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Pensions, Risks, and Capital Markets

Adair Turner

The title of my talk today is Pensions, Risks, and Capital Markets, and it draws on work the UK Pensions Commission conducted as we tried to get to grips with the issues of who does bear, who can bear, and who should bear different risks in different elements of the pension system, state and private. That analysis was set out in detail in a lecture I gave at the Cass Business School in April 2005, which is available on the UK Pensions Commission's website, http://www.pensionscommission.org.uk. In one crucial respect, however, our thinking evolved during last year and the conclusion we set out in our report differed from that suggested in my original lecture. I will highlight that point when we arrive at it.

My lecture last year covered issues relating to investment return risk as well as to longevity risk. It asked questions such as: Do the risks of equity investment decline with the length of the holding period? In what class of assets should pension funds be invested, and is the answer different for defined benefit and defined contribution schemes? But since today's conference is about longevity risk, I will leave aside the investment return risks and concentrate entirely on issues relating to longevity risk , and in particular four:

- How large is the uncertainty about future longevity and thus how great are the risks involved in underwriting longevity risk?;
- How much longevity risk is being absorbed by some or other agent today, and how might demand for longevity risk absorption develop in the future?;
- What are the prospects for risk absorption capacity and price?; and
- Who *should* bear longevity risk, and with what implications for policy?

First, then, how uncertain are our estimates of future life expectancy? And let me be clear, my focus today is entirely on uncertainty about the average life expectancy of an entire age cohort—not on variability in the individual life expectancies of individuals within each cohort—which is, of course, a significant risk, but one which is clearly statistically analyzable, manageable, and absorbable.

For it is uncertainty over the average life expectancy of entire age cohorts which is the key problem. Figure 1 sets out three projections from the UK Government Actuary's

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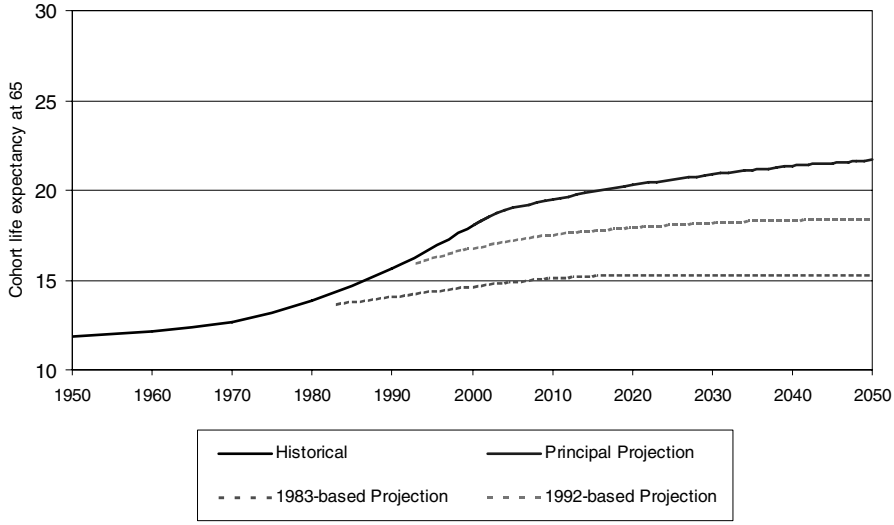
FIGURE 1
Estimates of Cohort Life Expectancy: Male at sixty-five. UK Government Actuary's Principal Projections



Department (GAD) of how male life expectancy from age sixty-five has developed in the past fifty years and how it might develop for the next fifty.[1]

The bottom line is the projection produced in 1983, the middle in 1992, and the top in 2003. Projected male life expectancy for 2020, for instance, has increased by five years over the last twenty years.

So the question is, how certain can we be of this latest projection, and what error margins should we assume around this projection?

At least two approaches are possible. One is to listen to alternative expert points of view about future potential medical advances and about whether a biological "limit-to-life" exists. At Cass Business School last year there were two lectures from the optimistic and pessimistic camps, and although neither Jim Vaupel nor Jay Olshansky specifically forecasted UK life expectancies, Figure 2 is a reasonable representation of their philosophies, Vaupel arguing that life expectancy at birth and at sixty-five is likely to continue rising by roughly one year every four years, Olshansky arguing that life expectancy in developed countries will soon level off. But of course these are simply two positions: the fact that they exist gives us no basis for assuming that more extreme positions are impossible. And the fact that these two points of view exist gives us no basis for ascribing to the range their views define a particular confidence level.

[1] The latest projection shown in Figure 1 is GAD's "2002 Principal Projection" issued in 2003, since this was the latest data available when the Pensions Commission conducted its "confidence interval" analysis. In 2005 GAD issued the "2004-based Principal Projection" which increased still further future projected life expectancy, moving the official projection closer to the mid-range of the Pensions Commission's proposed range. The impact of this change is shown in Figure 8.

