Reorienting Retirement Risk Management

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Outsourcing Pension Longevity Protection

Igor Balevich

Employer-provided defined benefit (DB) pension plans were a key component of the traditional 'three-legged stool' of retirement income in decades past, with the other two legs being Social Security and personal saving. Despite the steady decrease in the number of US participants covered by employer-sponsored DB plans over time and the sudden drop in value of retirement assets in 2008, $2 trillion of assets still remain in private DB plans and $3.5 trillion in government pension plans as of the end of 2008 (Investment Company Institute 2009). One of the valuable features of DB plans, when compared to the increasingly common defined contribution (DC) plan, is that the default form of benefit payment has been an annuity with payments continuing for at least the lifetime of the employee.

Managing a DB plan has proven to be a difficult task over the past 10 years. The early part of the decade was marked with significant funding declines (assets minus liabilities) and increases in the number of plan changes that either reduced or eliminated future benefit accruals. After many pensions worked their way back to a decent funded status by the end of 2007, capital market conditions in 2008 reversed all of the gains from the previous 5 years. Many corporate pension plans were in the process of deciding whether or how to implement liability-driven investing (LDI) strategies when the market turmoil struck. Ironically, such strategies could have helped protect against the volatile 2008 market conditions.

The last decade has also led to greater focus on the volatility of plan costs. In the United States, little attention has been devoted to mortality assumptions and their impact on costs. Yet this pattern is changing due to the 2006 Pension Protection Act (PPA) requirements to update mortality assumptions more frequently, as well as refinements in risk management strategies.

This chapter discusses mortality trends, the impact of longevity assumptions on pensions, and factors that drive plan sponsors' decisions on whether to outsource longevity exposure. We first review general population mortality improvement trends in the United States. Despite fairly steady improvement trends over most of the last century, opinions vary greatly on whether these trends will continue in the future. Although the mortality levels of people covered by pension plans tend to be lower than those of the general population, many of the methods and reasoning used to model general population mortality can be applied to pensions as well. Next we examine the impact of longevity assumptions and experience on pension plan liabilities. A comparison of the magnitude of this risk relative to the capital market risks can be informative in understanding whether and how pension plans sponsors may decide to outsource this risk. Finally, we discuss ways in which longevity exposures can be managed or outsourced. These include plan design changes to shift longevity risk to employees, transferring the risk to insurance companies, and hedging without completely eliminating longevity risk.

Longevity trends and estimation

There is little dispute that life spans have increased significantly and fairly steadily over most of the last century. Nevertheless, there is considerable debate and disagreement over whether this trend will continue in the future, whether the mortality improvements will accelerate, or whether they will slow or even reverse for some generations. Similarly, although there are many ways of modeling future mortality rates, currently there is no single widely accepted best method for doing this. These varied views could be refined and converge as more people focus their attention on the impact of mortality on pensions.

Historic mortality trends

Life expectancy at birth in the United States has increased from 58.3 years in 1934 to 75.2 years in 2005 for males, and from 62.4 years in 1934 to 80.4 years in 2005 for females (Human Mortality Database 2008). On average, life expectancies increased by just under 0.24 years for males and just over 0.25 years for females, for each calendar year over this time period. Note that these are *period* life expectancies, indicating how long someone born in a given year would live if he or she experienced mortality rates equal to those calculated for each age in that year. This is generally not a true estimate of how long a person born in a given year is actually expected to live, since period life expectancy does not take into account the projected changes in mortality rates that a person would actually experience over their lifetime. Nonetheless, it is still a useful measure to illustrate trends in mortality rates over time (Figure 10.1).

Despite a relatively steady historic long-term increase in life expectancy at birth, there are vastly different views on whether this trend will continue

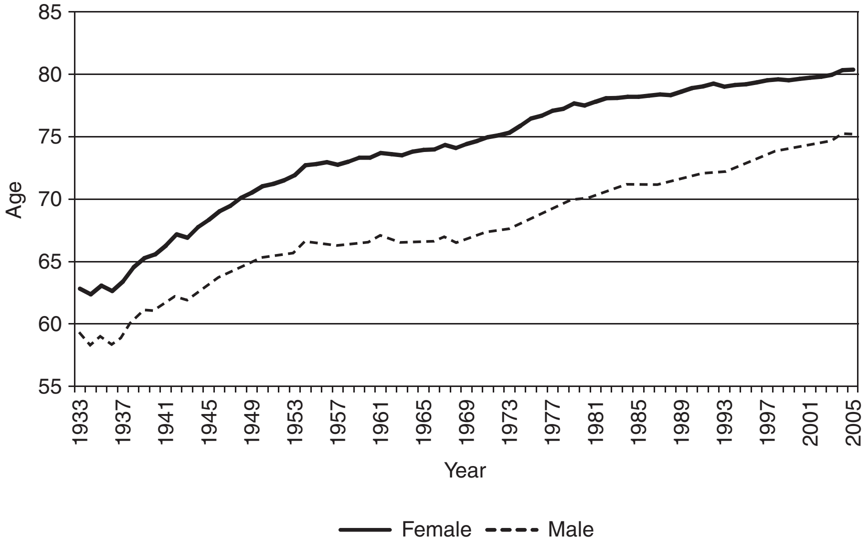

Figure 10.1 United States life expectancy at birth (period table). *Source*: Author's calculations derived from Human Mortality Database (2008).

