, policymakers and supervisors. To this end, the report illuminates the linkages between and across firms that are created by LRT and analyses the potential breakdown of the risk transfer chain in case of stressed longevity scenarios. Recommendations are made to promote an orderly functioning of LRT markets, now and in the future.

1.2 Background

Until recently, virtually all LRT activity had occurred in the United Kingdom, where "there are many defined benefit (DB) schemes, disclosure of pension liabilities is highly transparent and annuitisation of defined contribution (DC) schemes is effectively compulsory" (Swiss Re (2010)).[4] However, 2012 saw three large transactions in the Netherlands and the United States. Nevertheless, the outstanding volumes of such transactions remain small in comparison to the total amount of longevity risk in the private and public sectors. For example, at end-2011 about $20 trillion of pension assets were held by private pension plans, of which about 65% were DB plans.[5]

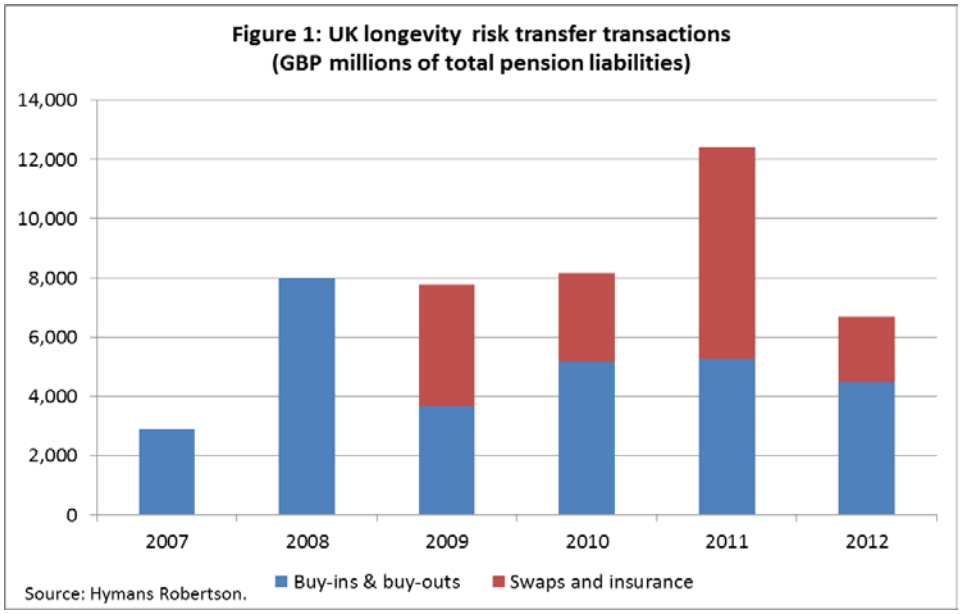
Total liabilities of UK DB pension plans amount to about £1 trillion, but only about £50 billion of DB de-risking transactions have taken place between the market's start-up in 2004 and end-2012 (Figure 1). In 2012, three large transactions took place – a $26 billion pension buy-out deal between General Motors and Prudential Insurance, a €12 billion longevity swap between Dutch insurer Aegon and Deutsche Bank, and a $7 billion pension buy-out between Verizon Communications and Prudential. Plus Canada has seen a small but steady stream of pension fund buy-out transactions – about C$1 billion per year since 2006. So far, almost all LRT transactions have related to pensions in payment because the uncertainty about these shorter-dated liabilities is less than that associated with pre-retirement DB plan liabilities. Also, (re)insurers have to carry larger longevity risk reserves for younger lives, whereas pension liability discount rates make risks relating to younger lives appear less financially material.

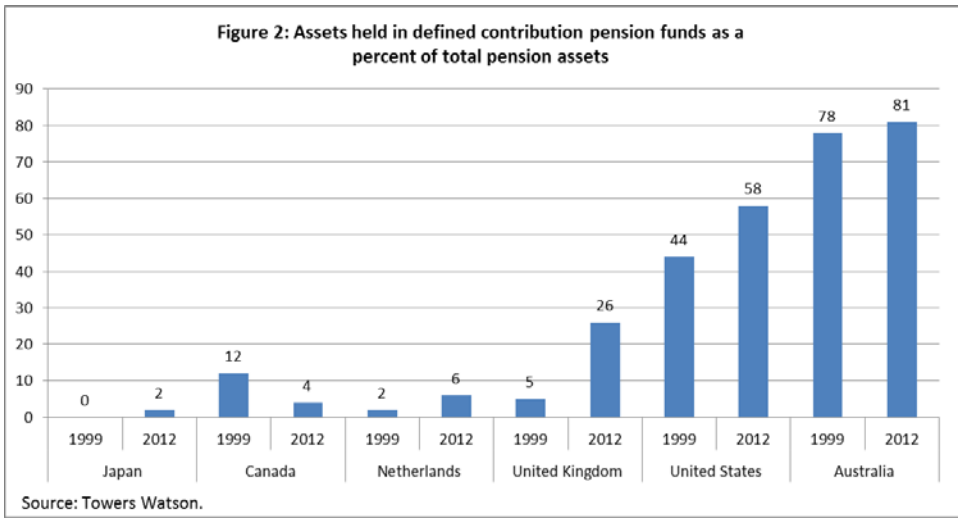
In some cases, DB plan longevity risk is being mitigated by closing DB plans to new employees, closing DB accruals to existing employees and converting DB plans to DC plans (Figure 2). Another form of mitigation is to offer DB pension plan members a one-time lump sum payment in exchange for their pension plan entitlements. However, these actions only limit the growth of the problem, and the plan sponsors may remain on the hook for already accrued DB benefits. Also, closing DB plans and accruals merely transfers the longevity risk to employees who, by choice or compulsion, will look to annuity markets for their personal de-risking needs. However, annuitisation markets are far smaller than predicted by rational decision-making models, although some countries, such as Italy, the Netherlands

[4] See Monk (2010) for a discussion of the factors that have motivated the surge of UK longevity risk transfer since 2007.

[5] According to OECD (2012b), all OECD private pension markets were valued at about $30 trillion, of which about $20 trillion was held by pension funds, $5 trillion in retirement products provided by banks and investment managers, and $4 trillion by insurers.

and Singapore, make annuitisation of DC plan proceeds compulsory upon retirement (Fong et al (2011)).[6] OECD (2012a) argues that an explanation for the small size of annuity markets is, in fact, the lack of financial instruments to hedge against longevity risk.





Another option is for DB plan participants to share some of the longevity risk with sponsors, for example, by linking retirement benefits to life expectancy. This happens to be the case in the Dutch pension system, where a pension fund shortfall is typically regarded as the joint responsibility of the employer and its (current and past) employees.[7] In an effort to make the risk sharing more explicit ex

[6] A number of academic papers explore the under-annuitisation puzzle. For example, Brown et al (2008) link it to irrational decision-making. They find that consumers are inclined to annuitise when the sales pitch is framed in terms of consumption, but not so inclined when it is framed as an investment.

[7] Ponds and Van Riel (2009) contrast the risk-sharing in Dutch DB pension plans to the setup of Anglo-Saxon plans, where the employer is regarded solely responsible for correcting pension plan underfunding.

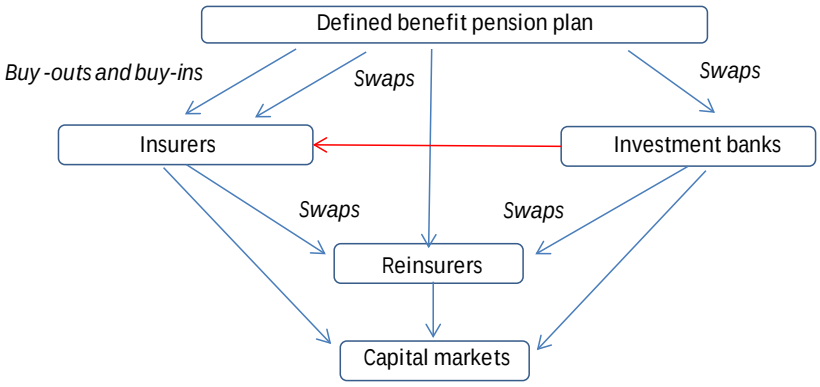
ante, Italy introduced the linkage between pension benefits and life expectancy in 2010.[8] Also, a new pension contract is under development in the Netherlands that will link pension benefits explicitly to life expectancy. Accordingly, longer working lives can offset longer life spans, essentially keeping the number of years in retirement (and thus financial retirement needs) fairly constant. For future pension benefits still to be accrued, the introduction of the new contract is relatively straightforward. It is legally challenging, however, to declare the new pension contract applicable to accrued pension rights.