FIGURE 2
Life Expectancy Debate

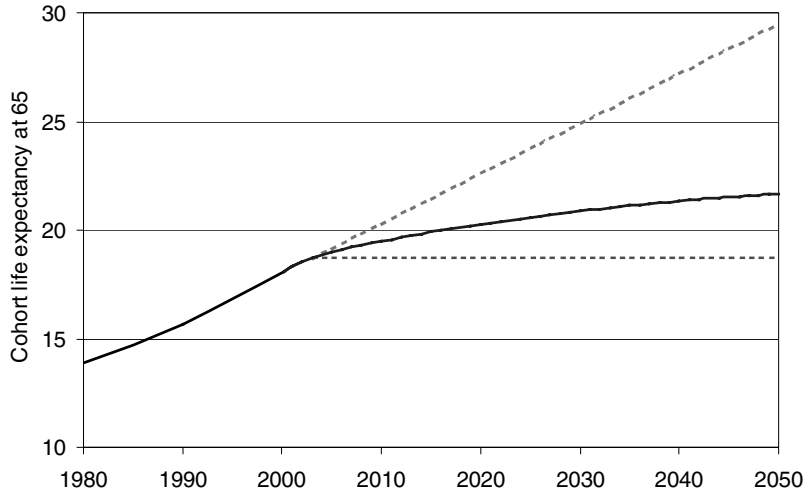
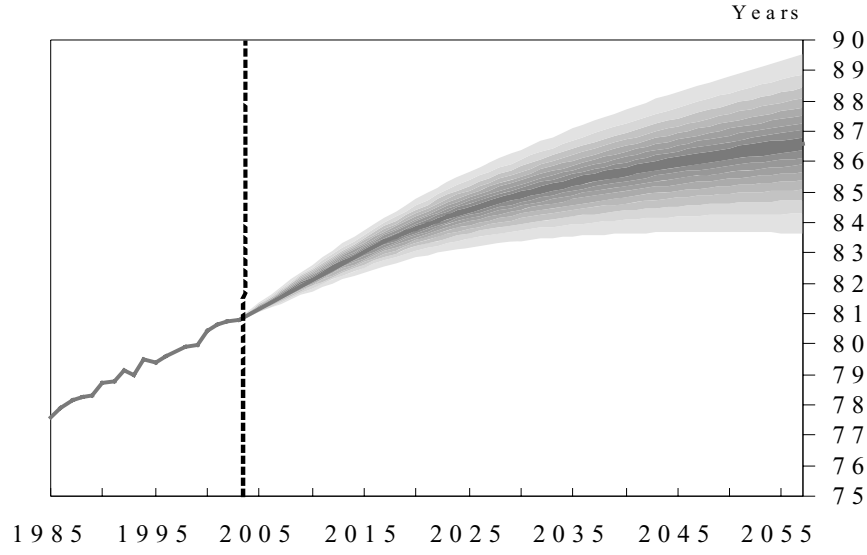


FIGURE 3
Life Expectancy Fan Chart—From "What Fates Impose," Lecture by Mervyn King, British Academy, 2004



An alternative approach is to try to use past errors or variations in forecasts as a basis for stochastic analysis. Some of you may be familiar with the fan charts of probabilities of future inflation rates which the Bank of England publishes each quarter, looking forward over two years. And the Governor of the Bank of England, Mervyn King, suggested in a lecture to the British Academy last year that the Pensions Commission should develop similar fan charts for life expectancy projections: Figure 3 shows the

first shot at that analysis by Bank of England staff. But this poses the question: Is it actually possible to calculate confidence intervals of life expectancy projections in a mathematical fashion? Are we dealing here with mathematically modelable risk or inherent uncertainty?

To consider that question, the Pensions Commission conducted an analysis of how uncertainty in mortality rate projections drives variability in life expectancy projections. In Britain over the last ten to fifteen years, mortality rate declines among age groups over sixty have been running at over 2 percent per annum (see Figure 4). If they continue at that rate, male life expectancy at sixty-five, currently estimated at nineteen, will reach about thirty by 2050. If the rate accelerates to 3 percent, life expectancy would soar to thirty-seven years. Only if it decelerates to 1 percent would the GAD's 2002-based principal projection of twenty-two years in 2050 be correct. So the GAD 2002 projection—a major increase from previous projections—nevertheless still assumed a major deceleration of mortality rate improvement.

But let us assume for now that this projection was the best mean expectation of the future. How uncertain should we consider it?

One way to approach that question is to observe what errors and changes to forecasts have appeared over the last twenty years, between the GAD's 1983 forecast and the 2003 forecast. Figure 5 shows the error rates for a male aged sixty-five. For years prior to 2003 we are comparing the 1983 forecast with actual results. The mortality of the sixty-five old male in 1994 was 17 percent below what was forecast in 1983. For years after 2003 we are comparing the 2003 forecast with the 1983 forecast. In 2003 we forecast that in 2014 the mortality rate of 65-year-old men will be 46 percent below what we forecast in 1983. Similar errors or changes are observed at age seventy-five and eighty-five.

