LONG FINANCE

Don't Stop Thinking About Tomorrow:
The Future of Pensions

Con Keating

FINANCE SHORT 2–02010

About the author

Con Keating

Con is currently a member of the steering committee of the financial econometrics research centre at the University of Warwick and of the Societe Universitaire Europeene de Recherche en Finance. As a research fellow of the Finance Development Centre he published widely on the regulation of financial institutions and pension systems, and also developed new statistical tools for the analysis of financial data, such as Omega functions and metrics. From 1994 to 2001 Con was chairman of the committee on methods and measures of the European Federation of Financial Analysts Societies and is currently a member of their Market Structure Commission. Con has also served as an advisor and consultant to the Organisation for Economic Cooperation and Development's (OECD) private pensions committee and a number of other international institutions.

In a career spanning more than forty years, Con has worked as an infrastructure project financier, corporate advisor, investment manager and research analyst in Europe, Asia and the United States. He has served on the boards of a number of educational and charitable foundations and as a trustee of several pension schemes. He is currently Head of Research for the BrightonRock insurance group.

Finance Short 2–02010*

Established in 02007 by Z/Yen Group in conjunction with Gresham College, the Long Finance initiative began with a conundrum – "when would we know our financial system is working?" Long Finance aims to "improve society's understanding and use of finance over the long-term", in contrast to the short-termism that defines today's financial and economic views. Long Finance is a community which can be explored and joined at **www.longfinance.net**.

Long Finance publishes occasional Finance Shorts in order to initiate discussion on a current topic in commerce viewed through a long-term lens. Finance Shorts allow authors to comment on current affairs or contemporary matters without feeling that intensive research or consensus is needed beforehand.

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Preface

We are particularly well placed at the EFFAS European Bond Commission to judge the quantity and quality of studies, papers and publications dealing with the topic of pensions. Whilst there is no doubt that the quantity of these has increased dramatically of late, the same unfortunately cannot be said about the quality. All that changes with this study.

Seldom have all the talking heads, and even most of the thinking ones, been in such a common agreement about an essentially economic and financial question as they are these days on the matter of pensions. But for whatever particular reason given (and there are many: demographics, low levels of return, the evil of stealing from future generations, present longevity, future longevity, etc) the usual conclusion seems unanimous and beyond appeal: we are told that our present model (whichever that may be; and there are many) is simply unsustainable. If this paper had a single purpose it would be to demonstrate that this is not the case: that if properly designed, and correctly understood, pensions are a perfectly sustainable feature of our social system.

In an amazingly broad sweep, but with a very fine brush, Dr Keating maps out the key dimensions to the pension problem (and there are many) from the historical context, through the ongoing failure of demographic forecasts and the minutiae of regulatory prescriptions and incentives, to the misconstrued and misguided financial analytics all too often brought to bear on the subject. The result is a tour de force, but it is more than a description of a timely and thorny issue: practically, this study is replete with suggestions both for policy and further research; and philosophically, it examines the limits of knowledge, draws the distinctions between risks and uncertainly and raises numerous other fundamental questions, without necessarily having an answer to them all. For, central to the underlying thesis is a realization of the importance of the concept of unknown unknowns.

It would be difficult to single out any specific point in this remarkable paper, so I will just mention three examples. Dr Keating's discussion of the irrelevance of calculating the present value of pension liabilities, and the sheer foolishness of doing so with a single, and usually totally arbitrary, discount rate is a welcome rejoinder to those who can only see the future through the temporary colour of today's glasses. Further, his revelation that the uncertainty of today's demographic projections is nothing new, but a persistent feature of such projections since they first started (Malthus, anyone?), is a refreshing expression of the use and misuse of spurious accuracy. Last, his emphasis on the importance of distinguishing between short-term and long-term horizons, and of being time-consistent in the analysis of the pension problem (or any problem) is incidentally a debunking rebuke to those in finance and politics who insist that the optimal long-term outcome is simply the sum of optimal short-term ones.

We are delighted to be associated with, and sponsoring, the publication of such a detailed and in-depth analysis of pensions today. That much of it is centered on the evolution of the system in the UK does not detract from the plethora of general points raised and made; rather, it is yet another suggestion for further research into pensions elsewhere and everywhere. As such this study falls perfectly into the purview of the EFFAS European Bond Commission, in the same vein as our support and sponsorship of various OECD efforts in the field of pensions.

I trust that this exceptional and encyclopedic mapping of the pension conundrum will prove to be as fascinating and thought provoking to its readers as it has been to me.

Chris Golden
Chairman – EFFAS European Bond Commission

Abstract

We consider the future of retirement income provision over the long term, predominantly in the context of the UK. We indicate a number of errors currently being made in the analysis and management of pensions, contribute to the policy debate on some further policy issues and offer several innovations which could enhance the adaptability and resilience of the pension system. The somewhat unconventional view is advanced that pensions, broadly as formerly envisaged, are sustainable over the long-term.

Acknowledgements for helpful discussions and contributions are due to far too many to list; without them this paper would have been much the poorer. Responsibility for errors and omissions, of course, remains with the author.

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Foreword

Long Finance aims to "improve society's understanding and use of finance over the long-term", challenging us to develop views of finance over periods of lifetimes, not nanoseconds. Few financial institutions should be more important over a lifetime than those providing for old age. The conventional reckoning of a 'generation' as thirty years has degenerated to twenty, while lifespans have increased to nudge the century mark. A lifetime's planning has moved from two or three generations to five.

When Long Finance began looking at pensions with Con Keating he remarked: "Defined benefit pensions may be the best risk transfer mechanism we've ever stumbled across." Yet pension policies everywhere are in disarray – defined benefit schemes in Britain are closed to new members and also closing down; private sector workers are outraged by public sector pension commitments; the young are outraged by obligations to the old; and accountants and actuaries around the world should be ashamed of their historical performance – and would be, if they weren't so busy re-estimating future liabilities from minute to minute.

The President of Ireland, Mary McAleese, stated at a financial conference earlier this year that risk products "provide a core of stability that opens up enough space to let the future in." Knowing that there are secure provisions for old age enables all of us to lead a fuller life in the present. Pensions don't just sustain pensioners, they improve quality of life for those on their way to pensionable age.

Con challenges us to adopt new views that will return pensions to their status as one of our most important risk transfer mechanisms. In particular, Con points out that defined benefit schemes can work, and work well, given appropriate regulation. Additionally, Con challenges pensions professionals to rethink their methods by, for example, using more appropriate discount rates such as those of earnings, not bonds. Finally, Con develops solid arguments for several innovations, particularly for pensions indemnity assurance.

Long Finance seeks to encourage debate about how to restore confidence in pension stability, so that more appropriate risks can be taken in the present that will lead to more rewarding lives. Con's booklet is a vital contribution to this debate. We are extremely grateful to Alpheus for funding the second of our Finance Shorts publications and providing support for subsequent discussion. The booklet is not an easy read – so be it; but Con's intellectual challenge moves us closer to a big reward, designing a better pension system for all.

Professor Michael Mainelli
Executive Chairman - Z/Yen Group Limited

The Argument

Background

Contributions to debate

- **Technique**
- **Growth**
- **Welfare State**
- **Ageing**
- **Longevity**
- **Financial Markets**

Analytical problems

- **Accounting**
- **Scheme Funding**
- **Saving**
- **Regulation**

"Forecasts of future populations, from those of the seventeenth century on, were practically always wrong."

Schumpeter, Capitalism, Socialism and Democracy, 1943

"Old age will only be respected if it fights for itself, maintains its rights, avoids dependence on anyone and asserts control over its own last breath."

Cicero, On Old Age, 44 BC

Con Keating | FutureofPensions.org | European Federation of Financial Analysts Societies | EFFAS – EBC

London, September 2010

Introduction

Provision of an income for oneself in retirement is unique in the sense that it requires thinking about the long-term and planning for it. While a lifetime is the longest term that we need to consider personally, it is obvious that as a society we need to think about these issues over even longer times, many lifetimes and multiple generations. For this, very long-lived institutions[1] are needed. In the developed world, there are examples of such quasi-permanent institutions of varying form: religious orders, university colleges and some charitable concerns are obvious[2]; somewhat less so, the institutions of government. Prior to their abolition in 1948[3] the Poor Laws had been in effect for nearly 400 years. This long-term concern is not a simple process to analyse, as one of its dominant characteristics is change. The challenge here is identification of the properties which confer resilience to change; the ability of an institution to adapt to changed circumstances is critical[4].

How many people living in 1908, when State pensions were introduced in the UK, could have foreseen the circumstances in which we live today in the developed world? Technological advances have afforded us a surely then-inconceivable standard of living. Change can be steady or abruptly discontinuous in nature. It was not until the year 2000 that fifty percent of the world possessed fixed-line telephones, but by 2007 fifty percent of the world possessed a mobile telephone.

Innovations

- **Allowing pensions institutions to work**
- **Developing a savings culture**
- **'Nudging' via taxation**
- **Eliminating investment regulation**
- **Hedging sponsor insolvency**
- **Supervisors encouraging DB**
- **Pension indemnity assurance**
- **Realising that regulation undermines trust**

Conclusions

Arthur C Clarke's words[5] on this topic resonate: "*Any sufficiently advanced technology is indistinguishable from magic.*" In fact, as with so many ideas, close parallels can be found in earlier writings – for example, Leigh Brackett's[6]: "*Witchcraft to the ignorant,... Simple science to the learned*" or Sir Robert Filmer's wonderment in 1653[7]: "*There be dayly many things found out, and dayly more may be which our Fore-fathers never knew to be possible in Nature.*" There is an important property to this knowledge: it is accidental – not born out of necessity but spontaneous in occurrence. It may be perceived as ever increasing in amount; just think of the field of mathematics where every new theorem proved adds to the stock. Technological change is, as will be seen later, central to economic and financial growth and capacity[8]. In a bio-medical context, it is the issue at the heart of the longevity debate. The challenge is identification of the enduring and its separation from the ephemeral. The pursuit of strategies which adapt institutions to developments that prove ephemeral may lead even the strongest to fail.

"The fact that there is uncertainty about the future does not of itself invalidate projections."

This should emphatically not be taken to imply that forecasting is inherently futile. Far from it; there are many things which are, in essence, time invariant. However, it should serve as a caution as to the forecasting techniques employed and our knowledge of their limitations. The most obvious comparison here is with the couple, meteorology and climatology. We know, from the very nature of these systems[9], that we will never be able to forecast the weather, a question of meteorology, with high precision at horizons beyond a few days; while we may make statements with a high degree of certainty about our climate over very long periods of time – summers will be warmer than winters.

In 1955, John Hajnal[10] addressed some of these concerns in a far-sighted paper "*The Prospects for Population Forecasts*". He argued the following three points:

1 *that population projections in the future as in the past will often be fairly wide of the mark – as often as simple guesses would be;*

2 *that, nevertheless, the frequent preparation of projections will continue;*

3 *that a projection can be useful as a piece of analysis even if its accuracy is low.*

The fact that there is uncertainty about the future does not of itself invalidate projections. There is much uncertainty also about the past[11] and occurrences that we do not fully understand, but we are here today in circumstances that are, to a large extent, observable and comprehensible. Hajnal's second point has undoubtedly proved to be accurate: population projections have proliferated. The economists among us might argue that point three follows from the observation that point two has proved to be accurate since these projections would presumably not be commissioned if forecasts had not previously proved useful. We live in an uncertain world with incomplete knowledge and limited powers of cognition.