Chapter 2 – Longevity risk transfer instruments

2.1 Overview

In this chapter, the basic transaction types will be explained – buy-outs, buy-ins, longevity swaps and longevity bonds.[9] Who uses which technique depends greatly on the type of counterparty (Figure 3). Insurers are associated with pension buy-ins, buy-outs and longevity insurance, whereas longevity swap transactions are associated with investment banks and reinsurers. Also, in most jurisdictions, banks are not allowed to issue or take on longevity risk in the form of annuities, buy-ins and buy-outs, but can take it indirectly via swap transactions. On the other side of the transactions, the choice of transaction type can have very different implications for the plan sponsor. Longevity bonds remain only a concept for now – several attempts have been made at issuing them, but none successfully.

Figure 3: Structure of longevity transfers by defined-benefit pension plans, by type of counterparty



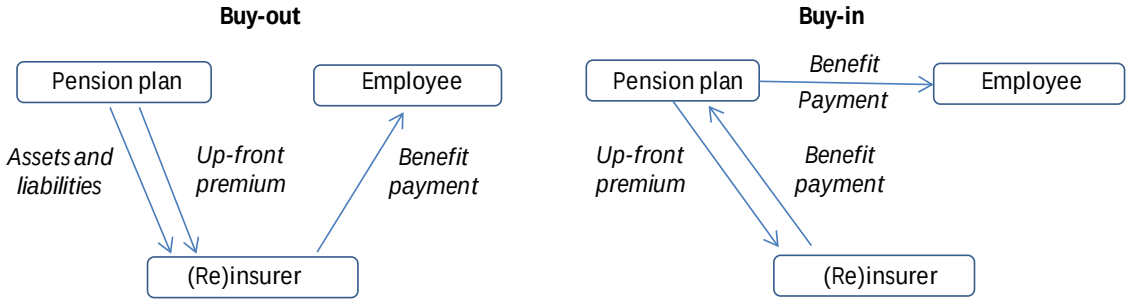
[8] According to Law 120/2010, the Italian minimum retirement age is updated every two years based on a life expectancy index calculated by the National Bureau of Statistics (ISTAT).

[9] Certain longevity risks are currently being traded in markets for what are called "life insurance settlement" securitisations. A life settlement occurs when the owner of a life insurance policy sells the policy for an amount below the face value of the policy (ie the amount paid when the policyholder dies). The purchaser becomes responsible for making premium payments in return for collecting death benefits. Although life settlement volumes have recently been growing, they have not reached the point at which securitisation becomes viable on a large scale. For example, credit rating agencies have been reluctant to rate life settlement securitisation transactions because the pools comprise too few heterogeneous policies for statistically stable cash flows to be estimated (AM Best (2009); S&P (2011)). Also, AM Best (2009) expresses concerns about "the wide range of opinions on life expectancies of legacy portfolios." (Life settlements should not be confused with "viatical" settlements that involve sellers with life expectancies of less than two years. The viatical settlement market started in the late 1980s and was aimed at people terminally ill with AIDS. It collapsed in 1996 with the advent of drugs that significantly extended AIDS victims' lives (Stone and Zissu (2006)).

2.2 Buy-ins and buy-outs

In a buy-out transaction all of the pension fund's assets and liabilities are transferred to an insurer in return for an upfront premium (see left-hand panel of Figure 4). The pension liabilities and their offsetting assets are removed from the pension fund sponsor's balance sheet and the insurer takes over full responsibility for making payments to pensioners. In a buy-in, the sponsor pays an upfront premium to the insurer who then makes periodic payments to the pension fund sponsor equal to those made by the sponsor to its members. This "insurance policy" is held as an asset by the pension plan for which the premium is the cost of the insurance policy that guarantees payments even if retirees live longer than expected.

Figure 4: Structure of pension buy-out and buy-in transactions



The apparent high cost of buy-outs and buy-ins is a result of insurance companies being typically subject to more stringent regulation than pension funds, such as the requirement to hold resilience test reserves in case of extreme scenarios – while pension funds typically can temporarily run funding gaps (where the discounted present value of their liabilities exceeds the value of their assets).[10] Additionally, buy-outs can appear expensive, in part, because any initial underfunding requires a lump-sum payment by the sponsor to reach full funding before the plan can be sold to a third party. Also, more recently, low interest rates have magnified the size of any underfunding. This option nevertheless remains the most used in the UK pension market because many corporate sponsors prefer not to have a DB plan weigh on their balance sheets. Buy-outs appear to be particularly attractive to smaller pension schemes, for which the pricing gap is not as significant, and which do not have the capability to hedge individual risks on their own.[11] In fact, almost all of the large UK LRT transactions (ie larger than £500 million) since 2007 have been either buy-ins or longevity swaps. Furthermore, all of the recent large LRT transactions in the United States have been buy-outs. Compared with the other types of longevity risk transfer, buy-outs have the potential disadvantage for employees that the government-backed guarantee of their pension entitlements is lost, that is, should such a guarantee exist.

2.3 Longevity swaps and insurance

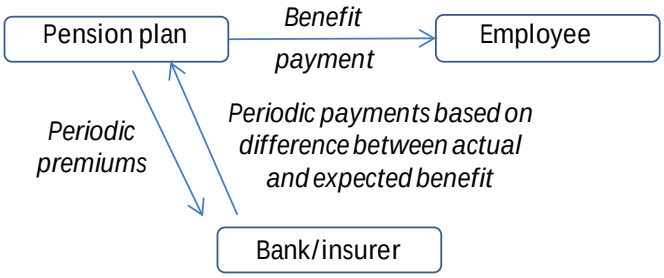
In a longevity swap, the pension fund obtains a similar protection from higher-than-expected pension payouts. The plan sponsor makes periodic fixed "premium" payments to the swap counterparty, which in turn makes periodic payments that are based on the difference between the actual and expected benefit

[10] However, in the Netherlands and United Kingdom, life insurers and DB pension funds use similar, relatively prudent liability discount rate curves to value their insurance/pension liabilities.

[11] Smaller pension schemes are subject to higher longevity risks in that their populations of workers may be vulnerable to idiosyncratic risks, such as the top management with the highest payouts from the plan living longer than rank-and-file members.

payments (Figure 5). The sponsor maintains full responsibility for making benefit payments to its employees. An advantage of buy-ins and swaps is that they can be used to hedge the longevity risk associated with specific subsets of the underlying population. An advantage of swaps is that longevity risk can be isolated, whereas buy-in and buy-out transactions typically also transfer the investment risk of the assets. Longevity swaps can also be combined with other types of derivative contracts, such as inflation, interest rate and total return swaps, to create so-called "synthetic" buy-ins that do transfer all of the risks. Also, underfunded pension plans can hedge up to 100% of their longevity risk without making any top-up payments.

Figure 5: Structure of longevity swap transactions



Furthermore, swaps are more likely to activate broader capital markets interest. For example, the €12 billion longevity swap between Dutch insurer Aegon and Deutsche Bank used standard International Swaps and Derivatives Association (ISDA) documentation. Also it had a 20-year maturity with a close-out mechanism that determined the final payment, as opposed to the open-ended maturities of more traditional transactions. In addition, the longevity-indexed floating payments are floored and capped so that investors are not exposed to open-ended risk if longevity is either under- or overestimated. Finally, it used a longevity index based on publicly available data to drive cash flows, as opposed to the actual longevity experience of Aegon's annuity book.[12]

Longevity swaps require the posting of high-quality liquid securities as collateral, which can potentially involve significant costs (IMF (2012)). However, the collateral requirements are based on only the net payments – the difference between what each swap participant owes the other. Biffis et al (2011) show that the cost of collateral to secure longevity swaps can be relatively low, especially when counterparty default risk and collateral rules are symmetrical. However, transactions with (re)insurers typically take the form of insurance contracts that may not involve collateral posting.

The counterparty risks associated with different modes of LRT are further discussed below.