FIGURE 4
Mortality Rate Declines and UK GA Principal 2003 Projection

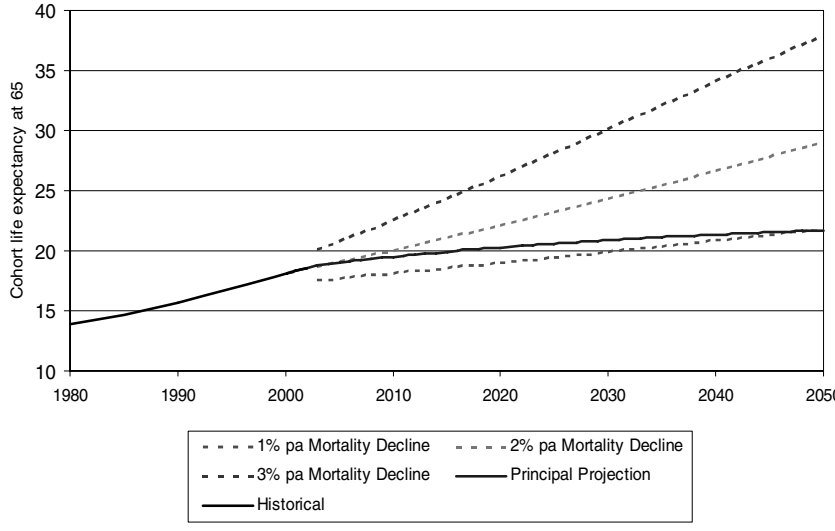
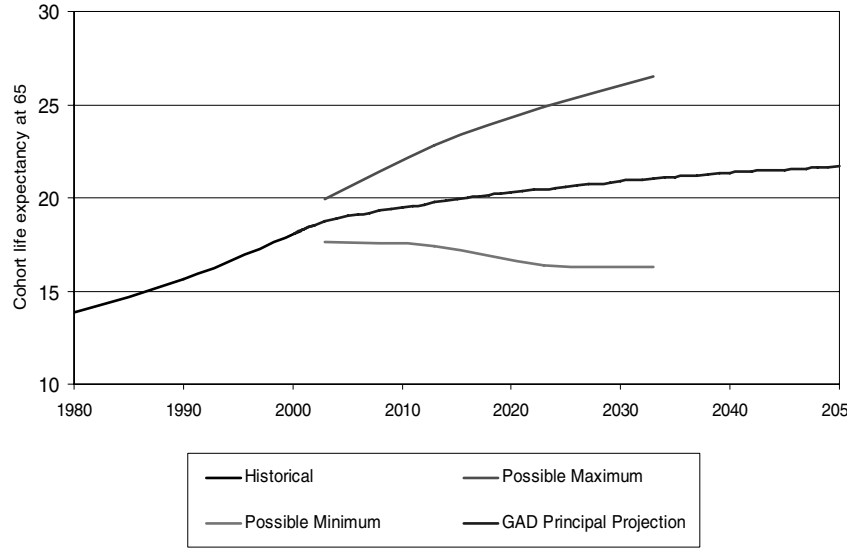


FIGURE 5
Actual Past Differences in Mortality Rate Forecasts: Male at Sixty-five

Mortality rates measured / forecast in year							
1984	1985	1986	.....	1994	.....	2004	 2014
Actual vs 1983 forecast						2003 forecast vs 1983 forecast	
Male at age 65	-8%	-0%	-3%	.....	-17%	.....	-41% ..... -46%

FIGURE 6
Male Cohort Life Expectancy at sixty-five



We then use these past error rates or changes to estimate a range of uncertainty looking forward for 2003. Figure 6 shows the results. What it says is:

- If the errors/changes which have already emerged since the 1983 forecast define the maximum error possible looking forward one year, two years, three years, *n* years, etc.,
- and if this error potential is symmetric,
- then male life expectancy at sixty-five today could lie in a range 17.6–19.9, but by 2033 it could be within a range 16.3–26.5.

It is vital, however, to interpret these mathematical estimates of the range of uncertainty correctly. I suggest, for debate, four propositions:

- First, we are dealing here with inherent uncertainty not mathematically definable risk. Note that we are not sampling a definitively existing underlying universal distribution. Nor are we even observing a sequence of changing actual variables over time. We are simply comparing our forecast made in one year either with actual results or with our forecast made in another. I therefore believe that we have here no real basis for making a mathematically precise estimate of confidence ranges. We cannot say, as we can in any sampling exercise, that we are 95 percent sure that the correct figure lies in a range x–y. Using confidence intervals statements to communicate expert judgments may still be valuable, but solely as a communication device.
- Second, it is important to be clear, we cannot be certain that the maximum error rate potential is revealed by the 1983–2003 comparison. We know that our estimate of the male 65-year-old mortality rate in 2013 has fallen by 46 percent in the twenty years between 1983 and 2003. But it could perhaps fall still more by the time we get to 2013.
- Third, we need to think through whether the error potential looking forward is symmetric around the base case or asymmetric. I suspect it is asymmetric. In the past twenty years, of course, the errors have been all one way. That does not necessarily imply that they will be one way in the future: our principal projection may now be a best mean expectation. But note that the symmetrical application of uncertainty in Figure 6 implies a lower bound which predicts actual falls in life expectancy, while the range of scientific and medical dispute is predominantly between no-change and further increase. And note that the current base case already assumes a limit-to-life, albeit over a longer term than was assumed in 1983. My judgment is that around the UK GAD's 2002 base case we are more likely to see errors that increase life expectancy than decrease it.
- But fourth, I suspect that over the next twenty years we are unlikely to see the emergence of errors quite as large as emerged within the first twenty years after 1983. The principal projection has been changed from a very strong version to a weaker version of the limit-to-life hypothesis. And errors as large and in the same direction as emerged between 1983 and 2003 would now, looking forward, imply actual acceleration of mortality rate declines and thus accelerating life expectancy increases. My judgment is therefore that the principal projection is likely to prove more accurate over the next twenty years than it did between 1983 and 2003. But beyond the next twenty years, compared with a base case which assumes a rapidly decelerating mortality rate decline, there is no reason to believe that errors could not be as large as they were in the past.

Taking these considerations together, a reasonable judgment on uncertainty *might* be as shown in Figure 7, with a somewhat predictable development over the next ten to fifteen years or so, but with exploding uncertainty thereafter, and with male life expectancy at sixty-five in 2050 anywhere from twenty to twenty-nine. As a judgment I might say that that range defines the 90 percent confidence interval, but that a judgment is all that would be, a judgment of uncertainty, since I believe that no mathematically precise definition of risk is possible.

