Longevity plan

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Over the last 25 years, we have witnessed the shift in retirement plans in the private sector from defined benefit (DB) to defined contribution (DC). From a historical standpoint, it is quite remarkable that DC plans, initially devised as a supplementary retirement savings vehicle, have essentially replaced the DB plan and gone on to become the primary retirement plan sponsored by employers. Meanwhile, many government-managed and -mandated plans have been devised under a DC structure. While we acknowledge this extreme reversal in the retirement landscape, we question its stability in the long run because of longevity risk from the perspective of the retiree.

Longevity risk from the DB plan sponsor's perspective is that the pensioners live beyond what is predicted by actuarial assumptions. Actuarial assumptions take into consideration historical patterns adjusted for expected improvements that arise from, among other things, improved lifestyles, better health and safety, and advanced healthcare. However, they are merely assumptions and pensioners inevitably sometimes die earlier than assumed and sometimes live longer than assumed. The DB plan sponsor (or insurance company writing annuity business) finances the risk associated with the range around the assumed age of death in which the majority of pensioners die. Hence, in part, the shift to DC plans.

Longevity risk from the perspective of the retiree is defined as the risk of running out of money during retirement. Having benefits from a DC plan as a primary retirement source subjects plan participants to their own longevity risk. Based on average life expectancy statistics, we know that half of the population will survive beyond its life expectancy and half of the population will not. This creates challenging circumstances for people to manage withdrawals from their retirement accounts. In addition, there is the added challenge of managing investments.

Associated with the confidence issue over mortality assumptions is a similar lack of confidence in the way in which an employee's salary develops both during his career and in the last years or so of his working lifetime. The DB plan benefit calculated based on final salary has predictive difficulties and manipulation issues (discussed in more detail below) that have also caused at least a shift in the design formulae and in some cases exacerbated the shift from DB to DC.

This article is not meant to compare the advantages and disadvantages of DC and DB plans; rather, it is meant to promote a new retirement paradigm where both types of plans can coexist and complement one another. This new retirement paradigm will recognize the existing DC plan as the primary retirement vehicle and view the DB plan as a secondary plan sponsored by private sector employers. This paper offers this retirement model as a contribution to the solution of the longevity risk problem.

INTRODUCING THE LONGEVITY PLAN

In order for the DB plan to be viable in its role as a supplementary retirement vehicle, its structure will have to be different from that of the traditional DB plan with which many are already familiar. The DB plan that is being proposed here is essentially a *longevity plan*. Key features of the proposed longevity plan include:

- Unit-accrual pattern such as in a career-average plan or a plan based on flat dollars per years of service

- Simplistic retirement options: No ancillary death, disability, or early retirement benefits would be offered (other than perhaps a lump-sum death benefit between termination and the pension actually starting)

- Life annuity options only: A single-life option for single participants and 75% joint and survivor option for married participants

- Participants would not begin plan participation before age 45 (although this could be extended to age 50)

- Participants would not commence benefits earlier than age 75 (and this could be extended to age 80 or 85)

In order for the suggested longevity DB plan to be successful, it has to avoid some of the negative features that have caused many plan sponsors to abandon DB plans in the first place.

CONFIDENCE IN EXPECTED LIFETIMES OF RETIREES

The table in Figure 1 shows the expected age at death of a 65-year-old and an 85-year-old female, based on different mortality assumptions.

While admittedly simplistic in terms of the potential error in predicting mortality experience, it shows that there is arguably more confidence in predicting the life span of an 85-year-old than a 65-year-old. This confidence is crucial to the agreement of either plan sponsors or insurers in underwriting a pension liability. Meanwhile, a 65-year-old retiree relying on a DC benefit is in the individually invidious position of having to budget for the wide range of potential life spans: i.e., running out of money before age 84 and living beyond age 86.

For the technically minded, in *Mortality Table Construction*, Robert Batten gives an approximation of the standard deviation of q_x (the mortality rate at a given age, x) as $q_x/\sqrt{\theta}$, where θ is the exposure, or the mortality rate divided by the square root of the number of trials (i.e., exposure). For older lives, the q_x is increasing while the exposure is lower because there are fewer survivors. Hence, we cannot expect to be more confident in the annual rate of mortality at older ages. However, because there are fewer lives, the amount by which we could be wrong in the number of years of future survival is lower. And this is good for financial management in terms of the absolute amount of capital at risk.