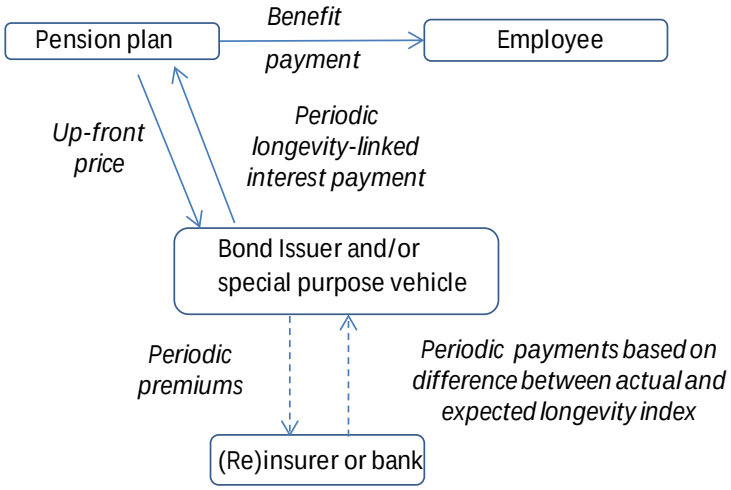
2.4 Longevity bonds

The payout on longevity bonds depends on the longevity experience of a given population, so that the payment is related to the number of survivors in the population. Basically, it would pay out more as the proportion of survivors in the reference population rises. One disadvantage is that, unlike a swap, the bond buyer makes a large upfront payment to the issuer, resulting in a counterparty risk exposure to the issuer. However, counterparty risk would be mitigated if the bonds are issued by a high-quality sovereign or supranational, or by a special purpose vehicle that invests the proceeds in low-risk highly

[12] The Aegon-Deutsche Bank transaction references Dutch population mortality data published by the Dutch National Office for Statistics. See Sagoo and Douglas (2012) for more detail.

liquid fixed income securities, from which the income covers the bond payouts.[13] The issuer might also transfer some or all of the longevity risk to a reinsurer probably via a longevity swap contract.

Figure 6: Structure of longevity bond transaction



To date, there has been no successful longevity bond issuance although there have been several false starts.[14] This contrasts with the much more active market for "mortality" bonds that transfer medium-term (three to five year) risk associated with catastrophic mortality events such as pandemics. In fact, Biffis and Blake (2012) propose that an optimal format for a longevity risk bond would entail a tranched principal-at-risk instrument very much like a catastrophe bond. Blake et al (2010) advocate government-issued longevity bonds that would provide benchmarks and liquidity to the market in the same way that government-issued inflation-linked bonds helped that market thrive. They say that, although governments are already heavily exposed to longevity risk, there would be no increase in aggregate longevity risk if such issuance was coupled with the indexation of retirement ages to longevity increases. However, it is not clear that the advantages of jumpstarting the market outweigh the costs, and estimates of net gains are difficult to measure.

Chapter 3 – Longevity risk transfer market drivers and impediments

3.1 Overview

Although there have been a number of large longevity risk transactions, total LRT volumes are as yet a small fraction of total pension fund and (re)insurer longevity risk exposure. In this chapter, potential explanations are given for the relatively small size of the LRT market. Before going into these LRT market impediments, though, possible reasons to transfer longevity risk are discussed.

[13] A special purpose vehicle is a subsidiary company with a balance sheet structure and legal status that makes its obligations secure even if the parent company goes bankrupt. It is most commonly seen in securitisation transactions.

[14] The European Investment Bank tried to issue a longevity bond in 2004, but it was cancelled due to lack of interest on both the buy- and sell-side (Biffis and Blake (2009)). The World Bank tried a similar product in 2010, but it also did not succeed (Zelenko (2011)).

3.2 LRT drivers

As mentioned in the introduction, the principal holders of longevity risk are DB pension funds. Given the dire funding position of most DB pension funds today (Towers Watson (2011); Swiss Re (2012)), a significant longevity shock could undermine corporations' ability to compete and prosper. Accordingly, there may be an incentive for companies to transfer longevity risk off their books, especially since this risk is potentially large. For smaller pension funds, the case for LRT may be relatively strong as such funds tend to have a larger longevity risk exposure as a result of undiversified idiosyncratic longevity risk.

Regulations may stimulate LRT when this leads to reserve relief for longevity risk sellers similar to the relief provided by more traditional reinsurance arrangements. As with traditional reinsurance, though, relief is only provided if the risk transfer is effective and material basis risk is absent (Groome et al (2011)). For example, UK DB pension plans can get regulatory relief by holding assets with payouts that mirror the behaviour of their liabilities, yet they have to demonstrate the effectiveness of the risk transfer. Under Solvency I regulations in Europe, the capital charge for life insurers is based on the size of the technical provisions, and only traditional reinsurance transactions may provide regulatory relief. Given that traditional reinsurance is indemnity-based, there is no basis risk. With Solvency II, the menu of acceptable de-risking transactions may broaden, although discussions are still ongoing. Solvency II will introduce a capital requirement for longevity risk that will allow for risk-mitigation techniques, albeit only under certain conditions. First, the protection buyer needs to show that the contractual arrangement does not result in the creation of new risks that are not reflected in the capital requirement. Second, the proposed risk-mitigation instrument should not involve material basis risk. Similarly, Canadian regulations recognise the risk mitigation benefits of longevity risk reinsurance contracts only as long as there is no material basis risk.

The buyers of longevity risk may be attracted by the limited or even negative correlation of longevity risk with other risk exposures. So far, most ultimate "buyers" of longevity risk have been life insurers and reinsurers for whom longevity risk may provide a partial hedge for their insurance exposure. This is because the two risks potentially offset each other — life annuity liabilities increase when annuitants live longer whereas life insurance liabilities decrease.[15] That being so, life insurers may get only some of this offset or even no offset where they already offer life annuities to individuals. In fact, the longevity risk exposures of European (re)insurers was found by the 2011 European Insurance and Occupational Pensions Authority Solvency II Quantitative Impact Study to be more than five times higher than their mortality risk exposures. In addition, reinsurer capacity to take on longevity risk may already be approaching the limit (which market participants interviewed as part of the background work for this report estimate at around $15 billion per year), so that a broader investment base would be required to match the large potential seller volume.

A relatively untapped pool of potential buyers of longevity risk consists of asset managers, insurance-linked funds, private equity funds, sovereign wealth funds and hedge funds. Asset managers and sovereign wealth funds may be encouraged by the fact that longevity risk is likely to be largely uncorrelated to the other risk factors in their portfolio.[16] However, although the long duration of the

[15] Cox and Lin (2007) and Dowd et al (2006) discuss the role that longevity risk-based derivative contracts can play in such hedging. Mortality risk can be used in part to hedge longevity risk, but the risk reduction may be much lower than expected because mortality risk contracts are short-term in nature (typically with a one- to five-year maturity) with a large exceptional element (eg pandemic risk), while longevity-risk is a longer-term risk (typically with a 20–80-year horizon) and reflects largely unanticipated changes in trend.

[16] Even so, the value of instruments for transferring longevity risk is correlated with interest rate levels via their role in the present value discounting of future pay-outs, so the lack-of-correlation rationale may be weaker than expected.

contracts may not suit hedge funds' typically short-term investment styles, they may be drawn into the market if these markets become more liquid and secondary markets develop.

Reverse mortgages

Regulatory arbitrage may also be a reason to engage in LRT. Indeed, a key lesson from the credit risk transfer (CRT) market has been the importance of aligning regulations and rules across regulated sectors and regulatory arbitrage into unregulated sectors (eg shadow banks). Reverse mortgages may be an instance of a regulatory loophole as such mortgages transfer longevity risk to the banking sector where there is no specific Basel Accord Pillar 1 capital charge for longevity risk. In a reverse mortgage, the lender advances payments to the borrower in the form of an upfront lump sum payment or periodic payments. The loan accrues interest and is settled using the proceeds from selling the property when the borrower moves or dies. The loan is non-recourse, in that the lender does not have access to the assets of the borrower or his/her estate to cover any shortfall (see Box 1).

In most countries, reverse mortgages on bank balance sheets are treated much the same as other residential mortgages. For example, according to Basel II, regular residential mortgages are 75% risk-weighted, unless the loan-to-value (LTV) ratio is less than 80%, in which case they are 35% risk-weighted. Similarly, in the United Kingdom, reverse mortgages are 35% risk-weighted, but for an outstanding balance that exceeds the 80% LTV, a 75% risk weight applies, and any balance that exceeds the value of the property is treated as a loss.[17] On the other hand, reverse mortgages are treated like other residential mortgages in most other countries' banking regulations.

To reduce the potential for regulatory arbitrage, communication and cooperation between those with supervisory responsibility for entities that hold or trade financial instruments containing longevity risk is important. In many jurisdictions pension funds are not under the same regulatory umbrella as (re)insurers. For example, in the United States, pension funds are supervised by the Department of Labor (DOL), and in the United Kingdom it is The Pension Regulator that regulates pensions, while insurance and banking products are dual-regulated by the Prudential Regulatory Authority (PRA) and Financial Conduct Authority (FCA). In France, Germany and the Netherlands, however, pension funds and (re)insurers are covered by the same prudential supervisors. In Canada, supervision depends on the province of incorporation of the pension plan sponsor or (re)insurer, although the vast majority of insurance is supervised by the federal Office of the Superintendent of Financial Institutions and most pension plan sponsors are provincially incorporated and supervised.