in the future. At one end of the spectrum, some argue that there are biological limits to the increases in life spans (Carnes, Olshansky, and Grahn 2003), and that factors such as childhood obesity will even decrease life expectancy for younger generations (Olshansky et al. 2005). Opponents point to the lack of evidence of a limit to life expectancy (Oeppen and Vaupel 2002). One extreme point of view is that regenerative medicine could possibly halt the aging process and that the first person to live to 1,000 years old might be alive today (de Grey and Rae 2007). This broad range of opinions illustrates the challenges involved in accurately modeling future mortality rates.

Modeling future mortality

Projecting future mortality rates for a given population involves estimating four elements: current mortality rates for the population, long-term trends, short-term derivations from the trend, and infrequent onetime shocks. Stochastic mortality simulations can use separate distributions for each of the elements, or they may utilize a model with parameters that can estimate their impacts.

The difference between the best estimate of current mortality rates and actual rates for the population is referred to as the *basis*. Since the actual rates are generally not known in advance, even for fully medically underwritten populations, it is important to estimate the magnitude of a confidence band around the best estimate to understand the basis risk of the projection. The long-term trend is generally assumed to capture reductions in the mortality rates over time due to medical advances. But as noted, there is much disagreement over how this long-term trend will change over time. Short-term deviations from the trend are typically small and random; they account for minor factors not included in the model explicitly. Infrequent onetime shocks can have a significant impact on mortality and examples include infectious diseases, natural disasters, and acts of war or terrorism.

There are many different types of projection models, and it is important to keep in mind the purpose of the projection when selecting a model in order to ensure the results are appropriate. Classes of models include those that extrapolate the trends of the calibrating past time horizon and those that rely heavily on expert opinion for inputs such as the likelihood of a disease being cured or the ultimate upper bound on life spans. Statistical extrapolation models are generally more appropriate for shorter projection periods; models that incorporate some degree of expert opinion (or range of expert opinions) seem more appropriate for long projections. Olshanksy (1988) discusses various types of models and considerations for projecting mortality rates. Cairns et al. (2007) compare the results of eight statistical models for projecting mortality rates. In addition to selecting a model appropriate for its intended usage, careful attention should also be paid to the assumptions used for model calibration and the resulting model parameters. A given model can produce significantly different results when calibrated differently.

Mortality assumptions for pension plans

Long-term trends in mortality rates for employees covered by pension plans have been broadly similar to trends for the US general population. However, mortality rates for employees covered by pension plans are typically lower than for the general population. This relationship makes intuitive sense, since those covered by pensions sponsored by their employers usually also have some sort of employer-sponsored medical coverage. The period life expectancy at birth for 2000 is 74.3 years for males and 79.6 for females for the US population (Human Mortality Database 2008), while the period life expectancy at birth using the RP-2000 mortality table (commonly used for pension valuations) is 78.4 years for males and 81.6 years for females (see Figure 10.2).

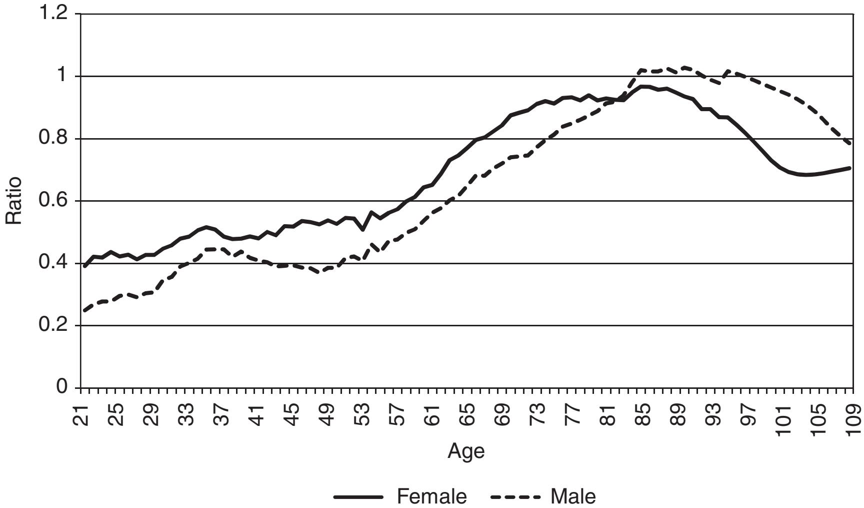

Figure 10.2 Ratio of RP-2000 combined healthy mortality rates to 2000 US population mortality rates. *Sources*: Author's calculations derived from Human Mortality Database (2008) and Society of Actuaries (2000).