It should be noted that since the original analysis of this issue was conducted by the UK Pensions Commission, the UK GAD has produced a new projection of life

FIGURE 7
Male Cohort Life Expectancy at sixty-five

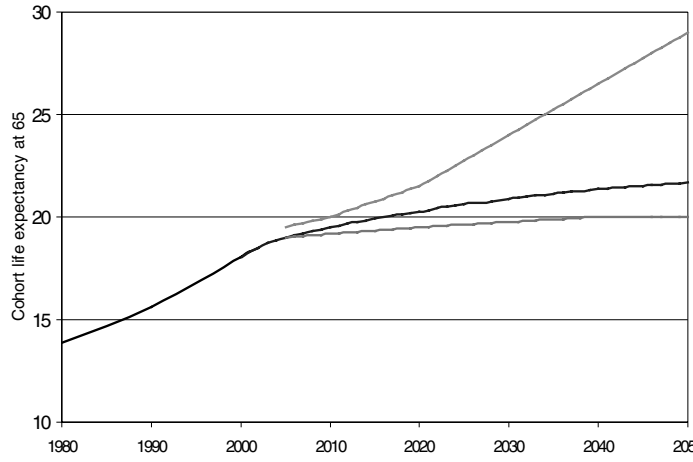
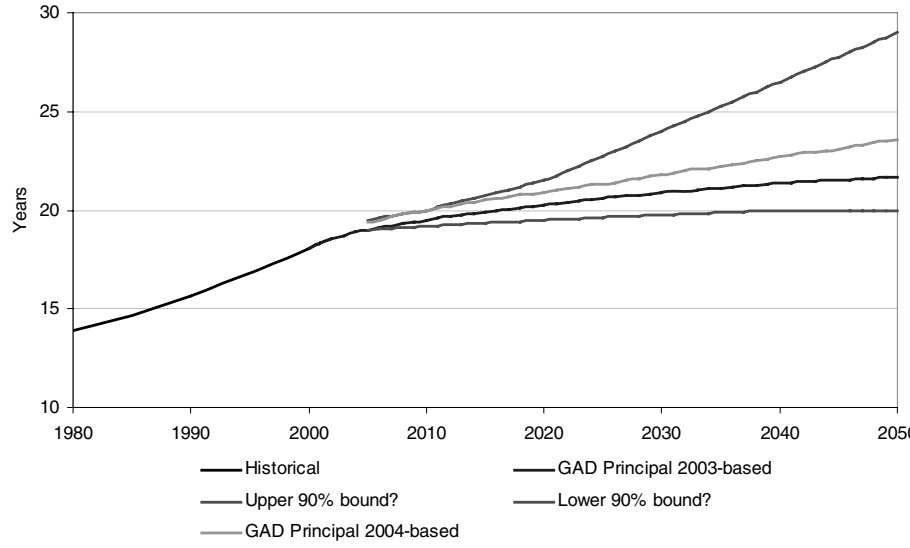


FIGURE 8
Male Cohort Life Expectancy at sixty-five: Range of Possible Uncertainty Around 2004-Based Principal Projection

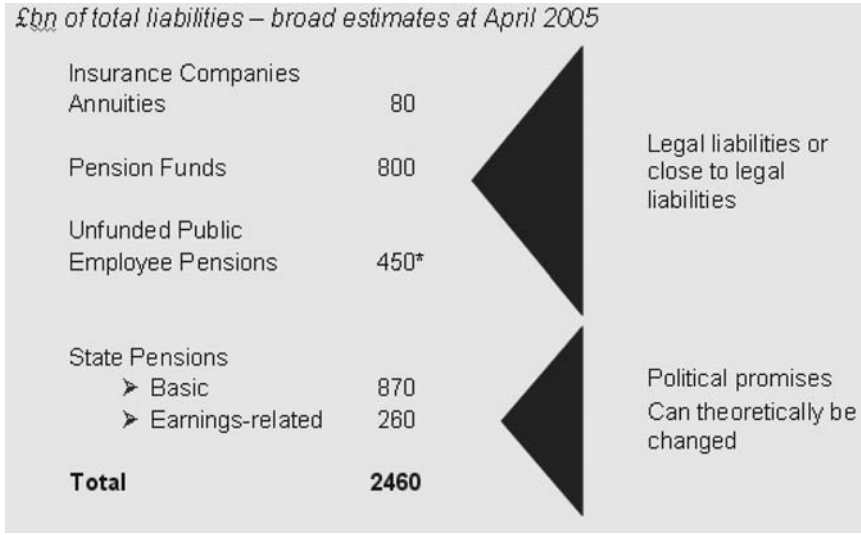


expectancy—the 2004-based projection (published in 2005)—which is closer to the midpoint of the range of uncertainty which the Pensions Commission proposed (see Figure 8).

IMPLICATIONS OF LONGEVITY UNCERTAINTY FOR PENSION SYSTEM DESIGN

Whether or not Figure 7 does represent the best judgment on uncertainty, what is clear is that the range of uncertainty in future life expectancy projections is wide. What

FIGURE 9
Longevity Risk in UK Pension Provision—Latest Figures (2006) Suggest Unfunded Public Employee Liabilities Now About £550 bn



implications therefore follow for capital markets, for pension fund management, for the annuity market, and for public policy?