[17] Canada has reverse mortgage rules similar to those in the United Kingdom, except that the 35% risk weight applies to mortgages with an initial LTV up to 40% and a current LTV up to 60%. Otherwise, mortgages with current LTVs up to 60% are 50% weighted. A 75% weight applies to reverse mortgages with current LTVs above 60 and up to 75%, and 100% to mortgages with LTVs above 75%, except when the LTV exceeds 85%, in which case the balance exceeding the 85% is treated as a loss. In addition, Canadian banks must undertake an actuarial review of their longevity risk and hold capital for that risk in addition to other Basel capital requirements.

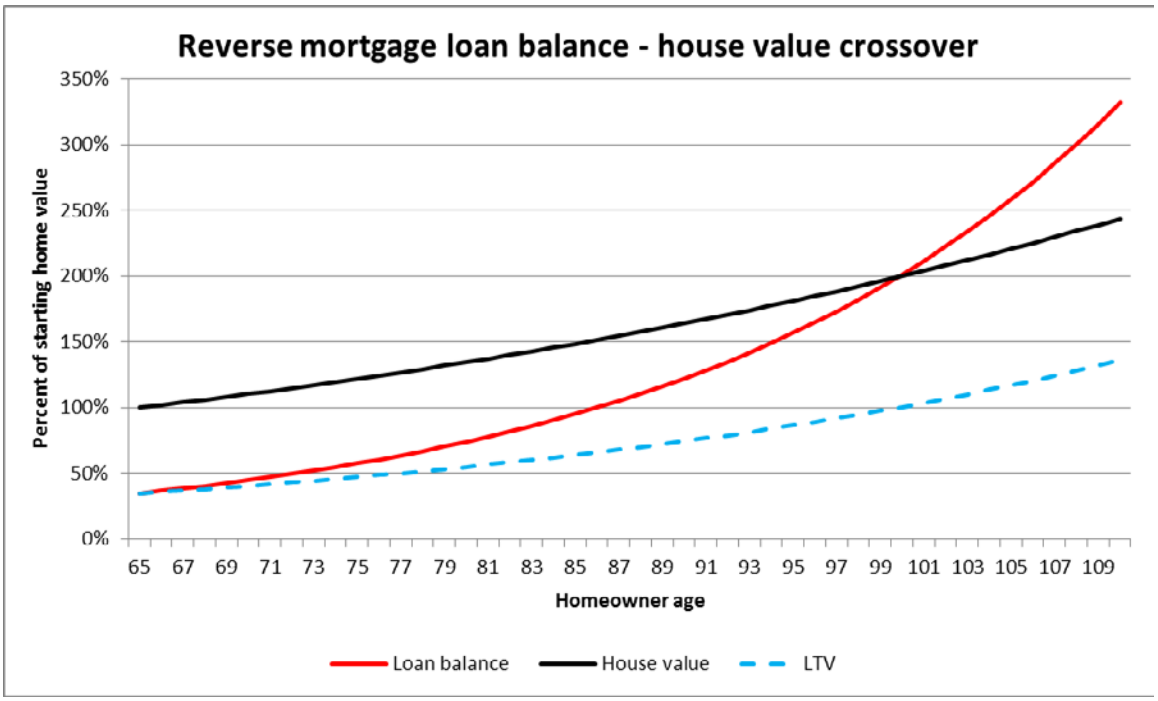
Box 1

Reverse mortgage primer

In a reverse (or "equity release") mortgage, the lender advances cash to the borrower in the form of an upfront lump sum payment or annuity-like periodic payments. The loan accrues interest and is settled using the property sale proceeds when the borrower moves or dies.[18] The loan is non-recourse, in that the lender does not have access to the assets of the borrower or his/her estate (beyond the collateral property) to cover any shortfall.

The figure below shows the evolution of the principal and interest accrual versus the house value for a hypothetical reverse mortgage with an annuity-like payout to a 65-year old homeowner.[19] It shows that in the early days the loan-to-value (LTV) ratio is extremely low, but after the "cross-over point" (when the homeowner is about 98 years old here) the LTV exceeds 100% and keeps rising. For the lender, this is where the mortgage becomes a money loser, because the home sale proceeds are not enough to cover the advances and accrued interest.

There are three main sources of risk to the lender: borrower longevity, house price depreciation, and rising interest rates (if it is an adjustable-rate mortgage). Models have been advanced to measure and price these risks, and in some countries lenders can access government-run mortgage insurance to eliminate them.[20]



[18] The settlement amount is equal to the minimum of the proceeds and the then-current loan balance (advances plus accrued interest). There may also be other charges and a "contingency payment" that consists of a participation share of any house price appreciation.

[19] The example uses an interest rate of 5%, an assumed annuity payment of 2.138% of the starting house value, and a 2% annual house price appreciation rate.

[20] See Lee, Wang and Huang (2012) for one such model and the references therein for others. See Szymanoski (1990 and 1994) for the methodology used by the US Federal Housing Administration (FHA) Home Equity Conversion Mortgage (HECM) to price its reverse mortgage insurance.

3.3 LRT impediments

Obstacles to broader interest in buying longevity risk include a "lemons" risk because the pension funds and (re)insurers seeking to mitigate their longevity risk may have a better idea of how healthy their population cohorts are likely to be. The presence of asymmetric information may create fears of selection bias whereby only those pension funds and (re)insurers with the longest-living populations may want to hedge longevity risk. This risk can be priced into proposed transactions, but that could undermine the attractiveness of the transaction on the other side. Alternatively, transactions could be based on the longevity experience of sample populations, such as those tracked by government statistical agencies.

Basing transactions on standardised cohorts may also improve market liquidity. In that regard, the Life & Longevity Markets Association (LLMA) is pushing for the development of a more standardised and liquid index-based LRT market.[21] They are working from the ground up, setting up standardised term sheets and pricing methodologies for such swap transactions, and pushing for the production of granular and more frequently updated life tables.[22] Also, Deutsche Boerse has introduced longevity swaps based on their XPect® family of longevity indices.[23] These swaps settle based on changes in expected life curves over shorter time periods.

However, basing transactions on standardised population cohorts could leave longevity risk sellers with possibly unacceptable levels of basis risk. Basis risk can be large, caused by significant differences in life expectancy at age 65 depending on sex, employment history, income and geographic location. For example, for a higher-income female in the southeast of England, life expectancy at 65 is approximately 22 years, whereas for a low-income male living in the north it is just under 13 years (Cass Business School (2004)). Recent research by Coughlan et al (2011) and Li and Hardy (2011) proposes index-based hedge methodologies to reduce such basis risk, but scepticism remains. Also, credit rating agencies only give partial credit for index-based transfer structures due to the basis risk. Reinsurance arrangements are typically recognised, although some allowance may be given for counterparty risk.

Regulations also influence how far pension plans are incentivised to pursue longevity de-risking. For example, while insurers generally have to use the most current mortality projections to value their annuity liabilities, in many countries pension funds face less stringent actuarial requirements.[24] Also, in most jurisdictions, the interest rates used to discount future pension fund liabilities exceed those used

[21] The LLMA is a non-profit group made up of several investment banks, insurers and reinsurers interested in facilitating the structuring of longevity risk transfer deals.

[22] Credit Suisse and Goldman Sachs have both tried and given up. Credit Suisse introduced a US longevity index based on publicly available US government mortality tables in 2006, but quietly pulled it sometime later. In 2007, Goldman Sachs introduced a mortality/longevity index (QxX) on the US insured population over the age of 65, aimed primarily at the life settlement industry. However, they shut that operation down in late 2009. Also in 2007, JP Morgan introduced similar annually updated indices ("LifeMetrics") covering Germany, the Netherlands, the United States, England and Wales. In April 2011, JP Morgan transferred the maintenance and dissemination of the index date to the LLMA. In this regard, it is encouraging that the Dutch insurance industry – both its Central Bureau of Statistics (CBS) and Association of Actuaries – regularly publishes mortality improvement tables (in addition to the CBS's monthly publication of mortality data).

[23] The monthly XPect® indices are based on data from Germany, the Netherlands and the United Kingdom. They track a number of male and female cohorts defined by birth dates (1900–19, 1920–39, 1940–59, 1960–79 and 1980–99).

[24] A rationale for more lenient pension plan regulations stems from the fact that there tends to be additional protection provided by the sponsor. Even so, in the Netherlands pension funds do have to use the latest actuarial insights on mortality improvements in the valuation of their pension liabilities.

by insurers.[25] In the Canada and the United States, for example, pension funds' use of out-of-date mortality projections and higher discount rates may be at least partially responsible for the lack of a vibrant LRT market there.

Few jurisdictions impose specific longevity risk charges on pension funds and insurers, although prudent technical provisions play a somewhat similar role.[26] However, Solvency II will impose a specific longevity risk charge on insurers, plus a "risk margin" to cover non-hedgeable risks such as longevity risk. There is a standard formula "solvency capital requirement" (SCR) based on a simulated across-the-board stressed mortality rate reduction, and an "internal model" approach that calibrates the SCR on a 99.5th percentile worst-case scenario. As such, under Solvency II it will become relatively capital-intensive for European insurers to assume longevity risk. As part of the reform of the European Institutions for Occupational Retirement Provision (IORP) Directive, there were plans to revise the solvency rules for IORPs in line with Solvency II principles, but these plans have since been put on hold until further studies are completed.