Mortality assumptions for pension liability valuations have historically received little attention in the United States. Traditionally, the Internal Revenue Service (IRS) has updated the required mortality table for pension current liability calculations approximately every decade. These tables were static, where the same rates were used for all future years. It was fairly rare for projected improvements to be explicitly calculated for future years within a valuation or for future valuations after the table was initially adopted. This approach then produced liability jumps whenever a new table was adopted.

The PPA changed the way mortality assumptions are to be used for pension plan purposes. Starting with 2008 valuations, there are generally applicable mortality tables, based on the RP-2000 mortality tables as well as guidance for the use of plan-specific mortality tables. Future mortality improvements can be included in one of two ways: one uses static tables with improvements projected for 7 years after the valuation date for annuitants and projected for 15 years after the valuation date for non-annuitants. Another uses projection Scale AA to calculate rates for each future year. The plan-specific mortality tables can be used instead of generally applicable mortality tables if certain conditions are met. These

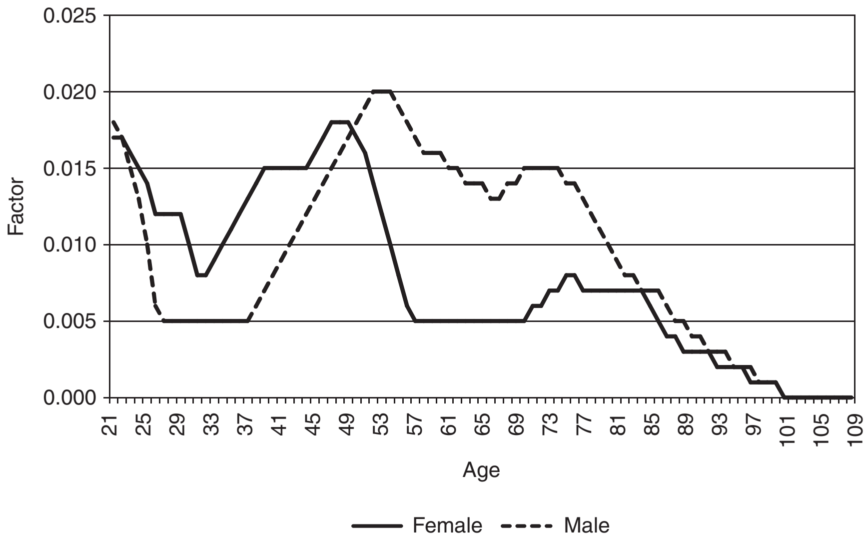

Figure 10.3 Annual mortality improvement factors using projection Scale AA. *Source*: Author's calculations derived from Society of Actuaries (2000).

changes will allow for more accurate and updated liability calculations (Figure 10.3).

It is interesting to note that the United Kingdom uses far more conservative mortality assumptions than the United States. It is estimated that pension liabilities in many countries would increase by 10–15 percent if assumptions similar to those in the United Kingdom were used (Hewitt Associates 2008).

Impact of longevity on pension plans

Next we analyze the impact of various mortality assumptions on life expectancies and pension liabilities. The assumptions are based on the 1983 GAM table, the RP-2000 table, projection Scale AA, as well as ad hoc adjustments to the underlying mortality table and improvement factors. The calculations are based on a sample plan consisting of retirees and terminated vested participants who have not yet commenced payments.

In Figure 10.4, we note that the impact of moving from the 1983 GAM table to the RP-2000 table is not as significant as one might expect. Life expectancy at birth increases 0.5 years, from 79.3 to 79.8. The life expectancy at age 65 is the same. Although the underlying data for the 1983 GAM