Demographic horizons have some very useful properties. Projections to horizons such as 2030 are, to a very large extent, determined by cohorts of people already living; they are, in essence, simple extrapolations of trends in place. As we progress towards horizons such as 2050, however, the population is largely yet to be born and the uncertainty increases markedly. If we want to move to horizons beyond that, it is necessary to consider inter-generational models[12]. We know that these cohorts are the progeny of those living today and so on going forward. We should expect a particular generation not to be independent[13] of its forebears[14], but that is not to say that these future generations will behave exactly as their parents did; in sociological terms their 'emotions' differ[15] but the change will tend to be unexcitingly measured rather than radical. For example, today's youth are clearly more aware of and concerned with environmental and ecological issues than previous generations. Another illustration: there is a strong empirical inverse relation between the level of development of an economy and the fertility of its population. This is clearly an emotional issue – one which raises doubts about population projections which rely on very low fertility assumptions. Cultural and even differing religious traditions can be very important for growth[16]. These slow shifts in generational emotions matter to the extent that we create our own future – these futures will vary in response to those behavioural influences. Karl Marx

offered the following insight[17]: "*Men make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly encountered, given and transmitted from the past. The tradition of all the dead generations weighs like a nightmare on the brain of the living.*" Although the empirical academic literature on this topic is somewhat thin, one study[18] suggests that two thirds of changes in attitudes arise from the progression of a cohort through life and one third arises from cohort succession.

"One of the principal failings of the economic modelling of demographic effects is their all-too-frequent lack of consideration of the labour participation rates for a population."

Long-term demographic modelling can be reduced to consideration of just three elements: the fertility rate, the mortality rate and migration. In fact, the latter is unnecessary if we are considering the global population. In the UK in recent years the focus has been overwhelmingly on the mortality element and the related pension cost 'problems', when the long-term is more heavily determined by the fertility rate and the short-term by migration[19]. One of the principal failings of most demographic models is their inability to cope with economically motivated migration. We should not lose sight of the high level of global unemployment that drives so much of migration; the International Labour Organisation 2010 "*Global Employment Trends*" reports this at a record high of 212 million. One of the principal failings of the economic modelling of demographic effects is their all-too-frequent lack of consideration of the labour participation rates for a population.

"With short-term objectives, neither discretionary policies nor markets can be expected or relied upon to provide intergenerational insurance."

Keynes' caution that "*in the long run we are all dead*" is taken wrongly by many to be an exhortation to pursue the immediate to the possible detriment of the long-term. This view is not supported by many of his other writings, as we shall see later when considering investment. Though it is well-known that pursuing a sequence of short-term objectives, even if optimal in outcome themselves, does not in general yield the optimal long-term outcome, we continuously fail to learn from financial experience and come to repeat our previous mistakes. The pursuit of short-term objectives is reflected in policy calls for reductions in government involvement and increased reliance on 'the market'- which fails to recognise that markets do not have to exist or that they are concerned with the here-and-now. There are limits to what can be achieved by a market; of prime concern is that markets cannot relieve poverty. Much of this paper will be concerned with the differences between the short- and the long-term. Attention will be drawn to the inherent time inconsistency[20] of a large part of pension analysis, regulation and accounting[21], a manifestation of the short-term/long-term dichotomy. With short-term objectives, neither discretionary policies nor markets can be expected or relied upon to provide intergenerational insurance.

The past few decades have been characterised by the rise of risk-based financial and other regulation[22]. This is perhaps surprising when the compacts that exist between regulators and regulated cannot be written as complete formal contracts between them, as risk is itself unobservable. It can, at best, only be estimated. Ex-post outcomes are often poor guides to the ex-ante risk. The 2010 Gulf oil-spill is a prime example: ex-ante, a spill of this size had a likelihood of occurrence of the order of one in ten trillion[23]. If, as a society, we make provision for events of this likelihood we are unlikely to be able even to feed or clothe ourselves, let alone raise future generations – but this is an incomplete analysis.

Donald Rumsfeld's unfairly criticised words on risk and uncertainty[24] are relevant here: "*There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we now know we don't know. But there are also unknown unknowns. These are things we do not know we don't know.*" Known knowns, in a risk context, have been popularised in finance by the advent of risk-based regulation for banking and insurance and the wide-spread application of elementary and advanced statistical methods to risk analysis. This is the elementary and extended ruin theory[25] of William Baumol[26]. Both the likelihood and consequence of an event are known. Known unknowns are the stuff of stress tests and partial information – and, as we shall

see, population projections. Here we are able to estimate the consequence of an event but not its likelihood of occurrence[27].

> ***"Here, we will advance the far from popular or accepted proposition that adequate pensions can be afforded and sustained. This view contrasts starkly with the European Commission's bald assertion: "On present trends the situation is untenable."***

Somewhat paradoxically, with risk defined as a subset of uncertainty[28] about which we do know some things, there are things that we know even about unknown unknowns. These are the common properties of the elements of that uncertainty set, to the extent that these can be inferred from the risk subset.

It may be that likelihood is objectively estimable but consequence varies dramatically for different parties. In fact, a complete analysis of an event, such as the Gulf spill, would also consider the benefit to be achieved from success, the additional barrels of oil available, as well as the magnitude of the potential harm of this event to both the producer and society more broadly. It is not at all obvious that such a cost-benefit analysis has been conducted for pension regulation in the UK.

Idiosyncratic risk may be shared among the members of a population but systemic or aggregate risk is borne collectively. However, systemic, social risk is idiosyncratic among differing generations and may be shared among them. This directly contradicts Gordon and Varian's[29] claim that "*an intergenerational risk-sharing scheme is infeasible due to problems of time consistency*", a stance which leads them to conclude that commitment institutions are necessary. Paradoxically, it is this conclusion which motivates the commitment device strand in this essay – though not necessary, commitment devices may be sufficient. In fact, a social compact among generations which is dependent upon its past history[30] can deliver intergenerational risk sharing which is actuarially fair, without the need for commitment institutions. This may be taken to motivate much of the descriptive history in this essay.

To complete this introduction, two further quotations from Keynes are relevant: "*Ideas shape the course of history*" and "*The difficulty lies not so much in developing new ideas as in escaping from old ones.*" In this paper we will challenge a number of current, conventional ideas. In this regard, J.K. Galbraith may have done us a disservice by popularising the expression "*conventional wisdom*"[31] in his 1958 classic "*The Affluent Society*" as, prior to this, the expression usually carried pejorative overtones, implying error and resistance to change. Erroneous beliefs may be widely held as illustrated by the projections of a new ice age in the 1960s or, perhaps more relevantly, the projections in the 1930s of a declining UK population[32]. Here, we will advance the far from popular or accepted proposition that adequate pensions can be afforded and sustained. This view contrasts starkly with the European Commission's bald assertion[33]: "On present trends the situation is untenable." In support of our view, we will here offer the following elementary mathematical observation: taking into account current and projected UK population and earnings forecasts, pension contributions amounting to 20% of salaries over a working life-time of 45 years will, with a 2% investment return, support a pension of two thirds of final salary for a retirement period of 30 years. Though there are many common aspects of pension issues globally, this essay will take a UK-centric view.

> ***"...pensions must be adequate to be sustainable."***

As there is often confusion between inter-generational fairness and sustainability, we shall state the obvious: a sustainable pension system does not have to be 'fair'. But perhaps less obvious is that an inter-generationally 'fair' system does not have to be sustainable. In fact, the expression 'inter-generationally fair' has no generally accepted definition. For example, standard utility theory and the related, empirical, revealed-preference literature would suggest rather strongly that higher transfer payments are appropriate as a population becomes wealthier – but whether that is 'fair' seems an open question. It does, however, highlight one issue – that pensions must be adequate to be sustainable.

Growth, Consumerism and Sustainability

We are aware that growth and consumerism as economic desiderata have been challenged. This movement may be traced back to Galbraith's "*Affluent*

Society" in 1958 but now includes such works as Richard Layard's "*Happiness*", Oliver James "*Affluenza*" and Richard Wilkinson and Kate Pickett's "*The Spirit Level*". This latter work created a significant stir on publication in 2009, merited in part by its sub-title "*Why more equal societies almost always do better.*" As we have tried and failed to reproduce the longevity and health results stated in Wilkinson and Pickett's book, it was enlightening to read Christopher Snowdon's 2010 "*The Spirit Level Delusion*" which debunks much of the econometric and statistical work reported in *'The Spirit Level"*. Inequality in the UK, whether measured by income decile ratios or by Gini coefficients, has been increasing since the early 1960s. The British Social Attitudes survey has regularly reported that around three quarters of respondents thought the gap too wide, but, perhaps surprisingly, did not support possible government remedial actions by anything like that proportion. This problem is far from unique to the UK; the 2007 UN Human Development Report found that income differentials are widening in countries that account for 80% of the world population. It seems unlikely that such complex subjects as inequality or longevity should have a single, simple explanation.

The Club of Rome published a report in 1972 entitled "*The Limits to Growth*"[34]. Using the then novel techniques of system dynamics[35], its World3 model simulated five global subsystems to 2100: Population, Food Production, Industrial Production, Pollution and Consumption of Non-renewable Natural Resources. The discussion surrounding this model was at times both vociferous and visceral. Undoubtedly, it served to popularise many of the issues of sustainability for the first time. Its projections have been revisited after 30 years by its authors[36] and others[37]. The reviews conclude that the surprise-free standard run of *"The Limits to Growth"* has been closely mirrored by subsequent developments.

With scarcity the central theme of *"The Limits to Growth"*, we have reservations about the absence of prices, which usually drive the resource allocation process.

Moreover, thirty years is a short time; this is rather more than Zhou En Lai's[38] response, "*It is too soon to say*", when asked by Henry Kissinger to comment on the French revolution. It is more closely related to the old saw that a new theory will only be widely accepted once the current adherents to the old theory have died; and is reflected in the earlier quotation of Keynes – a question of the degree of intergenerational change. The simple fact is that the evolution of the initial thirty years in projections such as the "Limits" model is very largely determined by the initial conditions, the population alive at the time and the technologies then employed.

There are also issues concerning the nature of the change undergone. Few, if any, alive in 1700 might have foreseen the industrial revolution and offered projections based upon it. President Kennedy was able to drive the NASA moon-landing programme in the 1960s as this was an application of established technology; but President Nixon's 1971 "*conquest of cancer (as) a national crusade*" proved infeasible since this required discovery and invention rather than established technological application.

The Welfare State

It has been widely argued that the welfare state is not sustainable due to pressures from the social security system on state finances[39]; and also that adverse incentives for the working population augment these pressures. This view is often compounded by the belief that pay-as-you-go social security is harmful to growth.

An early literature developed in which unfunded schemes could be either positive for growth or negative, though the marginally-held conventional view was that they would promote growth.

Under the abstract and unrealistic economic model of Ricardo, funded schemes are neutral in effect. Many economists have developed models which have used 'imperfections' to this Ricardian setting to try to explain the existence of unfunded social security systems, but these frictions are unnecessary. Marini & Scaramozzino[40] extend the 1958 model of Samuelson[41], and show that a far-sighted planner may find it optimal to introduce and maintain over time an unfunded scheme. A benevolent government then maximises social welfare by treating all generations alike – time consistency and intergenerational equity are the key to optimality and sustainability.