Another example of a regulatory restriction is the US DOL Interpretive Bulletin No. 95-1 that sets the "safest available annuity" standards that some say have restricted pension de-risking in the United States.[27] On the other hand, as an example of broadening the array of de-risking options, Canada's Office of the Superintendent of Financial Institutions (OSFI) has deemed that buy-in annuities are permissible investments of the pension funds they regulate, and that they would be accounted for in solvency ratio calculations.

Firms seeking to de-risk their DB pension plans have seen few rating and market benefits. However, it cannot be said that the rating agencies do not recognise the benefits of these transactions. For example, Fitch Ratings said that the $26 billion June 2012 GM buy-out transaction with Prudential Financial was "incrementally positive to GM's credit profile" but this was offset by the huge size of the remaining underfunded pension plans and the incremental fees and top-ups paid to Prudential (Fitch

[25] For example, in the United States, discount rates for corporate pension liabilities can be based on corporate bond yields, which may be higher than the discount rate on insurance liabilities. In Germany, generally since 2012 life insurance undertakings have to use 1.75 % to discount liabilities, whereas pension funds are allowed to use higher discount rates. In Italy the interest rate used by pension funds to calculate technical reserves is fixed annually by the Minister of Labour and Social Security and cannot be above the interest rate used to make medium/long-term projections for public debt, a rate that is currently higher than the "risk-free" rates used to discount insurance liabilities. By contrast, in the Netherlands and the United Kingdom, life insurers and DB pension funds use relatively similar discount rate curves to value their liabilities, placing the valuations of insurance and pension liabilities in these countries on a more equal footing.

[26] For example, in Europe, Solvency I does not impose a specific longevity risk charge, but there is a 1% charge on unit-linked annuities (ie where all of the investment risk remains with the annuitant) and a 4% charge on traditional life annuities. However, Canadian insurers have to add a margin to the estimated present value of their annuity liabilities to account for various longevity risk improvement and shock assumptions. The basic capital requirement is 1% of the so-calculated liability valuation, which includes any portion of the liability that does not involve life contingencies. On the other hand, there is no specific longevity risk charge on annuities in Germany, Japan and the United States.

[27] According to Waddell (2010), DOL 95-1 dilutes the de-risking impact of a buy-out transaction because the liability could come back to the plan sponsor if the insurance firm to which the plan was effectively transferred to fails and it is deemed that the sponsor did not buy the "safest available annuity" according to the DOL 95-1 standards. Also the effort and cost of doing the appropriate due diligence may make such de-risking transactions feasible for only the largest firms.

However, the NAIC has formed a working group with representatives of the DOL, the White House Council of Economic Advisors, the US Department of the Treasury and any other appropriate federal agencies to consider possible options for easing plan sponsor concerns about the financial soundness of annuity providers as related to the DOL annuity safe harbor plan sponsor selection of annuity provider and fiduciary responsibility requirements.

(2012)).[28] More generally, the results of empirical studies of the market impact of pension funding decisions are rather ambiguous, suggesting that debt markets price in underfunding to some degree, but equity markets do not (see Box 2).

The most sophisticated longevity risk managers use specific population data that get down to (and even inside) the postal code level, accounting for socio-economic factors. In contrast, publicly available data are too high-level and out-of-date to support the growth of a vibrant market. In principle, LRT transactions could be based on more granular life tables – eg down to the economic group level. While such granularity would reduce basis risk, it would also create an illiquid market, thereby keeping investors out.

Box 2

Market impact of pension funding decisions

The results of empirical work on the market impact of pension fund under- and overfunding are rather ambiguous, suggesting that debt markets price in pension underfunding to some degree, but that equity markets do not. Cardinale (2007) finds that credit spreads reflect unfunded liabilities for investment-grade (IG) firms, but not for non-IG ones. Gallagher and McKillop (2010) find that pension disclosures are reflected in credit default swap (CDS) spreads

McFarland et al (2009) find that pension underfunding is generally not reflected in equity prices. However, this could be an opacity issue, because they also find that the shares of firms with severely underfunded plans underperform those of firms with healthier pension plans for at least five years after the underfunding is first revealed. With regard to opacity, it is notable that all of these studies cover pre-2007 US-centric data, and it was not until 2007 that the enhanced disclosure requirements of FAS 158 came into effect. (Similarly enhanced disclosure came to the United Kingdom in 2003 via FRS 17.)

Finally, both sides of the market are also affected by a lack of reliable and sufficiently detailed information about longevity developments. Life tables are not updated frequently and are only available for relatively aggregated groups in the population. Sophisticated longevity risk management and transfer would benefit from much more disaggregated demographic data (including, for example, by postal code and cause of death), which can reduce basis risk; indexes of such data would facilitate the design and trading of LRT instruments. However, the use of more granular, disaggregated data sets leads to smaller samples in each data group, therefore potentially raising credibility issues.

[28] Similar offsetting points were made in Moody's (2012) and S&P (2012). Also, Moody's (2009) points out that "increased pension fund liability is unlikely to be sole driver of ratings downgrades where issuers have adequate liquidity, sufficient resources to alleviate their funding deficiency over time and financial metric contraction is modest for their rating category." Nevertheless, Carroll and Niehaus (1998) found that unfunded liabilities are reflected in credit ratings, but not the benefits of overfunding, concluding that "this asymmetric is consistent with the view that unfunded pension liabilities are corporate liabilities that compete with debt claims, but that there are costs associated with quickly accessing excess pension assets due to the mandated sharing of reverted excess assets."

Chapter 4 – Risk management challenges, systemic risks and stress scenarios

4.1 Overview

Although LRT markets are not large enough to present immediate systemic concerns, their potential size is enormous. LRT leads to linkages between and across firms involved in the risk transfer chain. These linkages are important from a microprudential perspective, yet may even become an issue on a macroprudential or systemic scale.

The potential size is to a large extent dependent on official policy regarding longevity risk transfers away from corporate pension funds – policy that seems quite ambivalent in many jurisdictions. Plus, in some countries, the public sector owns most of the longevity risk (eg France and Japan) and in others most corporate funds have transferred their longevity risk to their employees and pensioners via DC plans. In the end, policy decisions with respect to LRT markets are very much intertwined with policy positions regarding the optimal "home" for longevity risk.

4.2 Risk management challenges

A key risk that may arise from LRT is counterparty default risk. Buy-ins, longevity swaps, longevity insurance, and longevity bonds all create counterparty risk to the cedent, although to varying degrees. By contrast, buy-outs usually do not expose the cedent to counterparty risk. In fact, following a buy-out, the cedent's obligations to employees typically cease to exist, except in Germany and the United States.[29]

Table 1 describes the counterparty risk originating from different types of transactions, and the risk management approaches that could be used to mitigate this risk. In the case of buy-ins and longevity insurance, the longevity risk cedent is exposed to the ability to pay by the (re)insurer. While it surely helps that (re)insurers are regulated entities, the experience of the 2008–09 financial crisis has highlighted the primary importance of sound risk management. Note that a buy-in leads to a larger counterparty risk exposure than a comparable longevity insurance transaction, as principal and investment risk are also exchanged in the case of buy-ins.

In traditional reinsurance transactions, ratings play an important role in the evaluation of counterparty risk. This market practice is also recognised in the latest drafts of the standard formula of the pending Solvency II regime in the European Union, where the probability of default (PD) is determined by the rating of the respective reinsurance company. Diversification, that is using different reinsurance counterparties, is also good practice. Both diversification and the use of ratings are equally valuable when dealing with counterparty default risk arising from LRT.

In longevity swaps, the direct counterpart of the risk cedent may not be a (re)insurer, but counterparty risk can be mitigated through collateral arrangements. However, because new information on mortality rates is likely to become available with substantial lags, net exposures may still become sizeable. To promote a more frequent settlement of outstanding claims under a longevity swap, a pre-specified mark-to-model method could be used.

[29] See footnotes 1 and 27.

Counterparty risk originating from longevity risk transfer — Table 1

	Counterparty	Exposure	Risk management controls
Buy-in	(Re)insurer	Principal plus exposure contingent on investment and longevity risk	Credit risk due diligence (eg ratings and scenario analysis)
Longevity insurance	(Re)insurer	Exposure contingent on longevity risk	Credit risk due diligence and, in some cases, collateral posting
Longevity swap	(Re)insurer Bank Capital markets	Exposure contingent on longevity risk	Credit risk due diligence and collateral posting based on frequently updated mark-to-model.