Figure 1: Mortality Experience vs. Central Assumptions*						
	Adjustment to central mortality assumptions	Expected age at death for female age:		Expected duration of annuity:		
		65	85	65	85	
Central assumption	100%	84.4	91.0	19.4	6.0	
Lighter mortality	90%	85.3	91.5	20.3	6.5	
Heavier mortality	110%	83.7	90.6	18.7	5.6	
Very light mortality	75%	86.7	92.5	21.7	7.5	
Much heavier mortality	125%	82.8	90.1	17.8	5.1	
Delta heavy/light		3.9	2.4	3.9	2.4	
Delta relative to expected at age 65		4.6%	2.8%	20.2%	12.3%	

* Based on 2000-2006 experience collected by 30 June 2007 from UK self-administered pension schemes, published in CMI Working papers 34 and 35, 2008.

Having said this, fluctuation of mortality at the end of the table (at extreme ages) may be described as tail risk. At younger ages, where mortality rates are relatively small, even large fluctuations in mortality do not have a significant proportional effect on the number of survivors. However, at extreme ages, proportionally small variations in mortality rates can vastly change the number of survivors.

That is, although you may not have anticipated many survivors, it is easy to be off by a multiple. The difference may be a small number, but funding shortfalls can be off by large amounts. Put another way, people who are old now might not see much change for the short time they have left, but people who survive to be old will have plenty of time to deviate from expectations, hence tail risk. Meanwhile, at low discount rates, this can be very costly even though the affected cash flows are a long way off.

Further, we cannot ignore the significant risks that:

- The "expected" mortality may not be representative of the specific population of lives
- Mortality improvement may fluctuate over time, shifting expected long-term survival rate
- Sudden shifts may occur in mortality (both up and down), attributable to terrorism, war, or epidemics, as well as new cures and treatments for existing diseases

However, the DB plan that is run for the benefit of a larger group, with more predictable average results, has a better chance of weathering fluctuations than the individual, whose own experience outside of the group is virtually impossible to predict.

CONFIDENCE IN THE SALARY PROGRESSION OF EMPLOYEES
Figure 2 shows the typical salary progression of various employees from their dates of hire up until retirement age. We see a sample of three individuals who might be described as:

- The underachieving worker who makes his or her way through a working lifetime getting below-average increases
- The average worker who gets some promotional increases in early career
- The high achiever who is awarded significant increases through promotion and fast tracking

All are taken to the point when eventually their annual increments are similar, having reached their seniority potential.

The first chart in Figure 2 shows the annual increments and the second chart shows the potential end salary, assuming they all started at the same salary at the beginning of their careers.

Figure 2: Salary Progressions, Career
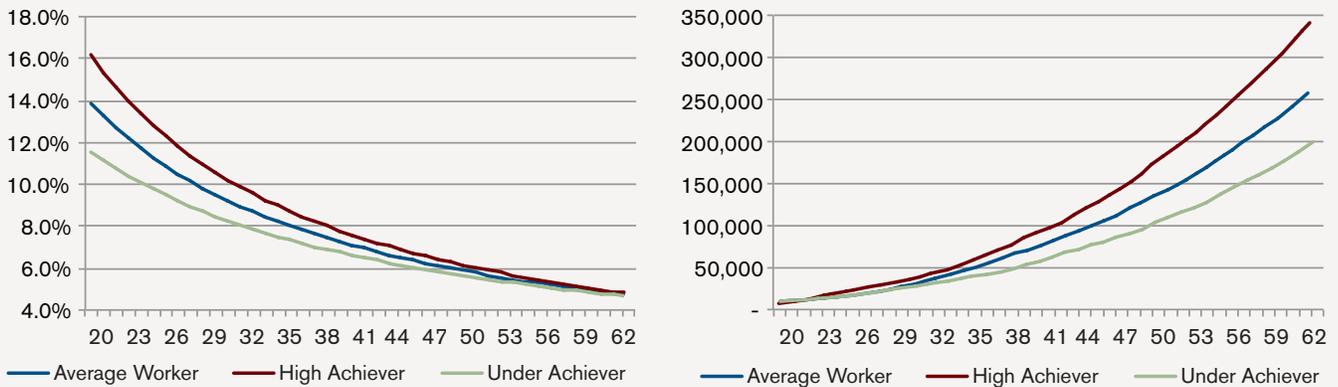
We see dramatically different ending salaries. For the sponsor of a DB plan, the funding of their respective benefits has very different financial consequences.

Seen from say age 45, the charts would appear as shown in Figure 3, using the same vertical scales. Note that we are now observing the salary progression from the same starting salary at age 45 to illustrate the range of potential salaries at retirement age. Hence the final salaries are not the same as those shown in Figure 2.