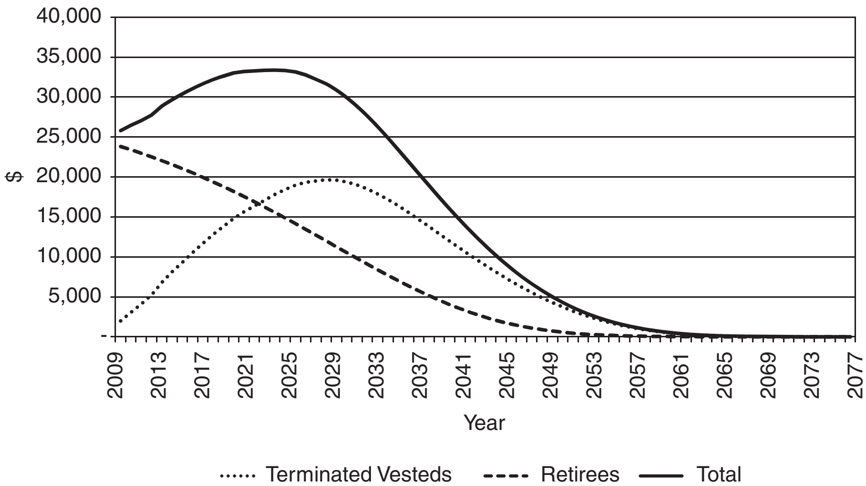

Figure 10.4 Sample pension plan benefit payments. *Source*: Author's calculations; see text.

table is from the 1960s, it was projected forward to 1983 and a 10 percent margin was applied for conservatism. The minimal impact shown is due to the fact that our mortality comparison uses a blend of 50 percent of the male and 50 percent of the female rates. The mortality rates of the RP-2000 table are lower for males and higher for females when compared to the 1983 GAM table.

The impact of using a projection scale has a significant impact on life expectancies as does applying an adjustment factor to the rates of an underlying table (Table 10.1). Life expectancy at birth increases from 79.8 to 85.1 years when Scale AA is applied to the RP-2000 table. Applying an adjustment factor of 75 percent to the RP-2000 table projected with Scale AA increases the life expectancy at birth by 2.6 to 87.7 years.

The liabilities increase by 2.6 percent when applying Scale AA to the RP-2000 table. The increase in liabilities of applying projection Scale AA is 3 percent when the benefit payments are increased by 1.5 percent after retirement (Table 10.2). Postretirement benefit increases enhance the impact on liabilities of changes in mortality assumptions. They are more common among pension plans in the United Kingdom and government pension plans in the United States, than among US corporate plans. The liabilities increase by 6.4 percent when reducing the Scale AA projected RP-2000 rates by 25 percent. This increase illustrates the potential basis risk of the underlying mortality assumption and the importance of trying to

TABLE 10.1 Life expectancy at birth and age 65 using various mortality assumptions

Mortality assumption[a]	Life expectancy at birth	Life expectancy at age 65
1983 GAM	79.3	18.7
RP-2000 combined healthy	79.8	18.7
RP-2000, projected Scale AA	85.1	19.5
RP-2000 × 75%, Scale AA[b]	87.7	21.9
RP-2000, Scale AA + 1%[c]	91.7	20.7

[a] All mortality assumptions use blended rates (50% male, 50% female).
[b] Mortality adjustment factor applied to mortality rates below terminal age (120).
[c] Scale AA improvement factors plus 1% applied to mortality rates at all ages below age 101.
Source: Author's calculations; derived from Society of Actuaries (2002).

TABLE 10.2 Liability values using various mortality assumptions[a]

Mortality assumption[b]	No postretirement benefit increases			1.5% postretirement benefit increases		
	TVs[c]	Retirees	Total	TVs[c]	Retirees	Total
1983 GAM	263,043	178,957	442,000	299,680	202,256	501,936
RP-2000 combined healthy	264,011	180,535	444,546	300,786	204,018	504,803
RP-2000, projected Scale AA	268,746	187,150	455,896	307,411	212,671	520,081
RP-2000 × 75%, Scale AA[d]	284,724	200,434	485,158	328,659	230,074	558,733
RP-2000, Scale AA + 1%[e]	275,553	195,701	471,254	317,349	224,532	541,881

[a] Liability calculations use 6% discount rate.
[b] All mortality assumptions use blended rates (50% male, 50% female).
[c] Terminated vested participants (TVs).
[d] Mortality adjustment factor applied to mortality rates below terminal age (120).
[e] Scale AA improvement factors plus 1% applied to mortality rates at all ages below age 101.
Source: Author's calculations; derived from Society of Actuaries (2002).

estimate mortality rates as closely as possible. As an example of the potential difference in mortality rates for different employee groups, it is estimated that workers in the primary metal industries have mortality rates over 30 percent higher, and workers in the petroleum industry have mortality rates over 20 percent lower than those in the RP-2000 table for ages 60 through 80 (Society of Actuaries 2000).

Magnitude of longevity risk relative to other risks

It is instructive to calculate the size of mortality-related risks, compared to a few of the main financial market risks on the funded status of our sample pension plan. Of the factors included, equities have the largest impact with one standard deviation event over a 1-year period leading to an 8.6 percent change in funded status. Interest rate risk is the next largest factor, having a 6.6 percent impact on funded status. The basis risk of estimating the true mortality of the underlying population has a 6.4 percent impact while the risk of the longevity improvement trend has a 3.4 percent impact. The mortality-related factors are nearly 20 percent larger for a plan where the benefits increase with inflation after retirement.