Depending on the type of risk transfer, the cedent may also become exposed to basis risk. Basis risk occurs when the longevity hedge is imperfect, which is particularly obvious in case of index-based longevity risk transfers. Indeed, the longevity experience of the hedged exposure may differ from that of the index. Coughlan et al (2011) describe how basis risk arising from index-based longevity hedges can be analysed and mitigated. Such methods were applied on the Aegon-Deutsche Bank longevity swap of January 2012. Nevertheless, basis risk remains a potential concern, and as mentioned above, regulations tend not to recognise the risk mitigation benefits of longevity hedges if there is material basis risk.[30]

As longevity swap transactions tend to mature prior to the closure of the underlying pension plan, there is often so-called rollover risk. Indeed, when the swap comes to an end, the pension plan is no longer protected against longevity risk and may not be able to enter into a new longevity swap with similar terms. Related to this, there is some debate as to whether genuine risk transfer can be effected with a contract that lasts for a significantly shorter period of time than the length of the underlying contract (10 years, versus full annuity run-off). Insurance-based transactions can extend to full annuity run-off, but they limit potential counterparties to (re)insurers.

Finally LRT may lead to opacity risk arising due to differences in the knowledge, skills and expertise of the buyer and seller of longevity risk. Opacity risk likely increases with the number of links in the risk transfer chain, as the original seller of longevity risk and the ultimate buyer become more and more widely separated.

For the institution or investor that accepts the longevity risk of a LRT, the risk management may be challenging. Under normal circumstances, longevity risk portfolios include a high degree of diversification because death events can usually be considered to be independent. However, there are situations where diversification may largely disappear, for example, when medical improvements or lifestyle changes positively affect the longevity of the whole portfolio. Also the diversification between longevity risk and financial risks may be overstated because the impact of longer life expectancy on the economy (in particular on corporates with pension liabilities) is overlooked. These tail dependencies make it difficult to assess, model and manage longevity risk effectively.

It was mentioned earlier that almost all LRT transactions to date relate to pensioners in payment. Hence there is a possibility that DB pension plan short-dated liabilities are well managed and mitigated, but that longer-term liabilities associated with pre-retirement plan members are left

[30] The regulatory treatment of the longevity basis risk associated with index-based hedges involves a trade-off between systematic and idiosyncratic longevity risk. Index-based hedges can be effective in mitigating systematic risk, which is a slowly building trend risk that cuts across all population cohorts. However, they leave the cedent exposed to the idiosyncratic risk associated with the cohorts they are exposed to.

orphaned. This could lead to a loss of longevity risk diversification, and increase the volatility of the plan's funding position. Given the still-small size of these markets, this is not a current concern, but it is something that does bear watching.

4.3 Potential systemic risk under stress scenarios

An important lesson from the CRT market, which is much more developed, is that the transfer of risk may lead to undesired and unforeseen consequences. In the case of CRT markets, a proliferation of complex products resulted in the build-up of concentrated leveraged positions, many of them held by investors who did not fully appreciate the higher-risk nature of these products (Joint Forum (2008)). Furthermore, some forms of credit risk transfer, particularly those customised to investor preferences, lacked transparency in relation to what was being transferred and to whom, and markets turned illiquid under stress, which also made reliable valuation difficult.

In the case of longevity risk transfer, as in pre-crisis CRT markets, risk concentration seems especially likely, given the complexity and specialised nature of these transactions. In fact, currently only a handful of (re)insurers and investment banks are active in the LRT market. Also LRT instruments may lack transparency about the nature and size of the inherent risk, in particular where the longevity risk relates to an actual portfolio of annuities that is managed by the cedent of the risk. Even more than for CRT instruments, the valuation of LRT instruments may lack reliability because there are no liquid markets for these instruments. Where valuations are use models based on past longevity experience, uncertainty about future longevity developments may put the reliability of valuations in doubt.

Even when bank or (re)insurers act only as intermediaries in LRT transactions, rather than holders, they are not invulnerable to sharp life expectancy increases. If their counterparties are unable to meet the contractual demands, the intermediaries themselves become exposed to any crystallised longevity risk. If the sharp rise in longevity is systemic, conceivably all longevity risk contracts become "in the money" and the longevity risk transfer chain potentially breaks down. When the market has had time to grow to sizeable proportions before a stress scenario occurs, longer life expectancy may have repercussions on the broader financial system, particularly to the extent that (investment) banks are involved.

One way to avoid a breakdown of the risk transfer chain might be to cap the transfer of risk at a predefined amount. By posting collateral, possibly equal to the predetermined amount at inception with frequent re-posting as expected present values change, the risk transfer could be effectively guaranteed in theory.[31] Note that a cap on the risk transfer also enhances the marketability of longevity risk to the capital market, as recent transactions have shown. However, collateral posting and good risk management require reliable and widely accepted valuation methodologies, whereas these still look to be in the research stage at present. If there were liquid secondary markets for such products in a standardised form, valuations could be bootstrapped from market prices, but such markets have yet to develop (Barrieu et al (2012) and Cairns, (2013)). Also, even if a widely accepted model of longevity risk did exist, collateral requirement gaps could still be created by longevity shocks.

Another option might be to prohibit certain market participants from taking longevity risk. To some degree, some jurisdictions already do this. For example, in most jurisdictions legislation and/or regulations prohibit banks from issuing life annuities and insurance contracts. Although banks are allowed to sell various retirement products, they are typically prohibited from offering guaranteed

[31] In fact, standards for posting of collateral up front ("initial margin" or "independent amounts") and as valuations change ("variation margin") on non-centrally cleared derivatives, with rare exceptions, have been mandated by the Basel Committee on Banking Supervision (BCBS (2013)).

income streams linked to the lifespan of the purchaser. However, banks are generally permitted to enter into longevity swaps, and some own insurance subsidiaries.

Another issue involves the potential for opaque interconnections to be formed by chains of LRT transactions. In many cases, counterparties to the initial transaction (eg with a pension plan sponsor) transfer some or all of the risks to other (re)insurers, and in the future, possibly to capital markets. In addition, pension plans that hedge in LRT markets and also place funds with asset managers or funds that invest in LRT instruments might find that at least the systematic components end up back on their balance sheets. Jurisdictions should consider the degree of interconnectedness of any losses arising from longevity risk. Not only is longevity risk likely to affect most owners/writers at the same time, but it is possible that, if banks (in particular) assume longevity risk, losses arising due to longevity risk may affect the stability of the financial system. This may not be a current concern given the small size of LRT markets, but it may be something to bear in mind for the future.

Due to inconsistent treatment of longevity risk across financial sectors, longevity risk may accumulate where it is least regulated or not regulated at all. There may also be a tendency that transfers take place from parties that have risk expertise to parties that have less risk expertise. Consequently, risks may accumulate where they are least understood and where they are monitored and managed less effectively.

Chapter 5 – Main findings and recommendations

5.1 Main findings

Longevity risk – the risk of paying out on pensions and annuities for longer than anticipated – is a major risk for the sustainability of retirement systems around the world. While longevity risk holders are much focused on investment risks, each year that they underestimate longevity will cost them an additional $450 billion to $1 trillion in aggregate payouts. Even on a global scale, these are massive amounts.

Corporate DB pension plans hold a large part of the world's longevity risk. In order to reduce the build-up of further longevity risk, many corporations have taken steps such as closing DB pension plans to new employees and closing DB accruals to existing employees. At the same time, it has become increasingly common for employers to offer DC plans, where the risk of living longer than expected is effectively borne by the employees rather than the employer. Though these changes in the pension domain have restrained the growth of the longevity risk exposure of plan sponsors, corporations tend to remain responsible for already accrued DB benefits. Hence, some of them have turned to LRT markets.

There are three primary types of LRT transactions: buy-outs, buy-ins and longevity swaps (or insurance). In a buy-out, all of the pension plan's assets and liabilities are transferred to a (re)insurer in return for a premium. In a buy-in, on the other hand, the assets and liabilities remain on the pension fund's balance sheet. While buy-outs and buy-ins transfer both investment and longevity risk, longevity swaps (and insurance) transfer only the latter. However, buy-ins and longevity swap (and insurance) transactions leave the pension fund with counterparty risk.

This Joint Forum report provides a first and preliminary analysis of the LRT market, including the associated potential risks and cross-sectoral issues for market participants, policymakers and supervisors.

Main findings

- LRT markets are still relatively small compared with their market potential. While the majority of LRT transactions have taken place in the United Kingdom, so far only £50 billion of DB pension liabilities have been de-risked (versus total DB assets of approximately £1 trillion). In 2012 there

were three large transactions outside the United Kingdom – two large buy-outs in the United States (involving a respective $26 billion and $7 billion of underlying assets) and a €12 billion longevity swap in the Netherlands. Yet even with these transactions, LRT markets remain small in comparison to the multi-trillion dollar size of pension and annuity liabilities worldwide.