It is sometimes asserted that the sustainability issue is specific to the current baby-boom 'shock'. Conesa and Garriga[42] consider precisely this situation in their paper "*Optimal Response to a Transitory Demographic Shock in*

Social Security Financing". They show that sustainability can still be achieved by a policy response which consists of the "*elimination of compulsory retirement, decreasing labor* [sic] *income taxation of the young*[43] *and a temporary increase of government debt.*"

The relevant attribute of these models, from which sustainability arises, is the endogenous nature of risks and the policy responses to those risks – a characteristic of the systems rather than analytical approach, discussed later. In a later section we will discuss the idea that the 'government is different' and the fiscal theory of the price level notion that government does not suffer (inter-temporal) budget constraints.

Governance, Regulation and Sustainability

The financial crisis has been instructive in many ways. It has, for example, illustrated a failing of supervision and regulation. By considering the viability of banking institutions as independent institutions on which considerable risk analysis was conducted, this supervision implicitly assumed that sound institutions together constituted a sound collective system. This conclusion is now the example, par excellence, of the economic concept of the fallacy of composition[44] and much work is being conducted on the risk of the banking system[45], rather than banks. The differences between an analytic and a systems approach are significant; in particular, the systems approach can overcome the intrinsic time-inconsistencies evident in many analytic approaches. The old French proverb "*Penny-wise is often pound foolish*" describes well the problems that may arise from the dissonance between analytic and systems methods. In his 1979 book "*The Macroscope: A New World Scientific System*", Joel De Rosnay produced a comparative listing of the similarities and differences between these methods, which is reproduced in table 1.

The crisis has also illustrated that the unfettered pursuit of the objective of maximising shareholder returns by banks may be incompatible with the greater (public) good, financial stability. Further, it demonstrates that markets[46] may reward and encourage anti-social behaviour. This market incentive problem is related to the non-market nature and public sector supply of many public goods. It is now obvious that crisis is likely to recur as long as the incentive structure of limited liability and short-term evaluation persists. That there continue to be flaws in the current incentive structure is a problem that must be redressed through governance design. The aftermath of the crisis, of course, has seen numerous sets of regulatory proposals intended to restrict the freedom of action of the banks. Unfortunately, many policy makers and their advisors in other fields are also prone to rely on compulsions, prohibitions and punishments rather than incentives to act in the public good. This issue of incentives and rules is material in the design of pensions institutions and in their supervision; and is directly relevant to their adaptability and resilience – two key characteristics of sustainability.

It appears that the definition of objective is a source of confusion in discussion of pension policy; provision of an adequate retirement income often competes with alleviation of old age poverty as well as minimisation of cost and risk exposures to employer or state. Though the majority of this essay discusses the design and implementation of supplementary pension systems rather than their role in the reduction of poverty in old age, it should not be read as a commentary on the perceived importance of the alleviation of poverty. We are concerned that there are currently only a limited number of policy instruments available; and reminded of the Tinbergen Rule, which states that for each and every policy target, there must be at least one policy tool. If there are fewer tools than targets, then some policy goals will not be achieved.

Described almost twenty five years ago by the World Commission on Environment and Development[47], a sustainable society is one that "*meets the needs of the present without compromising the ability of future generations to meet their own needs.*" This description is concordant with John Stuart Mill's argument[48] that "*the only purpose for which power can be rightfully exercised over any member of a civilised community, against his will, is to prevent harm to others.*" Both views raise questions over issues such as compulsory savings[49] and the new UK NEST (National Employment Savings Trust) pension arrangements[50]. It is also interesting to note that there is some evidence that the introduction of compulsory pension savings schemes results in evasion or avoidance behaviour: in Australia, many individuals are borrowing – that is dissaving – to fund their pension savings contributions[51].

Table 1: A comparison of analytical and systems approaches – Source: De Rosnay

Analytical	Systems
Isolate: Concentrate on Components	Combine: Concentrate on component interactions
Consider the nature of interactions	Consider the effect of interactions
Base oneself on accuracy of detail	Base oneself on global perception
Modify one parameter at a time	Modify groups of parameters simultaneously
Independent of time: the phenomena are reversible	Integrate time and irreversibility
Validation of facts by experimental proof within the framework of a theory	Validation of facts by comparing the functioning of the model and that of reality
Models are precise and detailed but difficult to use for action	Models are not rigorous enough to serve as a basis for knowledge but valid for decision and action
Effective approach for weak linear interactions	Effective approach for strong, nonlinear interactions
Leads to a single-discipline (Juxtadisciplinary) outcome	Leads to a multidisciplinary outcome
Leads to programmed action on details	Leads to aim oriented action
Knowledge of details – poorly defined objectives	Knowledge of objectives – details unclear

There are many other illustrations of such compulsions and prohibitions – the Pension Act 2004, which created the Pension Protection Fund, is one obvious example[52] – that reduce the adaptability and, therefore, the sustainability of certain forms of pension institution; in particular, corporate defined benefit (DB) pension trusts.

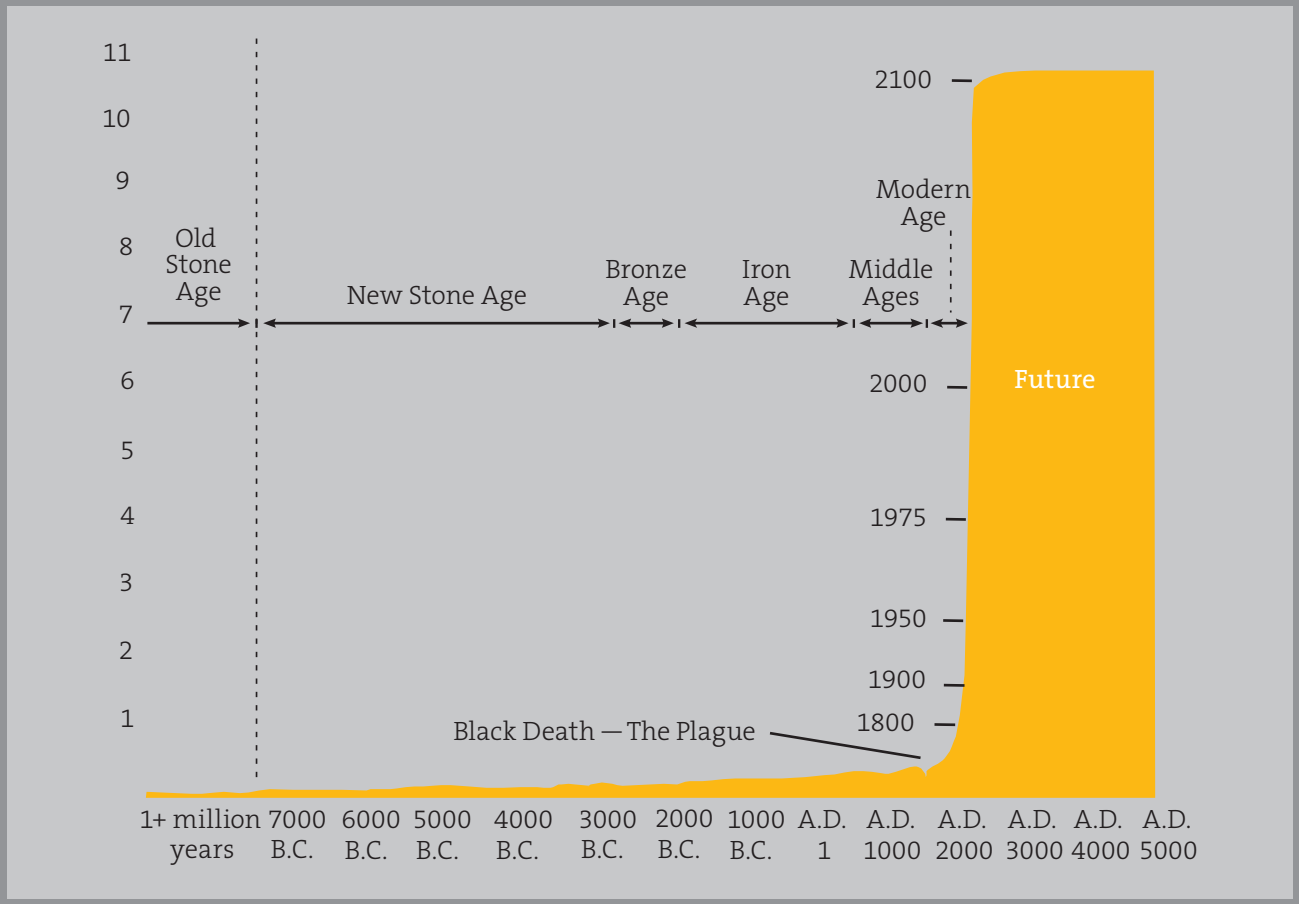
The Labour Government in the UK (1997 to 2010) was frequently accused of 'control-freakery'[53]. It was also associated with a culture of 'managerialism' in many Departments of State, and notably in the NHS. Many advisors, successful businessmen in their own right, were 'parachuted in' to bring corporate disciplines[54] to these bodies, notwithstanding the fact that many successful businessmen are highly autocratic[55]. The great problem, however, is that these Departments of State are not providing goods and services for purchase by willing customers – an absolutely fundamental difference. To quote from Dominic Hobson's "*The National Wealth*": "*It is government by technique rather than principle: the reduction of questions of politics to questions of management.*"

There are many illustrations of similar misplaced confidence. Perhaps the greatest has been a general tendency to overestimate what science and technology can deliver in the decades since the US moon landing was achieved, including the claims made for greatly extended life-spans. There in fact seems little likelihood that wars, crises, pestilence or inequity will be eliminated even in the longer term. Some newer approaches offer hope, such as the systemic approach in banking and the precautionary response evident to the projected "Swine Flu" pandemic, even if only as mitigants of severity.

Ageing

As illustrated in figure 1, the world's population is growing rapidly and projected to continue to do so into the 22nd century. The global population is projected in the central UN case[56] to rise to 9.22 billion in 2075, declining to 8.97 billion by 2300. By 2050 the UK population is forecast to have grown to 77 million from its current 68.6 million[57]. The escape from the Malthusian trap of a population limited by agricultural dependence and famine is a relatively recent affair and

Figure 1 – Source: Population Reference Bureau; and United Nations, World Population Projections to 2100



may be dated to the industrial revolution[58] following the Napoleonic wars at the beginning of the 19th century. This escape is largely due to sustained growth in productivity. However, it should be noted that the 2008 EC Demography Report projects a stable overall population in the EU to 2060 – its previous projection had been a decline. The consequence of this, under continuing productivity growth, would be greatly improved standards of living and pension affordability.

"...the 1973 Population Panel stated "Britain must face the fact that its population cannot go on increasing indefinitely."