Our funded status risk calculations make many simplifying assumptions. We assumed that the sample plan was 80 percent funded with an asset allocation of 60 percent equities and 40 percent medium duration fixed income. The risk impacts shown are the stand-alone risks for that factor. With the exception of offsetting the interest rate risk to the liabilities with the fixed income asset allocation, we incorporate no reductions for risk diversification. For simplicity, we do not illustrate the impact of credit spreads on the funded status risk, though these were one of the main drivers of funded status changes on an accounting basis for plans in 2008. One problem that arises when illustrating the magnitude of the mortality-related risks is that it is difficult to calibrate the likelihood of a particular change. It may be possible to show the likelihood of a change in the long-term improvement trend, but it is quite difficult to estimate the likelihood of an estimate of the underlying mortality basis risk for a pension population. For these reasons, the mortality-related risks we included apply a 75 percent factor to the mortality rates to illustrate the basis risk, while the improvement trend is estimated by adding 1 percent per year to the Scale AA improvement rates.

Deciding whether to outsource longevity

Plan sponsors have many factors to consider when deciding whether to outsource the longevity exposure in their DB plans. One factor is the magnitude of the risk individually, and compared to other risks. Others include which alternatives are available to manage the risk as well as whether it should be managed on its own or in combination with other risk exposures. A cost/benefit analysis can be performed to compare the effectiveness of managing the longevity risk compared to other risks. As an example, it may not make sense for a plan sponsor to spend more time and money managing plan longevity risk alone, if it is cheaper and results in greater overall funded status risk reduction to focus on the interest rate or equity investment exposures.

The global financial crisis has prompted pension sponsors to focus more than ever on ways to reduce the funded status volatility of their plans (see Figure 10.5). After recovering approximately half of the over 47 percent

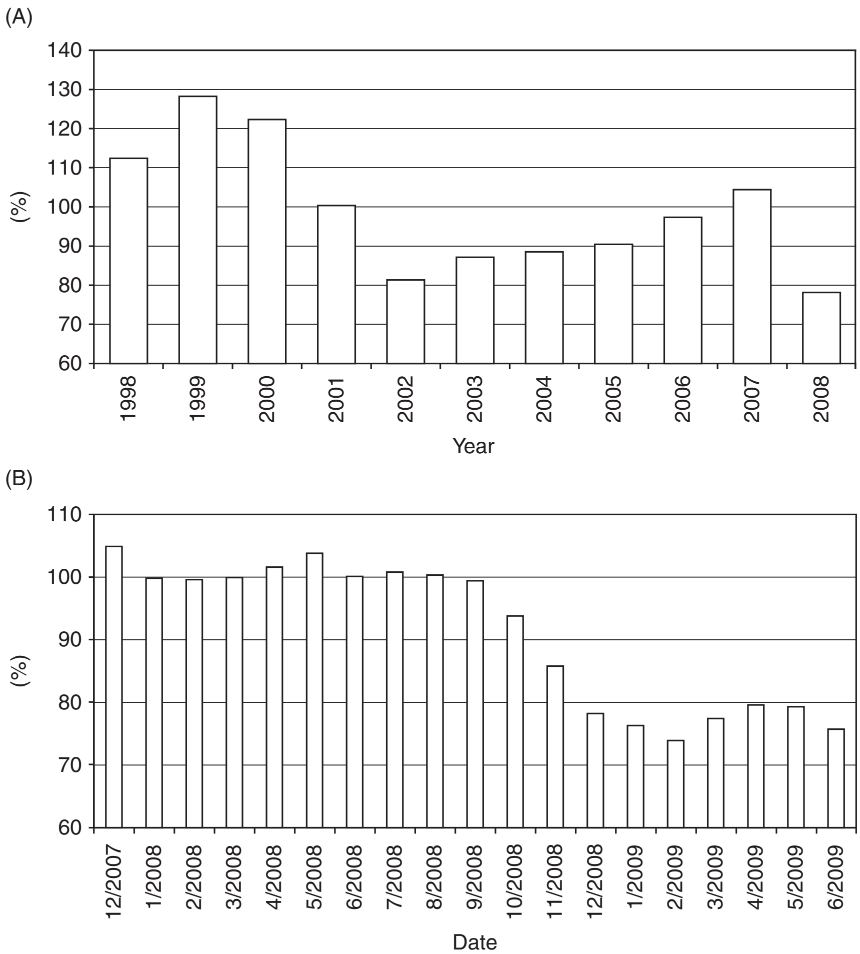

Figure 10.5 Defined benefit funding patterns over time. Panel A: Funded status for pensions sponsored by Standard & Poor's 500 companies. Panel B: Funded status for 100 largest corporate pension plans in the United States. *Sources*: Panel A derived from Silverblatt and Guarino (2009). Panel B derived from Milliman (2009*b*).