- Explanations for the small size of LRT markets include the relatively lenient regulatory treatment of longevity risk in pension funds compared with (re)insurers, selection bias ("lemons") risk and, in case of index-based transactions, basis risk. Another often-cited LRT market impediment is a lack of reliable and sufficiently detailed data on longevity developments, hampering the accurate valuation of pension and life insurance liabilities as well as the proper assessment of longevity risk.
- Techniques to broaden LRT markets tend to expose longevity risk sellers to new risks that may be substantial. For example, in order to reduce selection bias risk, LRT transactions may be based on population indices as opposed to the risk cedent's actual longevity experience. While this makes the transactions more attractive to capital market participants, it leaves the cedent with basis risk. At the same time, the risk transfer chain tends to grow in length, which leads to more opacity risk due to differences in the knowledge and skills between the seller and the buyer of longevity risk.
- Regulatory arbitrage may also drive longevity risk transfer, as it did the now much more developed CRT markets. For example, reverse mortgages may be an instance of a regulatory loophole as such mortgages transfer longevity risk to the banking sector where there is no specific Basel Accord Pillar 1 capital charge for this type of risk. Though Pillar 2 of the Basel Accord requires banks to identify and assess their risks, and ensure that "capital targets are… consistent with their overall risk profile", banks that do not believe their longevity risk is material may not include it in their risk profiles. Plus, by not being in Pillar 1, longevity risk-related capital requirements could differ significantly between jurisdictions.
- Given their potentially large size, LRT markets may raise systemic risk concerns in the future. As in the case of CRT, LRT may lead to a buildup of risk, much of which is held by only a handful of investors. While investment banks typically act as intermediaries in LRT deals, not as primary holders, they still present risks to their counterparties that could materialise in case of a longevity tail risk event. This could even lead to a systemic risk event if and when LRT markets have grown to their potential size and breadth.
- In countries where government-backed pension guarantee schemes exist, employees may prefer that their pension benefits not be transferred through a buy-out, as the guarantee is lost. Other LRT instruments (buy-ins and longevity swaps/insurance) do not share this drawback, yet leave pension fund sponsors and (re)insurers with counterparty risk. In case of a buy-out, pensioners effectively become exposed to the counterparty risk of a (re)insurer that is often more stringently regulated than their pension fund.
- The Joint Forum notes that, in many jurisdictions, policymakers have remained silent on the appropriateness of LRT activity in their jurisdictions. In most countries there appear to be few, if any, restrictions on transferring longevity risk across regulated sectors, and beyond. Even among regulated sectors, the regulatory treatment of longevity risk appears inconsistent.

5.2 Policy recommendations

Whether or not policymakers should play a more active role in encouraging longevity risk transfer from private pension plans to (re)insurers and, ultimately, to broader capital markets depends on considerations regarding where this risk is best held. Answering this question is beyond the scope of this preliminary analysis, but some relevant factors are worth mentioning.

Advocates of more LRT (see, eg, Towers Watson (2011) and Swiss Re (2012)) point to already visible and unwieldy corporate pension benefit obligations and to the heavy underfunding of DB pension funds.[32] In this context, they recognise that not only are pension obligations a sizeable distraction to corporate core business lines, but a significant longevity shock could undermine the firm's own existence. In addition, they point out that some LRT instruments (namely buy-outs) may provide pensioners with a more stringently regulated (re)insurer counterparty.

In addition, policymakers may want to encourage (re)insurers to use LRT markets to free up capital in order to give (re)insurers (or any other entities allowed to provide annuity products) the possibility of writing more of these annuities, which are useful and unique retirement products. On the other hand, the transfer of risk from a mature sector with significant capital requirements to an LRT market that may not have these safeguards might not be in the employees' best interests, and may even create new systemic risks.

At the same time, when longevity risk is shifted from the corporate sector to a limited number of (re)insurers, with global interconnections, there may be systemic consequences in the case of a failure of a key player (as was the case in the CRT market). Most countries in which this view is shared incentivise the private sector to provide adequate retirement benefits to employees, sometimes providing explicit protection to corporate pension funds with government-supported guarantee schemes. In other countries, this view is expressed implicitly by allowing pension funds to value their liabilities with a discount rate that is higher than the one used for (re)insurers' reserves.

Motivated by the aforementioned preliminary findings, the Joint Forum proposes the following recommendations to supervisors and policymakers.[33]

1. ***Communicate and cooperate:*** *Supervisors should communicate and cooperate on LRT internationally and cross-sectorally in order to reduce the potential for regulatory arbitrage.* Adequate supervisory cooperation is key to reducing the potential for regulatory arbitrage, especially in jurisdictions where pension funds and (re)insurers do not have the same regulatory/ supervisory authority.

2. ***Understand longevity risk exposures:*** *Supervisors should seek to ensure that holders of longevity risk under their supervision have the appropriate knowledge, skills, expertise and information to manage it.* Supervised holders should be prepared to demonstrate these abilities to their relevant supervisor, while appropriate education should be provided to the public with respect to retirement and life-long products.

3. ***Assess relevant policies:*** *Policymakers should review their explicit and implicit policies with regard to where longevity risk should reside to inform their policy towards LRT markets. They should also be aware that social policies may have consequences on both longevity risk management practices and the functioning of LRT markets*. Such reviews should consider which sector is in the best position to bear and manage the risk, and the roles of pension and insurer guarantee mechanisms.

[32] The academic literature has put forward a number of different theories to explain why corporations might over- or underfund the pension funds they sponsor. One such theory predicts that firms will underfund to maximise the value of an effective bankruptcy put option on fund assets provided by pension guarantee schemes such as the US Pension Benefit Guarantee Corporation (Sharpe (1976) and Treynor (1977)). In fact, An et al (2013) find evidence of pension put option maximisation-driven underfunding by financially distressed firms. On the other hand, profitable and well capitalised firms tend to overfund, which is consistent with theories that model pension funds as shelters for safe liquid assets on a tax-advantaged basis (Black (1980), Bodie et al (1987) and Francis and Reiter (1987)).

[33] See footnote 3 for definitions of the terms "supervisors" and "policymakers".

4. ***Review longevity risk rules and regulations:*** *Policymakers should review rules and regulations pertaining to the measurement, management and disclosure of longevity risk with the objective of establishing or maintaining appropriately high qualitative and quantitative standards, including provisions and capital requirements for expected and unexpected increases in life expectancy.* Standards will need to recognise differences across jurisdictions in the roles of various types of longevity risk buyers and sellers in bearing longevity risk uncertainty.

5. ***Ensure adequate risk-bearing capacity:*** *Policymakers should consider whether they should require that institutions taking on longevity risk, including pension fund sponsors, are able to withstand unexpected, as well as expected, increases in life expectancy.* Relatively lenient treatment of pension obligations in some jurisdictions has been noted as a market distortion that needs to be better justified by policymakers.

6. ***Monitor market developments:*** *Policymakers should closely monitor the LRT taking place between corporates, banks, (re)insurers and the financial markets, including the amount and nature of the longevity risk transferred, and the interconnectedness this gives rise to.* The financial crisis of 2008–09 has shown that the transfer of risk may lead to undesired and unforeseen consequences. Indeed, in the much more developed CRT markets, risk transfer actually led to risk concentration among a relatively small number of investors that were unable to bear the risk when this was most needed. In the case of LRT, risk concentration seems also likely, given the complexity and specialised nature of these transactions. In fact, only a few (re)insurers and investment banks are currently active in LRT markets. Transparency on longevity risk positions will be instrumental in preventing an undesirable build-up of this potentially large risk.[34]

7. ***Pay attention to tail risk:*** *Supervisors should take into account that longevity swaps may expose the banking sector to longevity tail risk, possibly leading to risk transfer chain breakdowns.* If the counterparties of investment banks are unable to meet their contractual demands under the longevity swap, the banks themselves become exposed to any crystallised longevity risk. If the sharp rise in life expectancy is systemic, conceivably all longevity risk contracts are "in the money". This could then lead to a failure of LRT market participants, including banks active as intermediaries in longevity swap transactions.

8. ***Collect adequate data:*** *Policymakers should support and foster the compilation and dissemination of more granular and up-to-date longevity and mortality data that are relevant for the valuations of pension and life insurance liabilities.* Such data would also be instrumental to the measurement and management of longevity risk. Indeed, among other things, better longevity and mortality data would help to reduce the basis risk created by risk transfer transactions based on standard indices.[35]

[34] There is an ongoing initiative led by the G20, the Financial Stability Board and the IMF to address key information gaps. The purpose of this initiative is to better understand emerging vulnerabilities of economies to shocks, enhance financial surveillance, and, more generally, support policy making. It would be useful to broaden the scope of the data gaps initiative to longevity risk.