In tandem with population growth, societies have also aged. In 2000, the median age globally was 26 years; it is projected by the UN[59] to be 44 years by 2100 and 48 years by 2300. But concerns over ageing populations are nothing new, as may be evidenced by, for example, the foundation in France in 1896 of L'Alliance Nationale contre la Depopulation[60], or the 1930s British projections of a declining but ageing population and its economic consequences[61]. In the UK, the 1949 Royal Commission on Population and the 1973 Population Panel[62] both felt that an end to population growth would reduce the problems of food imports and the recurrent balance of payments problems. In this post-war period the emigration issue known as the 'brain drain' was also much discussed. Indeed the 1973 Population Panel stated "Britain must face the fact that its population cannot go on increasing indefinitely" and called for government to "*define its attitude to questions concerning the level and rate of increase of population.*"

Life expectation at birth has risen and the UN projects[63] that it will rise further, varying across countries, from 66 to 97 years in 2100 and 87 to 106 years in 2300. It is notable that differences are not completely eliminated even over very long horizons. The population above 80 years of age in 2000 was 37 million in the developed

Figure 2: Projected age structure of the world – Source: UN "World Population to 2300"

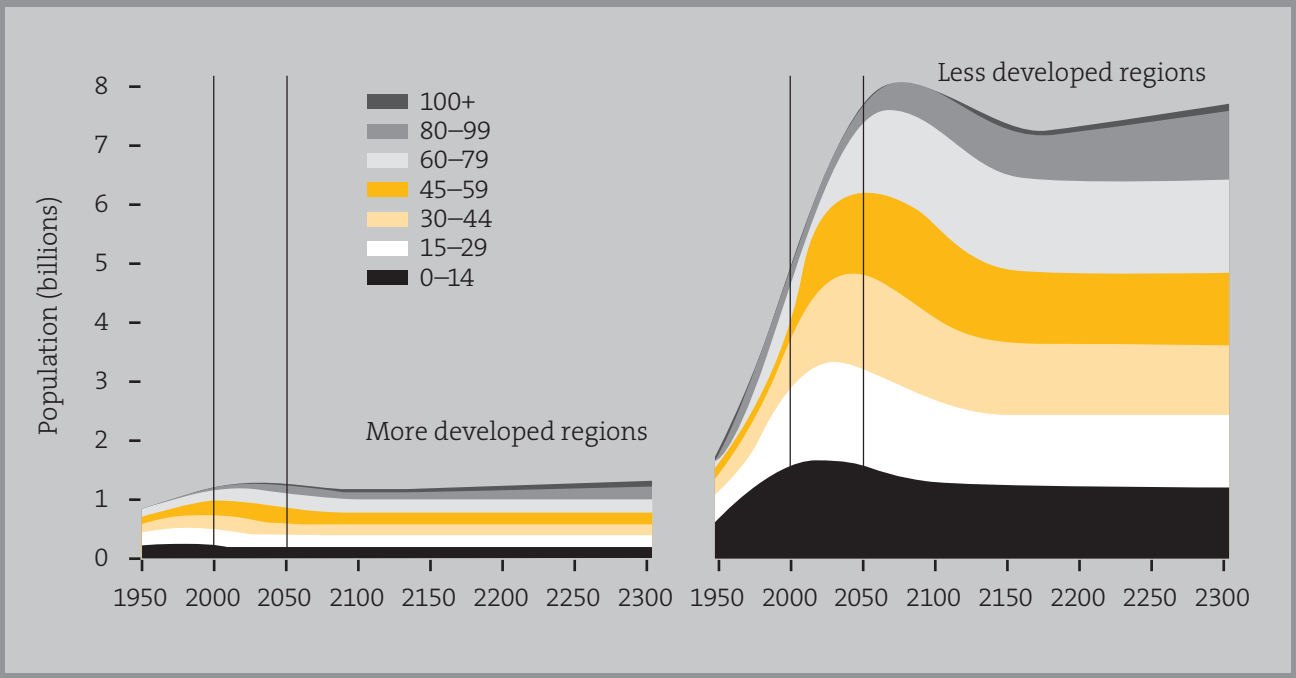
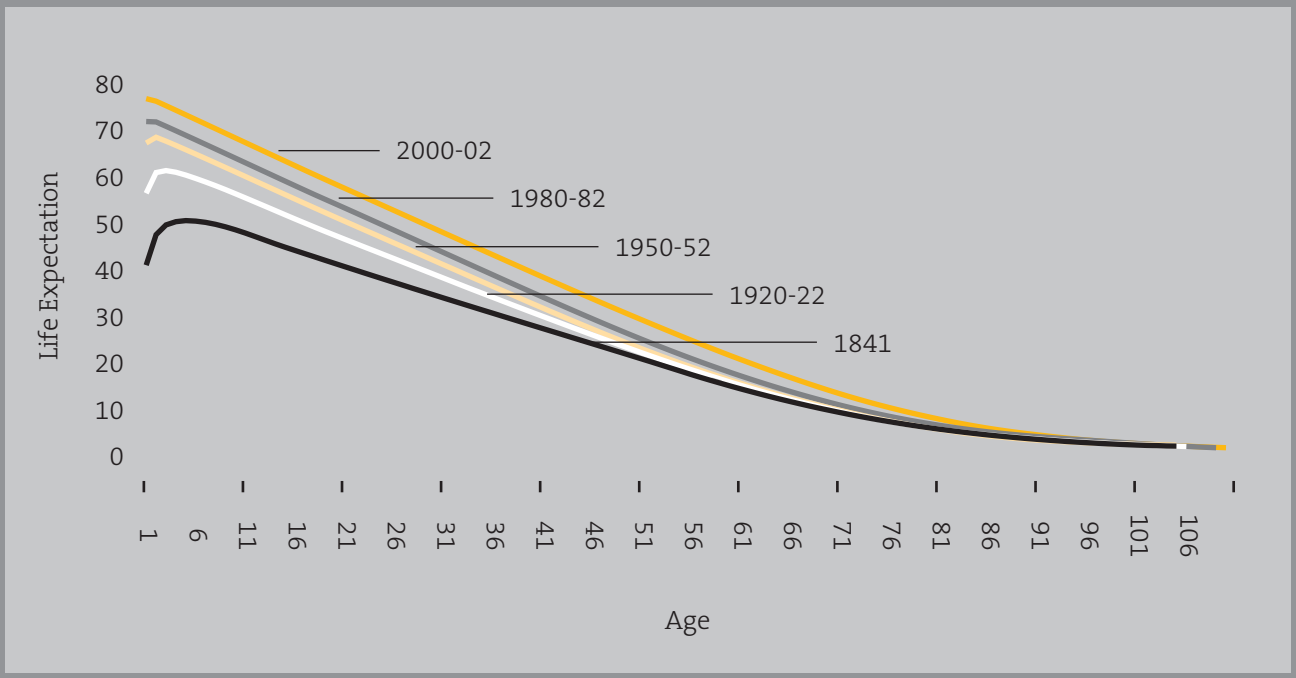


Figure 3: Life Expectation by age at different historic dates – Source: ONS



world and 32 million elsewhere, forecast to rise to 113 million and 265 million by 2050; and then to 267 million and 1.26 billion respectively by 2300. Clearly such a shift also implies a material shift in economic power, with which international political influence is usually a fellow-traveller. Figure 2, reproduced from the UN report, shows the age structure projected for developed and less developed regions. The proportion of the population aged 65 and above in Europe was 15% and is forecast to rise to 27% in 2050 and on to 35% in

2300. We will discuss the related concept of dependency ratios later. In the UK in 1901, life expectation was 58 years for women and 51 years for men but by 2010 this had risen to 81 years for women and 77 years for men. The narrowing of the gender gap is a feature of the majority of developed economies, which continues today[64].

It is important to note that the majority of this historic improvement in longevity arises from the reduction of childhood mortality due to improvements in health and hygiene. In 1900, UK infant mortality was 140 per thousand live births which, by 2009, had declined to 4.85. This is reflected in the life expectations by age, illustrated in figure 3 using the Office of National Statistics (ONS)[65] projections for males in England. The effect of infant mortality is clearly visible; only after 1980 to 1982 does life expectation decline monotonicly with age. With infant mortality at such low levels, the prime causes of perinatal death are now related to congenital defects and premature birth. It is particularly difficult to eliminate these, which suggests that little further improvement may be expected.

Old age is not a new phenomenon. In historical fact, if one survived to the age of 20, the chances of surviving to the age of 50, 60 or beyond were quite good in almost all epochs. At the time of introduction of the State Pension in 1908[66], life expectation at birth for a female in England and Wales may have been 52.4 years, but the life expectation of a female aged 70, the age at which pensions then became payable, was 9.3 years.

The discussions and debates which preceded the introduction of the State pension in 1908 are illuminating and presage much that is current in pension debates. Committees abounded – Rothschild, Chaplin and Hamilton to name just a few. Many of their reservations are still evident today: 'free-rider' problems expressed as concern with idleness and intemperance; recognition that the proportion of elderly in the population was increasing; and even a lack of confidence in the State's role in the field, expressed, for example, by members of the investigating committees[67]. The proportion of elderly was at a minimum of around 7% in 1810 (due mainly to the high rate of childbirth – fertility) and had risen to exceed 10% by 1900. Today it is around 20% and is forecast to rise to some 25% and above. In light of these increases, the Chief Charity Commissioner, Sir Henry Longley's observation[68] is timeless: "*The experience of the commissioners has led them to think it advisable not to fix the pension age and in making schemes they have usually abolished the precise age limits often fixed by the original trusts.*"

The mid to late 19th century was the age of the great social reformers: Mayhew, Toynbee, Booth and Rowntree. However, they were concerned with poverty more generally than just poverty in old age. In fact, Rowntree demonstrated in studies of York that poverty in old age was less prevalent than poverty in childhood[69]. The poverty problem was principally one of inadequate wages and, of course, the resultant inability to save for retirement provision. It should be noted that the trades unions[70] and Friendly Societies[71] were very active in the provision of (private sector) pensions for their members. Charitable provision of pensions and alms-house accommodation were the other major private source of old-age poverty relief[72]. State involvement was limited to supervision of the requirements of the Poor-Laws on municipal bodies, which were funded by rates levies. There were great disparities in practice from one body to another.

The trends observed in mortality differ from trends in life expectations; mortality is observable but life expectations are only estimated. However, prudence[73] demands that the projection is used for the estimation of liabilities under pension contracts. There are also some statistical issues such as 'tempo effects'[74] which can lead to distortions of estimates of period life expectation even though mortality rates are known. Figure 4 illustrates UK survivorship expectations at a selection of dates.

In figure 4, the areas under the curves to the left of the dashed, vertical line at age 65 may be considered as a measure of contributions received; and those to the right are of pensions payable. Ceteris paribus, increased longevity inevitably means both increased pension payments and increased contributions received. The effect of increasing longevity in the period 1931 to 1951 raised the (relative) affordability of pensions while in the period from 1971 to 1991 the effect was to decrease affordability. Raising the retirement age can be viewed as rebalancing the relative effects of contributions and pensions payable. This view, however, is confounded by the investment performance when the scheme is funded or when contribution rates are varied.