decrease in funded status experienced from the end of 1999 through the end of 2002, the funded status for the largest US plans fell over 30 percent between the end of 2007 and the end of February 2009 (Silverblatt and Guarino 2009; Milliman 2009*a*, *b*). Even companies that had focused almost entirely on asset-only measurement metrics are now seeking to better match their liabilities. Since exposures to financial market movements were the main drivers of the decrease in funding during 2008, and these comprise the largest portion of funded status risk, most of the risk reduction effort is focused on the financial risks. More plan sponsors are adopting LDI strategies to limit their exposure to financial market risks due to equity and other return-seeking investments, as well as the impact of interest rates and credit spreads on liability discounting. In the process, the risk due to mortality-related factors will become a larger proportion of the funded status risk. As the proportion of longevity-related funded status risk increases, the underlying mortality assumptions are updated more frequently, and strategies for managing longevity are refined, it seems inevitable that more plan sponsors take action.

Alternatives for longevity management

Plan sponsors have several alternatives to manage longevity exposure, and more are being developed. These include plan design changes, contracts with insurance companies that eliminate the longevity risk and typically other risks as well, and newer strategies that isolate the longevity risk and look like contracts typically used for financial market exposures. The alternatives differ by complexity, amount of risk transferred, and the period of time for which they are in effect.

Plan Design

Many DB pension plans have been at least partially replaced with DC plans (including 401(k)s) over the last decade. This change in plan design shifts the longevity risk as well as investment risk from plan sponsors to participants. To protect against outliving their assets, individual participants may purchase annuities from insurance companies. In order to address the higher cost of purchasing annuities individually, plan sponsors can contract with insurance companies to provide annuities at institutional prices. These annuity options can be outside the DC plan, part of the plan as a benefit payment election at retirement, or part of the plan as an investment choice that adds to the annuity as assets are accumulated during employment.

Although plan sponsors have been changing plan designs from DB to DC, it is believed that DB plans are more efficient for providing a sufficient level of retirement income to participants. Some reasons include the longer investment horizon and greater investment expertise of institutions sponsoring pension plans compared to the individual participants. Another reason is that pension plans cover a large number of participants, so gains and losses from the idiosyncratic longevity risks of the individual participants can balance out. One estimate of the cost reduction due to longevity pooling in a pension plan is 15 percent (Almeida and Fornia 2008).

New plan designs will likely emerge in the future, melding traditional DB plans where the sponsor bears all of the risks with DC plans where participants bear the majority of the risks. A discussion on potential methods to share the risks between sponsors and participants is taking place in the United Kingdom (Department for Work and Pensions 2008), and at least one plan sponsor in the United Kingdom has successfully implemented a plan change that shared the longevity risk between the sponsor and participants in the DB plan. Effective starting in 2006, BAE Systems introduced a Longevity Adjustment Factor, which reduces a portion of the pension benefits as life expectancies rise (BAE Systems 2006). Another method being discussed to share the longevity risk is to increase the retirement age as life expectancies increase. New design innovations could be driven by UK risk-sharing consultancies spurred by plan sponsor interest in managing risks without completely shifting them to the participants.

Transfer risk to insurance companies

The traditional method of eliminating all of the risks of sponsoring a DB plan (including longevity) is plan termination. In a standard termination, the plan has enough assets to pay all of the accrued benefits and the plan either purchases annuities from an insurance company or pays benefits as a lump sum. After a typical standard termination, all of the sponsors' obligations and responsibilities associated with the plan are eliminated (except for any misrepresentations in the annuity contract). Although many plans terminate each year, that vast majority are very small plans. More than 1,200 plans went through a standard termination in 2007 in the United States, but 75 percent of the plans had fewer than 25 participants. These terminations represented payments of $3.1 billion, with $1.9 billion of lump-sum payments and $1.2 billion of group annuity premiums (Pension Benefit Guaranty Corporation 2008).

Purchasing a group annuity contract from an insurance company to terminate a plan (sometimes referred to as a buyout) is often perceived as being expensive. When pricing terminal annuities, insurance companies use assumptions between best estimates and a worst-case scenario, which often end up being more conservative than the assumptions used to calculate liabilities for ongoing funding and accounting purposes. In particular, the mortality assumption used by insurers includes projections for future mortality improvements. Now that the PPA requires some sort of projected improvements to be factored into liability calculations for funding purposes, these improvements will likely be adopted for accounting purposes as well. This will reduce the gap between the cost of annuities and the ongoing liabilities.