A useful starting point is to estimate how large are the existing liabilities exposed to longevity risk, and who at present holds that longevity risk. Figure 9 sets out the broad figures. In total, different UK institutions appear to own about £2.5 trillion of liabilities whose value would increase if life expectancy increased. Within that total, two points are notable:

- First, just over £1.1 trillion represents the government's liability for state pension promises. But these are political promises which, to varying degrees, could be revised by changing the promise. This contrasts with the £1.4 trillion of legally contracted liabilities, either of the government as employer and unfunded pension provider, or of DB pension funds, or of insurance companies providing annuities.
- Second, note that the role of insurance companies as annuity providers is strikingly small within the context of the total picture. Only about £80 bn of the £2.5 trillion total has been absorbed by insurance companies subject to explicit capital adequacy regulations. In the United Kingdom at least, the vast majority of longevity risk is absorbed by the state, either as employer or as state pension provider, or by DB pension funds.

Given the likelihood that our uncertainty over longevity increases the further we look ahead, the risk inherent in these £2.5 trillion liabilities depends on the age of the individuals covered. With varying degrees of accuracy we can split the liabilities

FIGURE 10
Longevity Risk in UK Pension Provision

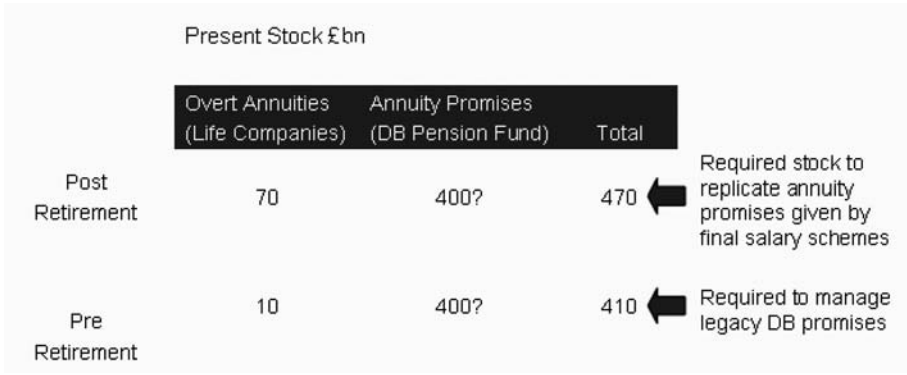
	Preretirement	Postretirement
Insurance Companies	10?	70?
Pension Funds	400?	400?
Unfunded Public Employee Pensions	260	190
State Pensions		
▪ Basic	490	380
▪ Earnings-related	170	90
Total	**1330**	**1130**

between those which relate to people of preretirement age (say below sixty or sixty-five) and those already in retirement (see Figure 10). Again it is striking that the big concentrations of risk do not lie with insurance companies, but with pension funds and with the government as employer.

- The great bulk of insurance company annuities cover already retired people, primarily over sixty, for whom the uncertainties of average cohort life expectancies are moderate. Only about £10 bn of deferred annuity liabilities, covering people of much younger age groups, have been created.
- The government as state pension provider carries significant long-term preretirement longevity risk, but could hand some or all of this back to individuals by increasing state pension age.
- But DB pension funds have something like £400 bn of very long term and legally contracted pension liabilities to people who have not yet reached typical retirement ages, and the government as employer has about £260 bn.

Looking forward, however, it is likely that changes in the UK's pension system will result in a shift of risk from DB pension funds to insurance companies or other capital at risk providers, a process I shall label "overt annuitization," to distinguish it from the implicit annuitization which occurs within DB funds. The DB to DC shift will clearly produce an increase in overtly written annuities, as more people save in DC form and need to annuitize their savings in retirement. The legacy management of existing DB fund risk may also produce overt annuitization via the bulk buyout route: and even if DB funds choose to manage the risk within the fund, their attempts to do so will produce demand for the same instruments, long bonds and ideally longevity-linked bonds, which could support expanded annuity capacity. Finally the declining generosity of the state PAYG system will itself drive increased demand for postretirement annuities if private savings rise over time in response, as the UK government and the Pensions Commission both hope.

FIGURE 11
Possible Long-term Annuity or Longevity Bonds Stock?



The demand for overt annuities can therefore only go one way.

- Estimates by Watson Wyatt suggest *at least* a doubling in the *flow* of new annuity business in the United Kingdom by 2012, and possibly explosive growth if DB funds pursue large-scale bulk buyouts.
- Although an alternative way to scope what might happen is to ask how large the annuity *stock* would need to be if it were to perform the function of longevity risk absorption which until now has been performed by DB pension fund (see Figure 11). In the long run and in a world in which all private pension provision was DC in nature, the UK's annuity stock would need to be £470 bn if as much postretirement longevity risk were to be absorbed as today. And it would need to be £410 bn larger still if all of the preretirement liabilities of the DB pension funds were to be transferred to overt annuities via the bulk buyout market. Still higher figures would result if public employee pensions moved to a DC model.

These are huge figures, which imply a very large-scale demand for appropriate maturity bonds, but also for longevity risk absorption. Given the great uncertainty in our estimates of future life expectancy, they raise the following issues:

1. What are the prospects for annuity market capacity and prices?;
2. Who *should* bear longevity risk?; and
3. What is the appropriate role for government? Should it issue longevity bonds?

First, prospects for annuity market capacity and prices. This is where the conclusion that Pensions Commission eventually reached, which is set out in a panel at the end of Chapter 5 of our Second Report (Pensions Commission, 2005), was somewhat different and more optimistic than that which I proposed in my original lecture last April. The essence of our conclusion was that, in a sense, there cannot be a problem of an absolutely constrained supply, but an issue of price, and that in the long run the individual response to the price signals that are going to arise will be not only unavoidable but also appropriate.