Figure 3: Salary Progressions, Age 45-65
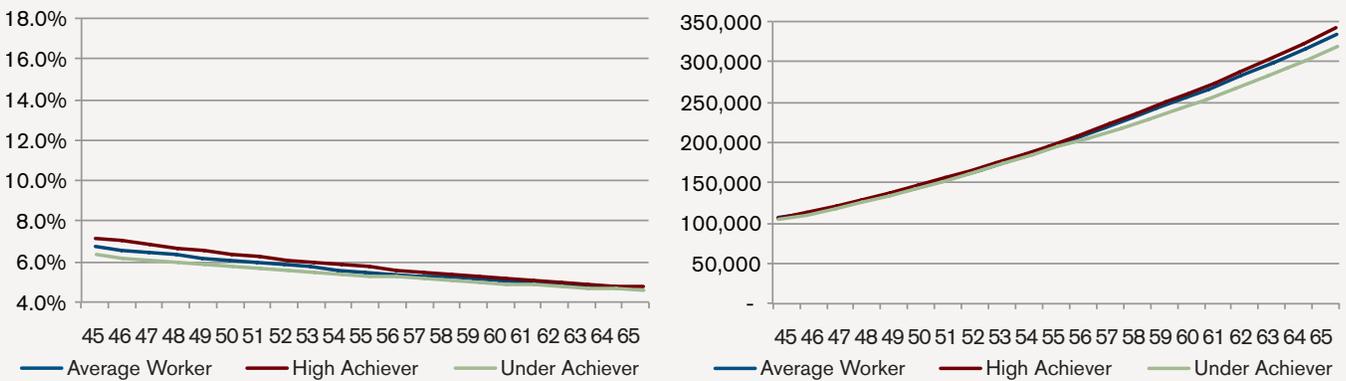
Now the financial consequences are seen to be similar whichever employee you observe.

The design of a new DB system to cope with longevity risk would be doubly attractive if it also helped deal with the salary inflation risk.

First and foremost, the plan must be perceived as affordable in the eyes of the plan sponsor. Traditional final-average-pay plans should not be considered given the difficulty in predicting the salary at retirement from the date employees commence their careers and potential benefits-leveraging features. Either start the accrual mid-career when the future salary inflation is more readily predictable or construct career-average-earnings or unit-accrual type plans.

In the first case we are assuming that the potential for accelerated promotions has already occurred for the relevant employees. By mid-career one's position in the business or industry hierarchy has been established and the majority of employees will see salary increases broadly in line with inflation until retirement. In the cases of career-average or unit-accrual plans, we are avoiding the potential for selective pay increases near retirement causing the accrued benefit to suddenly jump. We design a formula for the plan that either bases benefits over a person's career-average earnings or over a person's service career.

The retirement designs discussed in the sidebar examples may appear to offer retirement benefits that are relatively low in comparison to the benefits offered in an average traditional DB plan. However, recall that the purpose of these longevity plans is to offer a supplemental benefit to the existing DC plan. Moreover, this combination of the DC and DB plans is meant to support the average wage earner. Clearly, it would be less valuable to a highly compensated employee. However, a highly compensated employee would be assumed to have other independent sources of retirement income from which to draw. The same assumption can not necessarily be made for an average wage earner.

One consequence of traditional DB plans that plan sponsors dread is volatility. Generally, unit-accrual types of plans can take on conservative approaches with respect to their investment strategies because they do not have benefits-leveraging features or built-in salary inflation. Interest rate risk can be prudently managed by using liability-driven investment (LDI) strategies. However, as a plan portfolio's fixed income holdings increase relative to equity investments, the expected rate of return can experience a drag. Those plan sponsors that want to stay invested in equities while still reducing market risk can consider tail-risk hedging investment strategies. Coupling a low-cost design with the appropriate investment strategy can help to greatly lessen cost volatility and make plan funding more predictable. It is also important to mention a positive investment aspect of the proposed retirement paradigm for the plan participant. Because retirees are receiving guaranteed employer-funded benefits from the longevity

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EXAMPLES OF UNIT-ACCRUAL DESIGNS

An example of a DB plan might be one that delivers a pension of 1/60th of final salary for each year of service. In this case, traditionally, after 40 years' service at age 65, the retiree would receive 40/60 (or two-thirds) of his last drawn salary. Having started his career on an annual salaries of $20,000, over many years of promotions and inflation increases in line with the charts above, the salary might be assumed to grow to around $105,000. The pension would therefore be $70,000 per year. Using reasonable assumptions, such a pension would cost 9.1% of pay to fund. If it were designed as a career-average pension then the cost would be 5.6% of pay (although of course the benefit would be correspondingly lower). A contingent spouse's pension of 75% of the retiree's pension would add 0.9% to the final salary pension cost.