Another change in the PPA that could make standard terminations less costly for those offering lump-sum payment options is a change in the applicable interest rate. Regulators have required changing the rate used to compute lump sums from Treasury yields to corporate bond yields, to be fully phased in for plan years starting in 2012. Nevertheless, while the difference between the liabilities calculated for funding or accounting purposes and annuity purchases is decreasing, plan terminations will still be viewed as costly in most cases. Most plans are significantly underfunded on an accounting basis as of the end of 2008 and will need to fund this shortfall in order to purchase annuities.

There are also alternatives referred to as partial buyouts where certain risks can be transferred to an insurance company. Partial buyouts can be structured to cover only a portion of the liabilities; they can also transfer the risks for only a portion of the participants (e.g., retirees in payment status only) or for only a portion of the benefits (e.g., up to $1,000 per month per participant). Partial buyouts of the retirees only can be a cost-effective way to reduce liabilities and risk, since the cost of purchasing annuities for retirees is typically closer to the ongoing accounting liability than for active employees or those terminated but not yet in payments status. It is important to monitor whether a partial termination would occur when considering a partial buyout, since this could require full vesting of all participants. Another alternative to a buyout is a buy-in. In a buy-in, an annuity contract is purchased from an insurance company but, rather than transferring the liabilities to the insurance company, the annuity contract is held as an investment in the asset portfolio. Buy-ins do not reduce the liabilities but can reduce the risk similar to buyouts. Since buy-ins can be viewed as purchasing an investment rather than eliminating a liability, some of the rules governing buyouts, like partial terminations, should not be of concern. Buy-ins are more common when covering only a portion of the participants.

There has been much effort over the past few years to develop innovative alternatives to plan terminations involving group annuity contracts from an insurance company. A number of companies have been established in the United Kingdom to challenge the two dominant insurance companies in this market. Many of the newer companies in the United Kingdom are also set up as insurance companies. This market saw around £8 billion in transactions in 2008, with most of the transaction volume being buy-ins for retirees (LCP 2009*b*).

In the United States, several large investment banks announced their presence in the buyout market also with a few startup companies backed by private equity firms. In contrast to the majority of new entrants in the United Kingdom, most new US entrants were not set up as insurance companies. The intended structure of these noninsurance buyouts was to maintain the pension plan but transfer all of the responsibilities for sponsoring the plan to a new company. Yet before this market had a chance to take off, the US Treasury Department and IRS issued a ruling banning these transactions (Internal Revenue Service 2008). In conjunction with the ruling, the Treasury released a framework for future legislation consisting of conditions under which a noninsurance buyout could be allowed (United States Treasury Department 2008). It is interesting to note that the ruling covers transactions where the sponsorship of an entire plan is transferred to another company. There appears to be room for innovations where an insurance-based buyout is the first step toward sharing the risk with a noninsurance company or even noninsurance-based buy-ins. However, since many of the companies that had been pursuing new solutions in this market are currently capital-constrained and most pension plans now have a low funded status, new ideas in this area may not develop rapidly.

Hedging longevity risk

In recent years, products are being developed to hedge, rather than completely eliminate, longevity risk. Some target the longevity risk only, leaving it up to the plan sponsor's investment committee to decide whether to combine this with any risk management strategy addressing financial market risks. Several investment banks have introduced indices to help trade longevity products in the United States. Other companies in the United States are evaluating this area and there are even more companies in the United Kingdom actively pursuing this market.

One instrument that can be used to hedge longevity risk is a longevity swap. A longevity swap is similar in concept to an interest rate swap. A pension plan executing a longevity swap would agree to make fixed payments over the term of the contract based on future mortality expectations in return for receiving floating payments based on the actual mortality experience of the underlying population. For a swap meant to cover a group of retirees currently receiving payments that do not increase with inflation, the fixed payments would be a series of amounts that decrease over time as the participants die and benefit payments cease. If longevity improvements are greater than anticipated, more participants will be receiving benefits than expected, and the pension plan will receive more in floating payments than the fixed amounts it pays. This gain on the longevity swap in the asset portfolio would help to offset the mortality loss experienced on the liabilities. It is important to note that these contracts will have an expiry date much shorter than the length of time over which a typical pension plan is expected to pay benefits. However, it is possible to combine swaps having various maturities in different amounts to try to match the sensitivity of the liability to changes in mortality experience and longevity expectations. The mortality assumptions used to calculate the pension plan's liabilities should be examined in light of any longevity hedge transaction to make sure they are updated frequently to avoid any mismatch where changes in the value of the hedge are not recognized similarly in the liability calculations.