[35] The Joint Forum recognises that the provision of more frequently updated data will be more difficult in some countries than in others. More frequent updating will be more difficult in countries that use census-based methods (eg the United Kingdom and the United States) than in those that use register-based census methods (eg Denmark, Finland, Norway and Sweden). Data and privacy protection laws may also add frictions.

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Annex 1

List of members of the Joint Forum Working Group on Risk Assessment and Capital (JFRAC)

Co-Chairs	**Stuart Wason**	**OSFI**
	Philipp Sudeck	**BaFin**
Canada	Daniel Mayost	OSFI
France	Alexis Dupont	Autorité de contrôle prudentiel
	Fabien Marchese	Autorité de contrôle prudentiel
Germany	Christoph Schlecht	BaFin
Italy	Laura Pinzani	Bank of Italy
Japan	Takashi Hamano	Bank of Japan
	Shintaro Nakamura	Bank of Japan
	Yuko Shimamura	Bank of Japan
	Yuka Osuna	Financial Services Agency
Korea	Jung Hun Ho	Financial Supervisory Service
	Chan-Young Lee	Financial Supervisory Service
Netherlands	Paul Hilbers (*)	Netherlands Bank
	Janko Gorter	Netherlands Bank
Spain	Marta Estavillo	Bank of Spain
	José Manuel Portero	Comisión Nacional de Mercado de Valores
United Kingdom	Marty Bonus	Prudential Regulation Authority
United States	William White	Department of Insurance, Securities and Banking
	Suzanne Clair	Federal Deposit Insurance Corporation
	Robert Esson	National Association of Insurance Commissioners
	Alexandria Luk	Office of the Comptroller of the Currency
	David Blas	Securities and Exchange Commission
	John Fahey	Securities and Exchange Commission
European Commission	Lars Dieckhoff	European Commission
IMF	John Kiff (*)	International Monetary Fund
IAIS	Lance Leatherbarrow	International Association of Insurance Supervisors
IOSCO	Alp Eroglu	International Organization of Securities Commissions
Secretariat	Paul Melaschenko	Basel Committee/Joint Forum Secretariat
	Motohiro Hatanaka	Basel Committee/Joint Forum Secretariat

(*) Co-chairs of the Longevity Risk Transfer Markets workstream

Annex 2

Feedback received on the August 2013 consultative paper

On 15 August 2013, the Joint Forum released its consultative document "Longevity risk transfer markets: market structure, growth drivers and impediments, and potential risks". Interested parties were invited to provide written comments by 18 October 2013 and 13 responses to the public consultation were received. These comments are available on the Joint Forum's website[36]. The Forum wishes to thank those who took the time and effort to express their views.

Table 1: Institutions and academics that submitted comments

Type	Count	Names
Industry associations	3	Association of British Insurers Canadian Life and Health Insurance Association Institute and Faculty of Actuaries (UK)
Companies	4	Aegon Blue Square Re (Netherlands) Deutsche Bank Manulife Financial (Canada) Saudi Banks
Consultants	5	Aon Hewitt Camdor Global (UK) Hymans Robertson (UK) Life Bond Management GmbH Pacific Global Advisors (US)
Academics	1	David Blake

Table 2 details the key themes of the comments and the Joint Forum's respective responses, many of which were incorporated in this final report while others were considered to be outside its scope. For example, some comments advocated a discussion of legal risks and another called for covering state-held longevity risks.

There have been calls for more harmonisation between insurance and pension regulations that pertain to longevity risk. The Joint Forum agreed to call for policymakers to "review their explicit and implicit policies with regard to where longevity risk should reside to inform their policy towards LRT markets."

[36] See www.bis.org/publ/joint31/comments.htm.

Also notable were comments disagreeing with the assertion in the consultative report that swaps are inherently more counterparty risky than insurance contracts. In response, the paragraph was removed.

Table 2: Key comments and Responses

Specific Comments	Responses
(i) Comments calling for harmonisation of pension fund and insurance regulations	
It would be unreasonable and unnecessary to introduce additional requirements for insurers above and beyond those in Solvency II.	The question as to whether longevity risk-related regulations should be harmonised across sectors is best left to policymakers, because there are dimensions outside the regulatory realm that must be considered – eg social policies.
High regulatory standards of insurance industry should serve as a basis for all market participants.	
Longevity risk should be treated like any other risk and not singled out. Joint Forum should prod policymakers to work towards standard measures of longevity risk and longevity risk uncertainty.	
Regulations and risk management standards pertaining to longevity risk should be harmonised across sectors. DB plan valuations should reflect the full liability economic value. The buyout valuation of liabilities should be disclosed along with mortality assumptions, and the sensitivity to longevity risk.	
(ii) Comments disagreeing that swaps are inherently more counterparty risky than insurance contracts	
Disagree with the argument that there is a big difference in counterparty risk between insurance and swap contracts.	The last paragraph on page 7 was removed.
Disagree that insurance-based transactions achieve more complete risk transfer.	
(iii) Other comments	
The topic of index swaps should be noted in the executive summary's description of insurance and swap contracts.	Point inserted in the executive summary
Longevity risk transfer transactions are becoming increasingly cross border.	Point added to executive summary
Flesh out rationale for why almost all transactions relate to pensions in payment (ie older lives).	Point added to section 1.2
Include among longevity risk mitigants, lump sum (or enhanced transfer value) offers in which pension plan members exchange their pension entitlements for a one-off payment.	Point added in section 1.2

Buy-ins preferred to buy-outs in low interest rate environments due to smaller up-front lump sums.	Point inserted in section 2.2
A key advantage of longevity swaps is that they can hedge 100% of longevity risk even when the DB plan is underfunded.	Point added in section 2.3
Government-issued longevity bonds would help as market benchmarks and promote market liquidity, in the same way that Inflation Linked Securities helped to kick start inflation risk transfer markets.	Point added in section 2.4
Mention reinsurance capacity as another barrier to market expansion in the second bullet of Chapter 5's main findings.	This point was already made in section 3.2
Drop concern that hedge funds are averse to collateralisation.	Point removed from section 3.2
Hedge statement that implies that standardisation alone could improve liquidity.	Point removed from section 3.2
Private equity firms entering the market (eg Blackstone purchase of Rothesay Life from Goldman Sachs).	Point added in section 3.2
Insurance-linked funds are starting to take an interest.	Point added in section 3.2
Include something on revised European IORP Directive that at one point effectively would have converged pension solvency regulations with the ones that apply to insurers in Solvency II.	Point about the IORP directive revision inserted in section 3.3
Broaden the discussion of "lemons" problems to contracts between (re)insurers.	Point inserted in section 3.3
Standardised instruments are essential to the creation of liquid LRT markets, and mitigate insurer concentration risk.	Point made in section 3.3
Mention progress regarding the production of more granular and frequently updated mortality data in the Netherlands.	Point added to footnote 22, section 3.3
Focus on mitigating risks related to pensions in payment could skew DB plan risk to longer-dated pre-retirement plan member longevity risk.	Point added in section 4.2
Mention that the rollover risk associated with longevity swaps in some cases is less likely to be an issue with insurance contracts.	Point inserted in section 4.2
The basis risk discussion could be better balanced.	Point added as a footnote in section 4.2
By not giving capital relief on a longevity hedge unless it is perfect, there is a real danger of suffering the consequences of not being hedged at all.	Point added as a footnote in section 4.2
Pension funds that hedge in LRT markets could find at least the systematic component back on their balance sheets if they place funds with investment managers that invest in LRT markets.	Point added in section 4.3
Discussion of cancer cure impact is naïve – it will take a	Point removed from section 4.3

long time from discovery to implementation.	
Laudable but unrealistic to call for more granular data compiled and published more frequently.	Point added as a footnote to last bullet in recommendations in section 5.2
Any review of privately-held longevity risk should also include state-held longevity risk.	This is outside the scope of the paper.
Should note importance of transfers between (re)insurers. Although they are a smaller part of the market, they are important price setters and market makers.	We recognise that there are transfers between (re)insurers but there is insufficient data to substantiate the special importance of these transfers.
Chapter could highlight the legal risks associated with longevity risk hedging contracts, and there could be a deeper discussion of counterparty risk management.	This is meant to be an introduction and overview of LRT markets and related regulatory and risk management issues. It is beyond the scope of this paper to go deeply into these specific issues to that extent. However, it is interesting follow-up work.
Suggest practical ways to consider unexpected increases in life expectancy in setting capital or reserve requirements.	
Recommendations of paper only applicable to more developed countries.	The geography of privately-held longevity risk is rich and complex, and may as a consequence of LRT may change over time.
Longevity swaps are not collateralised daily but on a "contingent" basis.	While this may be true in some cases, we have insufficient data to verify this point.