If instead the final salary pension were to start accruing from age 45 up to age 65, and then paid from age 80, the cost would drop to 2.1%. If a career-average pension were accrued from age 45 and paid from age 80, it would cost 1.8% of pay.

Increasing the retirement age to 85 reduces the cost to 0.9% (final salary) and 0.7% (career average).

We have assumed the above salary scale (which over a full career gives, on average, 3.8% annual increases) and a discount rate of 6% p.a.

These costs assume the only benefit payable would be the pension to the retiree. This might be seen as too rigid and that some form of benefit should be paid after retirement and before the pension payment date if the retiree dies before then. As an order of magnitude, if the accrual starts at age 45 and the pension is paid from age 80, a lump sum of say three times the pension in such an event would add approximately 0.5% to the contribution rate. If a spouse's pension of 75% of the retiree's pension were to be payable on death after the pension starts, this would add approximately 0.3% to the cost.

The redesign proposed would reduce the cost of a final salary plan from 10.0% of pay down to 2.9% of pay. This cost could be reduced further with a career-average accrual and/or elimination of the death benefits.

The crucial point though is that confidence in this lower cost is higher after reducing the impact of the volatility in both salary inflation and longevity.

DB plan, they are free to adjust their investment strategies with respect to benefits accruing from their DC plans. This allows participants with a higher risk tolerance to invest more aggressively in their individual savings accounts.

Another attribute of the proposed longevity plan would be its simplistic design. Many plan sponsors cite a lack of appreciation and understanding among their employees when it comes to DB plans. It is true that many participants do not understand how their DB plans work and therefore show a lack of initial appreciation. Employee education on retirement planning can be helpful to a degree, but ultimately it is the plan's design that will have the most meaning. As suggested above, the proposed longevity plan will be simple in design. There will be no death or disability benefits prior to termination. On death after termination but before the pension start age, a lump sum of three times the pension would be paid. On death after the pension start age, a surviving spouse would receive a pension of 75% of the retiree's pension. Specific comments on each of these features follow.

Collecting an annuity benefit from the supplementary DB plan would not preclude a retiree receiving a lump-sum benefit from the DC plan. It would just make it easier for retirees to make decisions on how best to manage their lump-sum benefits from a withdrawal and consumption perspective; participants would know exactly when their lifetime annuity benefits would start—no earlier than age 75 in the proposed plan. Recall that early retirement would be restricted from the proposed longevity plan because the concern is for the latter years of retirement and the understanding is that other sources of savings should be enough to get you through the initial years of retirement.

Limiting optional forms of benefits to spouses keeps the retirement theme in focus. We all are aware of examples of how benefits meant for retirement are often used for other purposes. Without making judgment of this practice, having a supplementary DB plan offering just annuities will help retirees preserve their retirement benefits. While the annuity benefit cannot be willed to later generations, the DC benefit can be passed on to future generations. The main purpose of the proposed longevity plan is to provide a lifetime income stream to retirees. From this context, longevity plans should limit benefits only to situations involving retirement. Also, not providing additional benefits upon disability and death will help to keep the employer's cost down.

CONCLUSION

The combined retirement income from Social Security, a DC plan, and a supplementary DB longevity plan can mark the second coming of the three-legged stool concept—a concept that has much wisdom. Traditionally, it was Social Security, the DB retirement plan, and personal savings that made up the three-legged stool. We have seen the shift from DB to DC plans. We have also seen the prevalence of government-run or -mandated DC arrangements replacing Social Security, often in the absence of universal coverage in retirement. Consequently the formerly distinct three legs are now a blurred single accumulation. Many see little difference between the choice of growing their personal savings and contributing toward their retirements via a DC plan, notwithstanding the fiscal incentives that might be available.

This paper has outlined the longevity plan concept and demonstrated its value relative to its cost. The opportunities here are for:

- Employers to have more confidence in the sponsorship of a DB plan

- Insurers to design annuities for retirees at more advanced ages with lower capital requirements

- Governments (and future generations) to avoid being left to support those who cannot support themselves in retirement

To emphasise the last point, if retirees cannot adequately support themselves, they will need to turn to forms of social welfare funded by the federal government. It should be recognized that if some type of longevity plan solution is not made available then social welfare programs will eventually take the place of the "lost" DB plan (after all, welfare conceptually is just a DB plan). Thus, the question is not whether federal regulations will someday allow for this conceptual idea to become a reality. The need for lifetime income via longevity plans, if not obvious already, will certainly become clear once the majority of Baby Boomers experience their later years of retirement. The question now is really more a matter of when these issues will be addressed.

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