Let me explain. Capacity and pricing in the annuity market will essentially be determined by the supply of "position" takers, by the willingness of institutions—whether insurance companies, reinsurers, or issuers of longevity bonds—to put capital at risk in order to earn a return. I focus on "position takers" because the supply of "hedgers"—institutions with naturally offsetting positions—is small and likely to remain so. And the total amount of capital capacity which these "position takers" will require, if they were to perform the risk absorption role performed in the past—would be huge—both because the total amount of risk to be absorbed is, as we have seen, huge, and because as risks move from the implicit annuitization of defined benefit funds to overt annuitization, regulators demand that adequate capital is committed. In the past, defined benefit funds have been functionally equivalent to insurance companies subject to inadequate capital reserve requirements. In the future, adequate capital will be required and will need to be remunerated.

But despite that huge increase in potentially required capacity, I think it is wrong to see this problem as one of an absolute capacity constraint. It is a moot issue indeed whether any long-term capital market issue is appropriately analyzed in terms of quantitative capacity constraints rather than in terms of price, but it is particularly odd to talk about a quantitative shortage of capital in the annuity market, with capital essentially provided by the annuity purchaser in the upfront price. Demand for annuities automatically will produce capital devoted to the annuity business—at a price. And it is unclear why the price will be other than a fair one given the uncertainties involved.

But what is clear is that the fair price for absorbing capacity increases significantly as the tenor of the annuity written increases.

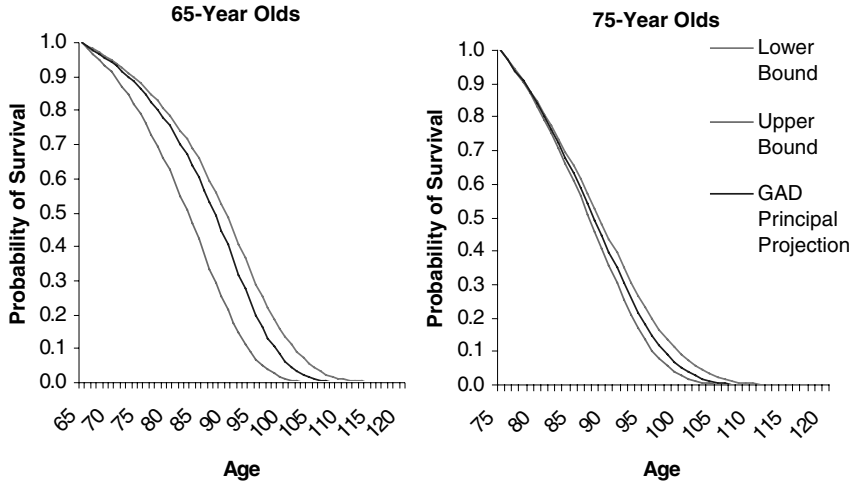
Uncertainty about future projections of life expectancy for the cohort of people currently aged 65 is much higher than uncertainty relating to the cohort of 75-year olds (see Figure 12). For 55-year olds the uncertainty is greater still, and for 35-year olds or 25-year olds it is huge. And the fair price which needs to be charged for absorbing the longevity risk of a 25-year old, or even a 55-year old, may be so high that very few 25-year olds or 55-year olds would be willing to pay it, if they actually faced that price.

The capacity/price prognosis for the longevity risk market may therefore be as follows.

- There is no inherent limit to the capacity which will be devoted to providing annuities for people who are, say, twenty years away from average expected age of death, and the price for uncertainty over twenty years will be such that many people will buy this product, with overt annuitization growing sufficiently to fill the role previously performed by implicit postretirement annuitization within defined benefit funds.
- But in the long run the vast majority of very long-term longevity risk which has been written by defined benefit funds and their sponsoring employers, will simply not be written by anyone—not because there is a meaningfully definable absolute shortage of capacity—but simply because the fair price makes it an unattractive contract for the individual.

Essentially what I am saying is that the absorption of large amounts of preretirement longevity risk by defined benefit funds and their sponsoring employers represented

FIGURE 12
Probability of Survival of 65- and 75-year-old Females with Modeled Variations Around GAD Principal Projections. Model Assumes Error Rates Increasing by 1 Percent Each Year, as Per Modeled Scenario.



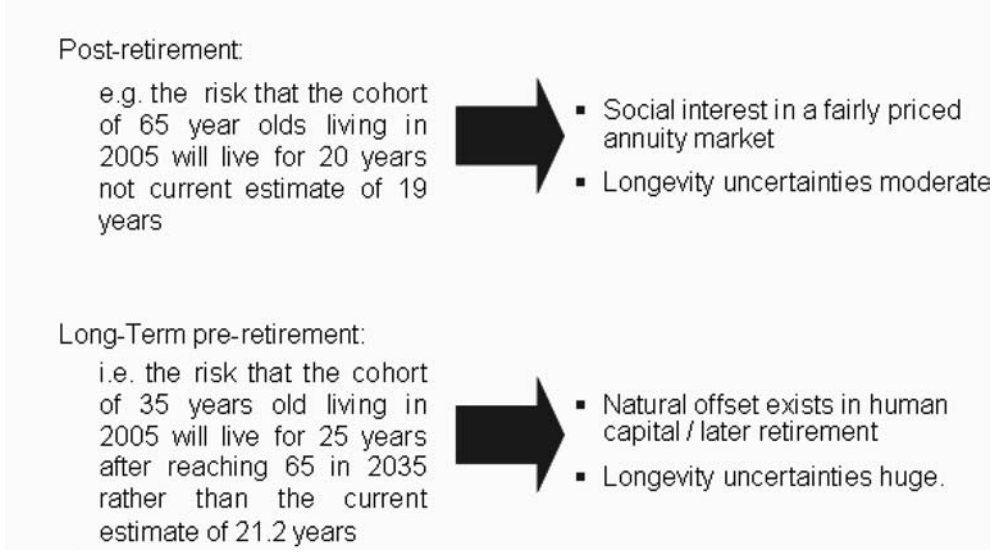
a systematic underpricing of longevity risk, rooted in a failure to understand uncertainty in longevity forecasts, in a sloppy capital adequacy regime, and in inadequate accounting. That underpricing in the past leaves those who took those positions with large legacy deficits, and the closer we get to marked-to-market accounting for those deficits, the more we may see those risks being shifted, at a fair but high price, to professional longevity risk managers receiving a return on their capital at risk.