Credit Suisse, JPMorgan, and Goldman Sachs have released longevity indices in the United States with the intention of trading derivative or other financial contracts linked to the indices (Credit Suisse 2009; Goldman Sachs 2009; JPMorgan 2009). The indices include either the future expected lifetimes, mortality rates, or impact of mortality on a group of lives. Some of the index data is split into subindices, divided by age and gender. The Credit Suisse and JPMorgan indices are based on national population data and are updated annually, but with a time lag. The Goldman Sachs indices are based on an insured population of senior citizens and are updated monthly. One of the key considerations when evaluating hedging the longevity risk of a pension plan with a product based on the mortality experience of a different population is the basis risk. It is possible to minimize this basis risk if the true underlying mortality of both populations is known. However, since only a range for the true mortality of the pension plan will be known, the ability to reduce the basis risk is limited. For example, if the hedge is calibrated assuming the true underlying mortality of the pension population was 105 percent of the RP-2000 rates but the actual mortality experienced is 75 percent of the RP-2000 rates, the hedge would not be as effective as anticipated. Instruments based on longevity indices can be quite effective at hedging the longevity trends but not as effective for the basis risk. A few of the significant benefits of a bank trading many contracts based on the same populations are potentially increased liquidity of the product and potentially reduced cost.

The market for longevity derivatives in the US appears to be in its infancy. As was the case with other types of pension risk management strategies and trends, it can be helpful to look at the market in the United Kingdom as a potential guide for what may develop in the United States. There have been longevity-only trades in the United Kingdom but, until recently, these have been with insurance or reinsurance companies managing their annuity books containing pension annuities. The first longevity transaction structured as a derivative took place at the beginning of 2008 between pension buyout company Lucida and JPMorgan. The first longevity swap directly with a pension fund took place in June 2009 between Babcock International and Credit Suisse. In July 2009, the Royal & Sun Alliance pension scheme entered into a deal with Goldman Sachs and its insurance company subsidiary Rothesay Life that included interest rate and longevity risks. These deals should add credence to recent consultant predictions that the longevity swap market will grow rapidly in the next year. Further evidence of the market growth is displayed by over £30 billion of quotations on pension liabilities issued by longevity hedge providers in the last 12 months (LCP 2009*a*).

Hedging or transferring longevity risk has received much attention in the United Kingdom and the United States. It seems only a matter of time before transactions with pension plans become more common. There are various developments, not all related to product innovations, which can help spur the growth of the market for hedging longevity risk. As noted earlier, increased adoption of LDI programs to manage the financial risks will draw more attention to the longevity risk as it becomes a relatively larger portion of the total plan risk. UK pension plans are further ahead of those in the United States in this respect, since LDI is more prevalent and the longevity risk is more significant due to postretirement benefits being indexed to inflation.

Understanding the true best estimate mortality assumptions and their impact on the pension liabilities is another factor that will benefit the longevity hedging market. Again, pensions in the United Kingdom are ahead of those in the United States in this respect. The cost of implementing a longevity hedge is a critical factor for the potential growth of this market. Pricing in the United Kingdom has recently become more competitive but this has not yet spread to the United States. Another key element in longevity market growth is the ability to understand and handle the basis risk between the hedge and the pension liability. While hedging products based on broad population indices could ultimately be more cost-effective than bespoke solutions, index-based products suffer from a larger basis risk. Finally, examples of plans successfully implementing longevity hedges are also important for market growth. This has just started in the United Kingdom but we have not seen visible signs of an imminent transaction in the United States. Although the United States seems to be behind the United Kingdom in all of these respects, the United States can observe how the market evolves overseas and then apply similar ideas there. This can ultimately allow for more rapid market growth, once it begins.

Additional discussions on pension risk transfer developments involving longevity in the United Kingdom appear in Hymans Robertson (2009), Lucida (2009), and Punter Southall (2009). A discussion of how some risk transfer strategies may evolve in the United States in light of developments in the United Kingdom appears in Monk (2009).

Conclusion

Despite the controversy over whether historic mortality improvements will continue at the same pace as they have in the past, there is little debate that longevity assumptions and experience have a significant impact on pension plans. The attention being paid to the impact of mortality on pension plans is set to increase as the PPA requires more realistic and frequently updated assumptions. Furthermore, as more plans adopt LDI strategies, the portion of total funded status risk due to mortality should increase.

There are a variety of ways pension plans can reduce their mortality risk. These vary from plan design changes that impact only the liabilities to buyouts that transfer all of the risks (and generally all of the assets) to a third party. New solutions are being developed to hedge the longevity risk without eliminating it. Given the amount of focus in this area and recent market developments in the United Kingdom, it seems a matter of time before additional solutions to the longevity issue become more prevalent.

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