Figure 4: Proportion of persons surviving to successive ages, according to death rates experienced or projected, 1851-2031 – Source: Adrian Gallop – ONS/GAD

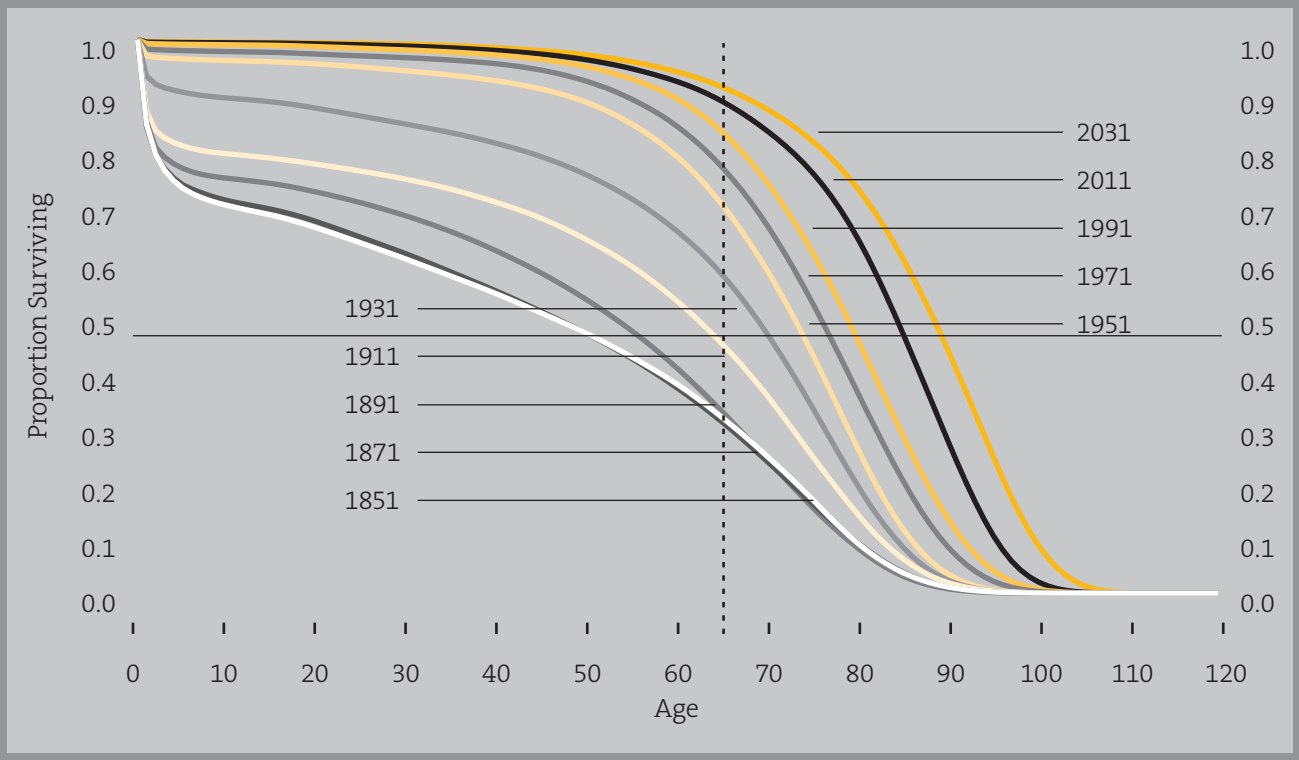
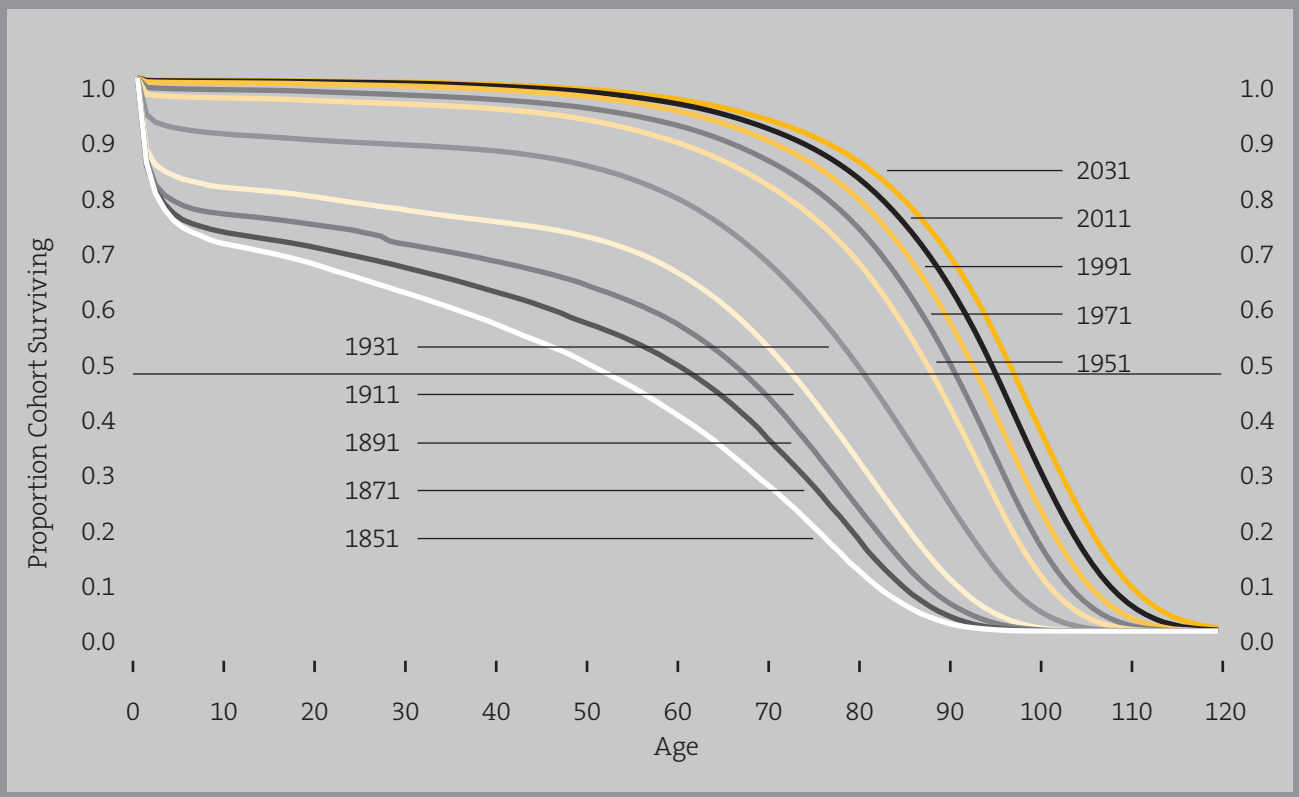


Figure 5: Cohort based survival probabilities – England and Wales – Source: Adrian Gallop ONS/GAD



The improvement in life expectation at birth is demonstrated by the intercept of the horizontal line at 50% survival[75]. This improvement is monotonic but not uniformly increasing. It is tempting to attribute this variation from projected trend as risk; but that is incorrect. Variation of the outcome – the subsequent mortality experience – is the correct measure. The 'rectangularisation'[76] of the survival curve reflects another facet of mortality experience: though the average, expected lifespan has been increasing, the extremity of old age has not improved as much. This pattern has been observed sufficiently widely that it has acquired a name: 'compression'. One measure of this is the increasing steepness of the survival curve at the median.

This compression is most evident in a cohort[77] presentation of life expectations (figure 5). It has a significant consequence – that risk measured as variation from the expectation[78] or trend value has been declining. However, we shall see later that variation from the trend expectation is not the principal source of mortality or survival risk in a private pension scheme. From these two sets of survival curves (figures 4 and 5), the relative importance of improvements to mortality at different stages of life may be gauged.

The UN projections also include high and low scenarios. In the UN's high scenario, the global population increases to 10.6 billion by 2050 and 36.4 billion by 2300; and in the low scenario, the population increases to 7.4 billion by 2050 before declining to 2.3 billion by 2300. In terms of the introductory remarks on risk, this UN analysis can be seen as a consequence analysis, rather than the more complete risk, which requires both likelihood and consequence. There are other analyses which consider probability or likelihood based projections[79], though to shorter horizons. The degrees of uncertainty are similar in magnitude. These extreme, very long-term projections are most unlikely to be realised, since we should expect interventions long before these events come to be. In the case of the UN's high projections, the concerns of sustainable environments, including food production, would come to the fore long before these population figures were realised. The UK Government Actuary's Department produces forecasts to 2033 showing the effects of varying assumptions concerning fertility, migration and mortality, reproduced in figure 6. Of particular note is the relatively small impact of increasing longevity.

A related issue for pension schemes is the choice of mortality table for scheme liability evaluation. In the UK this amounts to a choice among the Continuous Mortality Investigation's short, medium and long cohort projection tables. These are irregularly updated. The Pensions Regulator reports a marked increase in the use of the most recent tables and also increasing use of the medium and long cohort variants by schemes. It appears that in the UK in recent times, defined benefit pension schemes have been increasing their longevity assumptions by approximately one year each year. Almost inevitably these increases have been challenged as excessive by some observers, notably representatives of Club Vita[80].

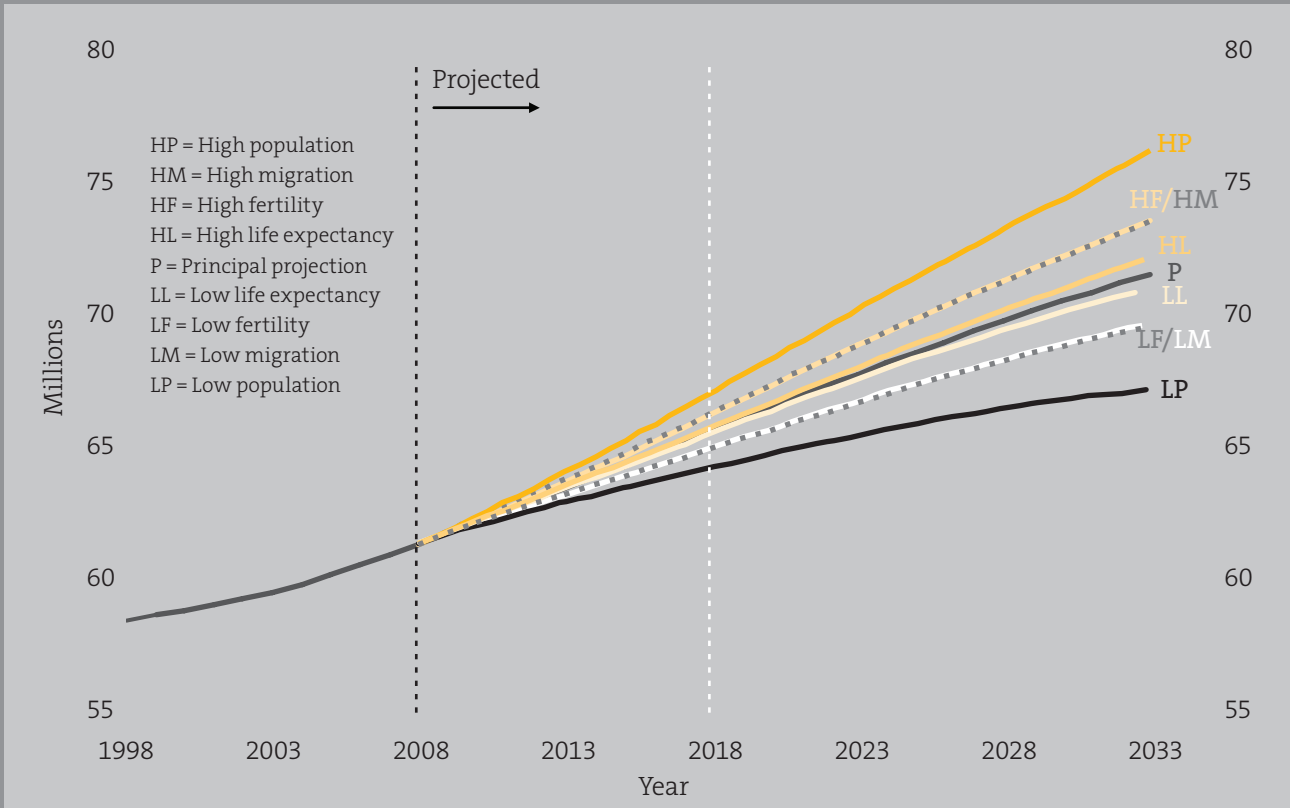
Of course, there are further complexities to consider for a scheme, such as the distribution of member service entitlements, the lump sums payable at retirement and the status of the scheme with respect to new members. However, the predominant risk associated with longevity is the heterogeneity of the scheme's membership – this may be far from that of the overall national population. This is illustrated in table 2 by the disparities between life expectancies in differing local authorities or even between wards within an authority.