There may, therefore, be a significant capital market role in absorbing some of the legacy risk, and that could be a significant business for several decades. But in the very long term, in a defined contribution world, we will not see the present level of preretirement longevity risk absorption being replicated. The risk will not be absorbed by anyone, it will stay with the individual.

Which brings us to the second issue—who, in principle, *should* bear the risk of life expectancy uncertainty for entire age cohorts? I propose that the answer is quite different for long-term versus short-term longevity uncertainty, for the preretirement and postretirement periods, with important implications for optimal pension system design (see Figure 13).

- Once people have retired, and certainly once they have reached the age where reentry into the labor market would be difficult, it seems clear that there is a social interest in there existing a fairly priced annuity market, providing individuals with assurance of income until death. The individual is poorly placed to absorb the risks, and, fortunately, the range of uncertainty is sufficiently constrained to limit the capital required for risk absorption.
- Looking at long-term longevity risk preretirement, however (for instance uncertainty over the life expectancy which today's thirty-year olds will enjoy after

FIGURE 13
Who Should Bear Cohort Longevity Risk?



reaching 65 in 2040), a completely different conclusion seems logical. Over very long periods, huge uncertainty in life expectancy forecasts makes risk absorption by insurance companies or other financial intermediaries prohibitively expensive. Conversely, the individual has within their human capital the natural offsetting position. If by 2040 today's 30-year olds can then expect to live for 26 years beyond 65 rather than today's prediction of 21 years, it is highly likely that they will also be far healthier 65-year olds than we currently anticipate, and therefore well placed to divide the five unanticipated years of additional life between more work and more leisure in an economically sustainable fashion.

Much postretirement longevity risk should ideally be insured by individuals and absorbed by insurance companies or other providers. Most preretirement longevity risk should ideally be absorbed by individuals since they, unlike employers, insurance companies, or the state, have a natural offsetting position in their own human capital.

This implies that some of the shift of risk to individuals which we are seeing should be positively welcomed. It also implies that pension policy should explore options to shift longevity risk without necessarily shifting other risks.

- Thus while the shift from DB to DC provision has the beneficial effect of shifting long-term longevity risk to a more appropriate risk bearer, and of creating incentives to later retirement, it may be concerning that it also simultaneously shifts investment risk to individuals who may have limited capacity to manage it well.
- Alternative ways to shift longevity risk can be designed which avoid this disadvantage. Private DB schemes and state pension schemes can be redesigned to link pensionable ages to future uncertain trends in life expectancy, while still providing

assured pension levels at that changing age. And both private DB schemes and state pension schemes can be redesigned to deliver an assured investment return to individuals, while making the pension which is purchased with the accumulated pot dependent on annuity rates when the individual decides to retire. The Swedish notional defined contribution (NDC) system achieves this effect (Palmer, 2006).

In the Swedish scheme, however the government does sell the annuity, and therefore continues to absorb postretirement longevity risk—as indeed governments do in all standard PAYG schemes, even if the pensionable age is linked by formula to increasing life expectancy. So the third question is—how much longevity risk *should* government absorb, and should they absorb some longevity risk via the issue of longevity bonds?

The starting point is to note that all governments in rich, developed countries are fairly long longevity risk—through the state pension system, through, usually, public employee pension provision if this is still defined benefit in form, and through healthcare provision. The primary challenge for most governments indeed must be to shed the inappropriate risks arising from long-term preretirement longevity uncertainty. In the state system that means either formula-linked pension ages or NDC systems. In public employee pensions it means formula-linked pension ages, NDC systems, or pure DC systems.

But despite that long risk position, calls are sometimes made for governments to issue longevity bonds (see for example, Blake and Burrows, 2001). Implicitly or explicitly these calls must rest on one of two rationales:

- First, a market failure argument might be advanced, that the market will for some reason charge an unfair price for longevity risk, whereas the government could charge a fair price and therefore make a reasonable rate of return on the risk taken. But it is unclear why this should be the case. In the face of large, inherent uncertainty, rather than of precisely mathematically modelable risk, the setting of a fair price for very long-term longevity risk is inherently difficult, but it appears equally so for government and for the private sector.
- Second, however, it might be argued that the government is effectively already bearing some of the longevity risk which apparently resides within the private market, and therefore might be better off to absorb some of it explicitly, via longevity bonds, rather than having risk handed back to it in the future in unpredictable ways.
  - The first variant of this argument is that if DB funds are unable to hedge longevity risk, that could be a contributory factor in driving insolvency and recourse to the UK's Pension Protection Fund (PPF), our newly created equivalent of the US's PBGC. If the government effectively underwrites the PPF, it faces the longevity risk. But the government would have to absorb a very large amount of very long-term longevity uncertainty significantly to offset this danger, and in doing so it would be absorbing risk which is currently spread across equity owners (including overseas holders of UK equities) and across DB pension fund members who would receive less than 100 percent payouts from the PPF. There does not seem to be a compelling logic why this nationalization of currently dispersed risks would be either fair or efficient.

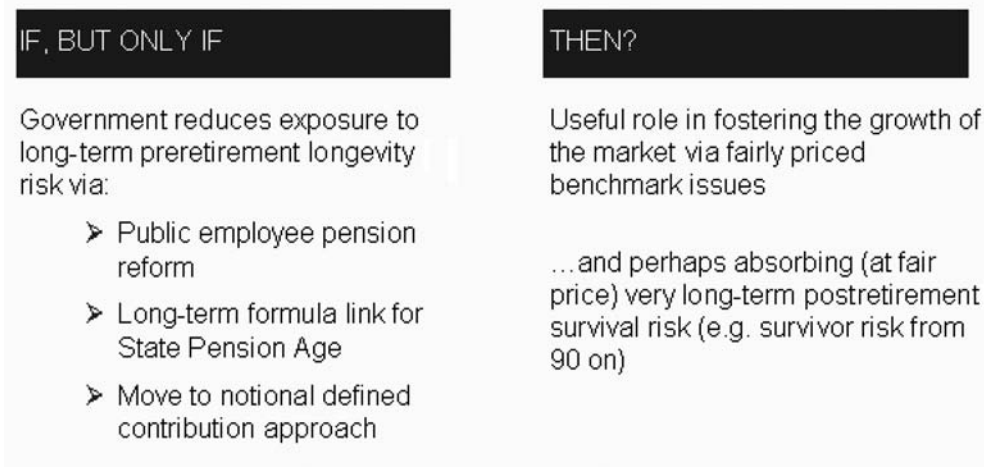
– The second variant argues that if higher priced annuities result in a greater likelihood of people falling back on means-tested state benefits in later retirement, this might establish a legitimate government interest in at least ensuring fair pricing within the annuity market.

This final argument strikes me as the only one which might provide a rationale for government issue of longevity bonds, and might also suggest a particular form of government intervention. For it may be the case that major uncertainty about mortality rates in the older stages of retirement (e.g., above ninety) has a disproportionate impact on the pricing of annuities at the onset of retirement, and that a government role in absorbing this risk (at best estimates of fair price) might help lubricate the annuity market. But for the government to take on extra longevity risk on top of its present large long position would be unwise. I therefore suggest for debate that there might be a role for government in postretirement longevity bonds, but only within the context of a government strategy to shed inappropriate preretirement longevity risk. Thus, Figure 14.

- If, but only if, the government can substantially reduce its longer-term longevity exposure via reform of public sector employee pensions and state pensions,
- then it could consider playing a facilitating role in the annuity market, absorbing very long tail postretirement longevity risk, through the issue of appropriate bonds. The same effect could however, at least with respect to poorer households, be achieved by making the basic state pension more generous beyond a certain high age, creating the opportunity for the provision of limited-term annuity products which only cover individuals up to that age.

So let me sum up. There is huge uncertainty about future projections of average life expectancy and these expectancies explode the further we look ahead. And these are

FIGURE 14
Government Role in Longevity Bonds: An Optimal Approach?



inherent uncertainties, not precisely modelable risks, so that any confidence intervals we describe are judgments, not mathematical facts. Despite that, however, there is no inherent lack of capital to support growing demand for longevity absorption postretirement, and the uncertainties of postretirement, uncertainties in, say, the last twenty years before expected death, are sufficiently limited that the price for risk absorption will still look attractive to many annuity purchasers.

But when we look at really long longevity risk, forty or fifty years before expected age of death, the uncertainties explode, and the price which risk capital will require for absorbing that risk is unattractively high, and would not be paid by any significant number of individuals making their own rational decisions, given that it is the individuals, not the capital providers, who own the offsetting position, which is the human capital asset.

But the fact is that, in the past, two sets of actors—states and private nonfinancial companies through the defined benefit funds—have absorbed huge amounts of very long-term longevity risk, with insufficient analysis of the uncertainties involved and a sloppy approach to the implicit capital requirements of DB funds (not just, of course, in relation to longevity risk, but also in relation to investment return risk).

Faced with the long-term uncertainty we now recognize, the state should, over time, exit from as much preretirement longevity risk as possible, focusing its appetite for longevity risk on ensuring the social good of pension certainty postretirement, through state pension promises which are fixed once a person has retired and perhaps via measures to lubricate a well-functioning postretirement annuity market.

As for private employers and defined benefit funds, the problem is not the future, but a huge legacy deficit and risk inherited from the past. Once this deficit and the volatility of this deficit is correctly recognized in accounting terms, the very high price of long-term longevity risk absorption (and indeed of investment return risk absorption) will become obvious, and an increasing role is likely to emerge for private providers of capital willing to take that risk away from corporations at a price high enough to provide a reasonable return on the large amount of capital required to absorb long-term uncertainty. That risk absorption role could take the direct form of bulk annuity underwriting, or the indirect form of issuing longevity bonds, in turn bought by the bulk annuity providers. And I suspect that it is on these options for managing the enormous legacy risk which much of today's discussion will focus. I look forward to that discussion.

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