Much of this disparity can be explained by differences in the socio-economic class of the residents in these areas. The trend over the past forty years or so has been for disparities in life expectation by social class to widen – in 1970 the difference between social class I and V was about 2.5 years, and by 2005 this had widened to exceed 4 years. Some insurance company annuity providers now distinguish among policy holders by postcode at retirement[81] in the attempt to

Table 2: High and Low Expected Longevity in Selected Local Authorities and Wards.

UK		Camden	
Kensington & Chelsea	83.7	Belsize	80.4
Westminster	81.5	Swiss Cottage	79.3
West Dunbartonshire	71.9	St Pancras & Somers Town	70.2
Glasgow	70.8	Kilburn	69.8

Figure 6: Population of the United Kingdom according to 2008-based principal and variant projections, 1998 to 2033 – Source: ONS



quantify their risk exposure precisely. The membership of pension schemes is affected by such variations; the specific risk of its own population of members usually dominates the variation in national population trends.

The Longevity Debate

For the past thirty or forty years the Government Actuary's forecasts of longevity have proven to be pessimistic – a characteristic shared with many demographers and private sector life actuaries. This has led to substantial subsequent upward revisions and costs to pension schemes. The debate is far broader than this though[82]. Childhood mortality has been radically lowered and some cohorts of the population have lived surprisingly long lives. The improvements in longevity of the past few decades have arisen principally from deferment of death, as evidenced in figure 4 earlier. This picture is representative of a large part of the developed world where improvement is principally due to bio-medical advances, rather than the public hygiene and sanitation improvements of earlier times. Infectious diseases now account annually in the UK for almost no deaths measured in age standardised terms; respiratory disease is now below 100/100,000 deaths having exceeded 400/100,000 in the 1920s; circulatory problems which, in the 1940s and 1950s, were responsible for over 700/100,000 deaths are now below 250/100,000. Only cancers have shown resistance to decline – they accounted for some 200/100,000 deaths in 1920 and are now around 250/100,000. Perhaps this latter statistic is an illustration of the substitution of one cause of death for another.

The prospect for further large declines in mortality from these sources is clearly limited. Internationally there is some emerging evidence, from, for example, females in the Netherlands and Denmark, that further expected improvements to longevity have recently failed to occur. In the US, the lack of improvement of life expectation for women aged 65 between 1990 and 2005 is notable. There is also a school of thought which points to the dramatic increase in obesity in the developed world, and notes that this could decrease

longevity markedly. In addition, there are also lifestyle choices, such as marriage, which can greatly affect longevity. Smoking is perhaps the classic illustration of such a choice. When these choices reach the level of generational emotions, they may become significant in terms of not just longevity but also migration and fertility. The UK's Foresight Programme produced a study "*Tackling Obesities – Future Choices*" in 2007, which projected the development of obesity in the population; by 2050 it estimated that 60% of men, 50% of women and 25% of children would be obese. Among its conclusions were that humans are predisposed by their biology to become obese and that it was a trend that would take several decades to remedy.

The debate, in effect, separates those who believe that there really are no effective limits to lifespan from those who believe that there are. The bio-medical advances of the past 100 years have solved many of the causes of premature death such as infectious disease; but this is simply a question of removing impediments to the putative biologically natural lifespan. Of particular concern is the claim that genetic engineering offers the prospect of far longer life. No such breakthrough in medical science as yet exists; we are being asked to accept that it will occur. This is tantamount to the prediction in 1700 of the industrial revolution or President Richard Nixon's failing crusade against cancer in the 1970s. Moreover, it is perfectly possible that genetic alterations that improve the experience later in life could harm earlier experience – it is well known that genetic modification in other systems may improve their performance in one regard but usually at the cost of performance in another. If genetic or other developments do occur which may afford us negligible rates of senescence, it will still be a long time before these become broadly available since the clinical trials, of necessity, will be long affairs.

The reality is that we know rather little about how much is determined by our genes; studies that compare identical and fraternal twins suggest that this genetic predetermination may be far less than commonly believed. This seems to be the old nature versus nurture debate in new clothes.

"The debate, in effect, separates those who believe that there really are no effective limits to lifespan from those who believe that there are."

There is also rather a profound concern here: does a genetically-modified person remain the same individual after that modification? That is a question that doubtless will trouble many an insurance company's lawyers at some future date.

Financial Markets in Longevity

The Longevity and Life Markets Association (LLMA), a group of investment banks and insurance companies, has been established as a not-for-profit venture in order to promote a liquid traded market in longevity and mortality-related risk. This group has been lobbying governments, notably the UK, to begin issuing government securities with pay-offs linked to longevity – their argument is that this will 'kick-start' these markets.

"The short history of longevity markets is one of remarkable failure."

There are many risks for which we might create liquid markets[83], but in doing so high demand is inevitably placed on a scarce resource – the liquidity stock. So the first question must be: why are such demands justified in relation to mortality-risk and not some other untraded risk? What social benefit is there to be gained from bringing a risk which eventuates only slowly in the distant future to the here and now of active markets?

The short history of longevity markets is one of remarkable failure. Attempts at creating and selling securities linked to population indices have failed, usually because the basis risk they contain relative to any pension scheme's particular population and benefit entitlements distribution – the specific risk of the scheme – has been unacceptably large. Longevity swaps where the counterparties exchange the specific cash-flows of pensions payable for fixed payments have gained some traction. However, as with all derivatives, there are concerns. These contracts contain credit support agreements which require the posting of cash or securities as collateral when prices move. This means that neither counterpart really knows, ex-ante, the true cost of the contract. Moreover, for a pension scheme it can mean a pronounced shortening of the horizon of

the scheme and the resultant loss of availability of the liquidity premium that it may obtain on its investments. This shortening may profoundly change the nature of pension scheme funding – instead of being for the long-term it is directly exposed to the vagaries of a market and unpredictable short-term demands for liquidity. The risk being traded is an estimated risk, a number calculated by an actuary. There is no arbitrage mechanism by which the prices of this traded risk may be made to converge with the reality of the subsequent mortality experience – this arbitrage process is simply the mirror image of the exposure of the process we are asked to believe is too great for the specialist life and pensions institutions. The market price may be arbitrarily far from fundamentals – a property which is advantageous for speculation but not for productive investment.

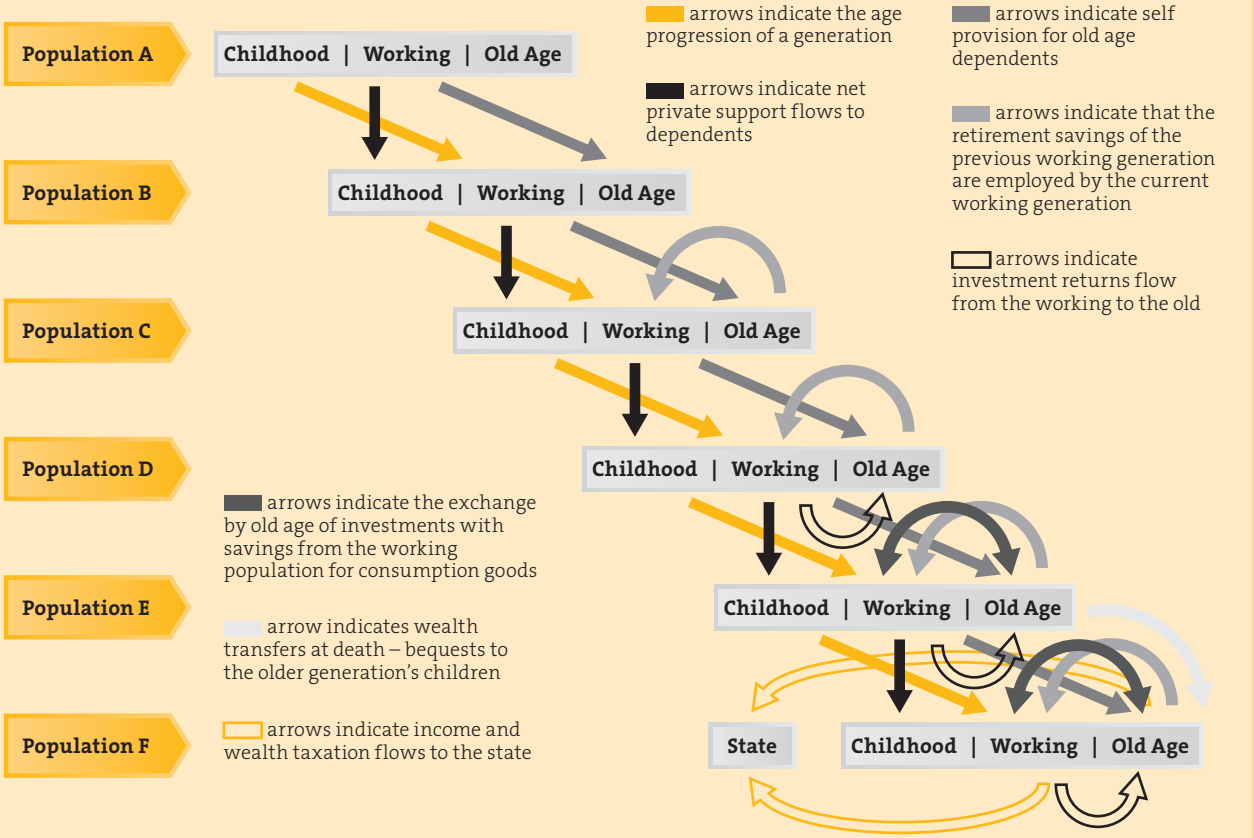
Higher pensions payments imply a higher level of consumption and demand in the economy than might otherwise be the case, which in turn means that the corporate sector stands to increase sales and profits by meeting this demand. In fact, the increased demand from longer-lived pensioners is considerably greater than the increased pension costs borne by corporations since it includes also that arising from state and public pensions. Crudely and extremely put, the company now producing nappies can easily adopt this technology to the production of incontinence pads to meet the shifting demand. The European Commission[84] recognises this point: *"..., ageing societies bring new opportunities to innovative firms through the demand for new or innovative goods and services."* This observation implies that the risk is in fact already internalised and hedged within corporate groups – which completely undermines the risk transfer arguments. The government faces this risk to a large extent already, through its public sector employees' schemes and through the general provision of pensions to the population. To propose the issuance of securities which increase this exposure to arbitrary levels, which could even exceed the actual level of costs experienced within the economy, seems unjustified. There is also a meta-argument. Government has decided to redistribute longevity risk in this manner; some of this risk now rests in private sector pension institutions, internalised within corporations rather than with the individual. If the government now offers to issue longevity-linked securities it is again redistributing this risk – to society more broadly rather than solely among the owners of the corporate sponsors of a scheme. This is strange behaviour in a welfare democracy, particularly when one alternative solution requires no more than raising the age of retirement.

We can only conclude that this desire to create markets involving government is driven by the self-interest of the promoters, rather than any public interest, since it is evident that there are few obvious counterparts for the derivatives contracts for which they have identified demand. The UK Debt Management Office has declined to issue longevity-linked securities.

"The market price may be arbitrarily far from fundamentals – a property which is advantageous for speculation but not for productive investment."

Box 1 – A Model of Private Flows of Wealth

The inter-generational model illustrated in the diagram below details the flows of wealth between generations. As these flows intertwine, the diagram introduces them progressively.



A The current working generation supports the generation currently in childhood. This is partially investment in their human capital – to be utilised during their subsequent working lifetime.

B The working population saves as provision for its own retirement. This may in reality take the form of marketable investments or bank deposits which may ultimately be sold or drawn down for consumption requirements in retirement.

C These pension provisions form the investment capital required by the working generation.

D Investment income flows from the current working generation's output to the elderly. In a full mathematical model, this investment income would be the result of a production function and would include tax flows to the state.

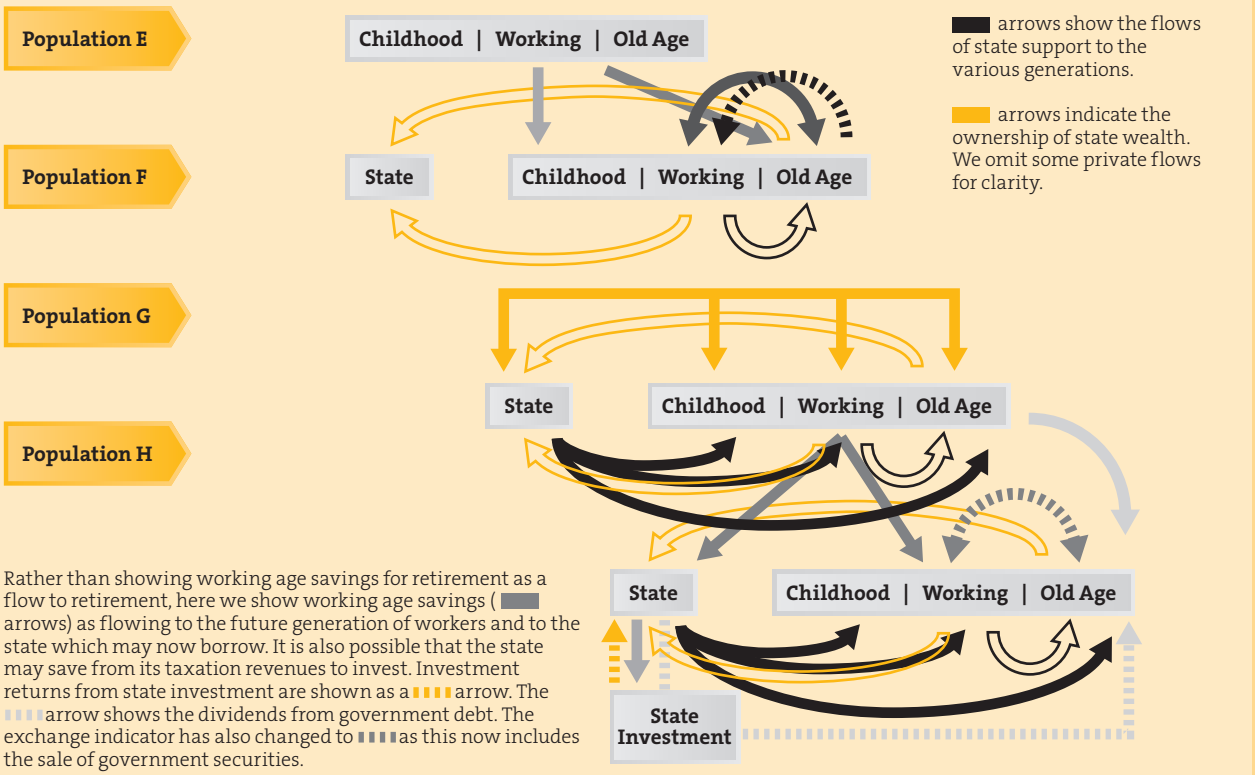
E The elderly exchange some of their savings investments with the working generation to meet required consumption needs. Note that this exchange makes the elderly dependent on the working population. Any wealth not consumed in retirement is bequeathed by the elderly to their children – the current working population – towards, or at the end of, their working careers.

F The working age population and the elderly pay taxes to the state.

This model is extended in box 2 to show the flows from the state to the various generations.

Box 2: An Inter-Generational Model with State Flows Included

The model illustrated below extends the earlier model of private wealth flows (omitting some elements for clarity) to include a welfare state with the ability to borrow and provide public goods.



G At this stage the state provides benefits (black arrows) to all three generations. For example, education to the children, unemployment benefits to the (non-)working and pensions to the elderly. This is a pay-as-you go arrangement. This may be considered as funded by the income and wealth taxes shown earlier. For simplicity we omit consumption taxes. State wealth (solid gold arrows) is shown as being the property of all sub-populations, including children. This may arise if the working and the elderly pay more in taxes than are disbursed in benefits.

H We next allow the state to invest, that is to say defer, the consumption of current tax receipts productively. These investments form part of the state wealth. They may be funded either by under-consumption of taxes received or by borrowing from the working population's retirement savings. We omit the possibility of borrowing from the wealth of the elderly, for simplicity. This borrowing pays dividends or coupons to the working population in advance of their becoming members of the old age population in the next period.

Note that income in old age may be derived from savings investments in either private or public sector securities, together with bequests. It would be trivial to introduce a pension institution to manage these flows. Further investments of either type may be realised by sale to the working generation. In addition, there are state pension benefits received. Pensioners also pay taxes.

Box 3 – A Discussion of an Inter-Generational Model

The model developed in boxes 1 and 2 illustrates simple inter-generational wealth flows. It is based on a closed economy in which only the working age cohort have any productive activity.

The model allows the payment of state pensions in retirement to be made either from state savings or from state borrowing. If the state decides to fund its future pension payments from taxation of the working generation and current pensioners, i.e. running a surplus of receipts over expenditures, it faces a problem. If it holds these tax receipts as cash, it is unproductive and inefficient. Episodes of state saving have historically been associated with periods of low growth or recession. If the state decides to invest it may do so directly or through private sector investments. In the second instance it will be competing with workers' investment savings. Public goods are the obvious investment choice for it, since these will normally be under-supplied by the private sector. It also faces problems when it chooses to borrow to fund pensions in retirement – the investment of these borrowed funds until they are disbursed as pensions.

In the model, the working age population may save some of its income as government debt and some as private sector investment, with the aim of living in retirement on the income and sales proceeds from these investments. When this working cohort has become the old age population it may realise investments of either or both types from sale to the then current working generation to fund consumption. In doing so it is displacing new investment by that working age population in either public or private sectors. Bequests from previous generations typically arrive late in the working life or early old age. Their productive income may be consumed, but sale to the working generation is necessary if the investments are to be realised for consumption. An implicit assumption here is that the state does not borrow at short term but only to maturities beyond the working life of that cohort.

This long-term borrowing means that the children will repay the debt at maturity during their working lives. If, instead of investment, the state borrows to finance the current pension bill, and this debt has a tenor beyond the working lifetime, then some of its costs will fall on the cohort currently in childhood. The working age and old age cohorts will have benefited from lower taxes. But until these cohorts expire, they will also experience higher taxes needed to service the government debt extant. The net balance of these two tax effects is usually lower current taxation.

The introduction of financial intermediaries is an unnecessary complication. We observe that the working age cohort must save enough to purchase from its post-tax income those financial assets that both government and the retired generation wish to sell. The working capital needed by the childhood cohort as it transitions to working age can be realised by the reallocation of financial assets purchased from the previous elderly cohort.

Though this model is not designed to reflect the differences between individual defined contribution and collective defined benefit, there are important differences between them which relate to the sale by an older generation to the succeeding generation. With defined contribution, in practice this requires sale in a market. With defined benefit, this sale is partly internalised as new contributions may be used to pay current pensions (fully or in part), with investment assets left undisturbed. There is also a concern that working age savers will prefer new investments, which might typically offer higher potential returns, to the purchase of those investment assets that the (newly) retired wish to sell.

Later sections will cover the system of accounting for inter-generational flows and transfers.

The Economic Analysis of Pensions

The most elementary analysis of pensions focuses upon simple measures such as the dependency ratio – the proportion of the post-retirement population to that in employment. The ONS publishes projections known as old age support ratios, which take account of the projected changes to normal retirement ages; these decline from 3.23 currently to 2.78 in 2033. The UN projections ultimately suggest a ratio of 2. A ratio of 2 is associated with a population which is equally distributed among childhood, old age and working cohorts[85], with the working accounting for 50% of the total population. There are a number of difficulties with such an elementary measure. The primary concern is that these projections are based on relations between individuals, where the household is the fundamental institution for mutual familial support. This narrow focus reduces the significance of international comparisons since societies vary greatly; furthermore, time serial comparisons will also be complicated by changes in household structure, such as the increasing prominence of single parent families.

> ***"Demographic dependency does not map to identical economic dependency."***

There are a number of technical issues related to these figures and the mapping of demographic age-structure to economic age-structure. First, the working age population is not necessarily in employment – many women do no remunerated work at all and unemployment seems always to be both present and variable. Second, much of the population does not retire at the normal retirement age and many continue well beyond. There are material concerns with labour participation rates. Perhaps the greatest difficulty lies in the fact that the working age is typically defined from the age of 15 although most youths in the UK are now engaged in tertiary education well beyond that age. It is generally assumed that dependent pensioners are associated with higher cost expenditures than those below 16, but this is a suspect assumption when applied to dependents in tertiary education, particularly as half the lifetime consumption of educational expense occurs for full-time students between the ages of 20 and 22. This expenditure will only increase as more students continue into post-graduate education. A better measure would be the total dependency ratio[86] where the numerator captures both dependent children (including those in higher education) and persons in retirement and the denominator of the working population.

But even this measure would be flawed. The costs of education, though a current expense, are an investment in a nation's human capital resources – an investment – while pensions are principally consumption expenditures. This question of national wealth is surprisingly badly captured by the current system of National Accounts[87]; the treatment tends to be limited to the stock of financial claims – for example, the net debt and net worth figures reported by the UK. In 1998 the World Bank produced in its environmental economics series a paper entitled "*Estimating National Wealth: Methodology and Results*" which reports human resources as more than 50% of per capita wealth in all regions and close to 75% for the developed world. By contrast, other than for the obvious oil and natural resource endowed regions, natural resource capital accounts for amounts in low single digits. Produced goods, the mainstay of current national accounts, lie in the range of 15% to 30% of wealth. The World Bank paper illustrates the strong positive relation between years of educational attainment and wealth – in that study, twelve years of educational attainment equates to about $250,000 of wealth. The methodology of the World Bank approach may, of course, be criticised. Of more interest are the findings of Crespo, Cuaresma and Lutz[88] which show a strong relation between educational attainment of the younger age group and economic growth – the mechanism for which appears to be technology adoption which harks back to the introductory quotation of Keynes on the adoption of theories.

These studies uncover the most serious criticism of these simple approaches. Demographic dependency does not map to identical economic dependency. Applying a lifetime consumption or income pattern to these demographics should not be done in a naive way which assumes that these are independent of one another. The low fertility exhibited by large generations, such as the 'baby boomers', is also associated with increased educational investment in that generation's children[89]. All else equal, increased human capital generates higher per capita

productivity[90], though this is subject to diminishing returns in developed economies. Education and higher human capital add a quality[91] dimension to the ratio which otherwise is simply a crude quantitative approximation. Moreover, it would be necessary to consider both the labour income age profiles and the consumption age profiles. Labour earnings profiles differ from country to country and by level of educational attainment; consumption profiles vary remarkably much more from country to country. There are many substitution complexities to be considered; the differences in national medical systems and the effects that this may have on other consumption in retirement is one of the more obvious examples.

> ***"...dependency rates may become so extreme that they harm growth and the social welfare. It is the contention of this paper that what we face is not that extreme."***

It is now orthodoxy for practitioners that higher dependency ratios imply unsustainable costs. However, the standard economic growth model (Solow-Swan) actually suggests the contrary: higher per capita consumption results from the 'capital deepening' of the economy[92] as succeeding generations become smaller in number. The standard practitioner belief has its roots in a conjecture, due to Paul Samuelson[93], that dependency rates may become so extreme that they harm growth and the social welfare. It is the contention of this paper that what we face is not that extreme.

Labour mobility is a further issue in questions of human capital and economic productivity. The propensity of pension scheme membership to limit labour mobility, particularly among older workers, is well-documented. Portability, or at the least, preservation[94], is clearly desirable. Public sector occupational pensions[95] have been transferable since 1948. At this time, post nationalisation, when the public sector employed 25% of the labour force, the trade union ambition was parity with local government employees. The concern here goes beyond direct productivity impacts; labour mobility facilitates greater adaptability and, through that, sustainability.

Pensioners in retirement are principally consumers. They add to demand for produced goods and services, which sustains employment. We know very little about the needs of pensioners and the minimum level of pension for comfortable retirement. The studies of actual expenditures are informative to a degree, but these studies, of course, are constrained by the income and wealth of that old age population. The historic ambition of a two thirds final-salary retirement income is no more than a back-of-the-envelope calculation; much more research is necessary. Pensioners, of course, are not entirely unproductive. Many do engage in paid and unpaid activity into very advanced ages but most of this is not captured in the National Accounts, in common with the black economy[96]. There are also significant questions surrounding the economically inactive at other ages. In 2009 27% of women aged 50 to 59 and 24% of men aged 50 to 64 were classified by the Labour Force Survey as inactive. In the immediate post-retirement age groups, these figures rise to 87% and 90%. It seems that there is considerable room within the existing labour force to increase participation rates[97], lowering apparent dependency forecasts. This increases the total productive output. Age is the second most highly experienced form of discrimination and most common perception of disadvantage when seeking a job[98]. Increased participation would lower the costs of other social benefits.

The question of extended multi-generational households is often discussed in pensions literature – much of this looks back to halcyon prior ages when children accommodated and cared for their ageing parents. Unfortunately, this image has little empirical support[99]. In "*The Long History of Old Age*", the eminent historian Pat Thane describes this view of the elderly: "*Because they were few, and not very costly, they were valued, respected, cherished and supported by their families as, it is said, they are not today. ... Past societies, often much poorer than those of today, supported large numbers of old people.*" The reality, however, could be very different: "*Separation of families because of movement around the country or the world is not, as often thought, a fact only of modern life"* and *"In the 18th century just one third of Europeans had a surviving child when they reached their 60th birthday*[100]." Of course, if the changes envisaged by the UN come to pass, a number of consequences may ensue. Far more elderly people will be able to know their grandchildren. With pressure from increased population densities, more cohabitation among generations could reasonably result. When combined with improved

fitness in retirement, the elderly could be expected to increase their contribution to household services and childcare, enabling their own children to pursue their careers more fully.

One of the prime determinants of old age productive activity is the quality of life enjoyed. A 1993 study for the Joseph Rowntree Trust found that "*between 68 and 73 per cent of the samples were happy with their overall quality of life. There was little change over time in these proportions. In the sample of people aged 85 and over, half of the men and 40 per cent of the women had at least five 'good' quality of life scores (out of 8 or 9 indicators) at first interview. The higher the number of the 'good' score, the more likely interviewees were to survive until the follow-up interviews. In the sample of people aged 85 and over, after allowing for differences in health, men with few social contacts had a higher risk of death than others, while women who belonged to social clubs had a better chance of living longer.*" Healthy life expectation has improved but not as rapidly as the overall life expectation. The most recent UK data show a widening of the gap between healthy and overall life expectation – for males aged 65 from 4.0 years to 4.3 years; and for women aged 65 from 5.0 years to 5.4 years. This differential is rather more important in the context of health care provision than in the context of total productive output and pensions sustainability. There is surprisingly little research on the determinants of late-life employment; the English Longitudinal Study of Ageing only began collecting life-history data in 2007. One of the few really robust results is that later-life employment in women increases with their level of educational attainment. It is also possible that having children tends to result in later-age withdrawal from labour markets – perhaps more so as the costs of educating a child have risen.

Many of the proponents of the unsustainable pensions school look to the rising burden that pensions may become, where the burden is usually expressed as a proportion of GDP. They are usually also strident critics of intergenerational transfers arising from increasing public debt. However, these analyses are often far from complete. (See boxes 1, 2 and 3 for an illustration of an inter-generational model which considers the transfers in such an economy.) One of the important lacuna in these studies is the acknowledgement that newly born generations inherit a share of the stock of national wealth, at least that which is publicly owned. This economic infrastructure owned in common – such as the transport infrastructure – is substantial. The younger generation also benefits from such public services as the armed forces and legal system. The capital which this represents is very substantial; in rather dated parlance, it is the child's birthright. It is true that a generation wishing to stand alone must save as provision for its own retirement; but this saving also includes the investment undertaken by the state during their working and tax-paying lifetime. The implicit assumption in this argument is that this wealth is the natural property of future generations. The resultant focus is on private financial wealth and the ability of the state to increase taxes to pay for pension expenditures.

Pension costs as capitalised values are often compared to the national debt. For example, one recent report[101] discounted plausible future pension payments for unfunded public sector employees' schemes using a real rate of return of 0.8%, on the basis that this was the prevailing real rate of return on index linked gilts. It arrived at very high figures for the capital values of these pension promises – £1 trillion plus. By comparison with the stock of gilts outstanding – £0.8 trillion which was forecast to rise to just £1.4 trillion – this is very large. However, if we value or capitalise the productive output of the economy (GDP) using this discount rate we arrive at a UK national wealth figure of £158 trillion, a completely implausible value. UK household wealth is currently estimated at £9 trillion. The discount rate applied is also far lower than the rates of productivity increase and economic growth we have observed over the last century. The Treasury reports that these pensions currently cost 1.7% of GDP, a figure which rises to a maximum of 1.9% before falling away. By comparison, the costs of the basic state pension and related benefits are currently around 5.5% of GDP; and the UK Department of Work and Pensions forecasts that these costs will rise to just 6.1% by 2050. This figure is among the lowest in the developed world. In the UK, total transfer payments have ranged from around 12.5% to 13.0% of GDP at the turn of the millennium to some 15.5% in the recent recession. They are forecast to decline to between 13.5% and 14.0% in the coming decades. To offer a popular numeraire for these figures, two pence in the pound on income tax yields approximately 1% of GDP.

Of course, the new generation also benefits from investment by the state and their parents in their health and education. This investment is the dominant source of their human capital; but, expressed in accounting terms, it is treated as current expense by both state and parents. An inter-generationally 'fair' evaluation would not assume that pensioners should write this expenditure off completely, or that future generations would always do so.

The largest flaw in these simple dependency ratio comparisons lies in their lack of consideration of the effects of productivity growth. For example, for two workers to produce in 2050 the same as three workers today, a rate of productivity increase of just over 1% per annum is needed. In the period 1991 to 2008, UK productivity growth averaged 1.93% per annum by the GDP output per worker measure; and 2.33% per annum by the hours worked per worker measure. In their Bank of England working paper 259 "*Productivity Growth in UK Industries, 1970 – 2000: Structural Change and the Role of ICT*" Oulton and Srinivasan report output productivity rising by 2.24% per annum by using the ONS calculation method; and 2.64% for the whole economy using the BEID[102] dataset. They also report whole economy labour productivity using this dataset at 2.78% and 3.20% for the market sector. Taking productivity growth into consideration, the statistical evidence supports the assertion that pension dependency, even at the lower coverage rates that are forecast, is perfectly sustainable. The question is overwhelmingly political[103]: how much improved productivity should accrue to workers and how much should be diverted to the benefit of pensioners?

In the scenarios envisaged, with labour in short supply, the tendency must be expected for workers to demand a greater share of productive output, most likely at the cost of capital investment returns. In the absence of labour inputs, there can be no productive returns to capital. In such situations, even perceived inequalities may be material issues in wage negotiations and have direct effects on labour productivity in the absence of satisfactory agreement. We should not forget the old Soviet aphorism: "*They pretend to pay us and we pretend to work.*"

Oulton and Srinivasan note: "*Labour productivity has grown more rapidly in the market sector. Over the whole 30-year span, the difference was 0.42 percentage points per year.*" They also observe, correctly, that: "*There are well known difficulties in measuring the volume of government output, so lower productivity growth in the government sector should not necessarily be taken at face value.*" However, for the past thirty years it has been political orthodoxy that the public sector is less productive than the private sector; this was the rationale that supported the privatisation of so many state sponsored enterprises, such as the public utilities. Unfortunately, we really know very little about the determinants of productivity, even in the private sector; the empirical and theoretical analyses are largely absent. There are numerous issues in the measurement of production; many are well-covered by the Report of the Commission on the Measurement of Economic Performance and Social Progress[104]. Among the open questions of direct relevance to this paper are: what is the nature of intangible capital[105]? And: to what extent is innovation predictable? When thinking about the long-term, it should be realised that the returns to savings investment will be contained by the relative efficiencies and growth rates of the public and private sectors.

Productivity is particularly relevant when it comes to choosing the location of pension provision institutions in both the state and private sectors. Pensions do share some characteristics with public goods[106]; but that alone is not sufficient to warrant public provision. Many public goods are supplied by the private sector and, historically, many which are now publicly provided were privately delivered. However, it is clear that there is a state role in a welfare democracy – protection of the unfortunate. This implies that at least some minimal state pension provision is necessary as a safety net.

With state involvement in pensions motivated by the public good supply role in many areas of pensions, it is worth noting the boundaries of the state as they are described by public accountants[107]: "*The general government sector usefully separates the non-market activities of government from those of the rest of the economy because the powers, motivation, and functions of government are different from other sectors. Governments have compulsory powers to raise taxes and other compulsory levies and to pass laws affecting the behaviour of other economic units. They focus on providing public goods considerations rather than profit maximization, and the principal economic activities of government are:*

- *To assume responsibility for the provision of goods and services to the community on a nonmarket basis, either for collective consumption (such as public administration, defense, and law enforcement) or individual consumption (education, health, housing and cultural services); and*
- *To redistribute income and wealth by means of transfer payments (taxes or social benefits).*

The broader public sector is also useful because governments often fulfil their public policy objectives through the operation of public corporations (for example, railways, airlines, public utilities and public financial corporations). It may do so by requiring the corporation to service areas of the economy that would not be covered otherwise and by charging subsidized prices, including low interest lending. As a result, the public corporation operates with a reduced profit, or at a loss. Such public policy operations are known as quasi-fiscal activity."

An extended discussion of the relative roles of the state and the private sector is inappropriate here. However, some distinctions need to be made. The state is responsible for the general welfare and is sovereign. The private sector is overwhelmingly self-interested and is concerned with tradable goods and services willingly purchased, while many public sector goods are non-tradable. Indeed, the state need not sell its goods or services at all. By issuing currency or debt obligations it can buy whatever it needs[108]. Consequently, the resource allocation mechanism is different; a question, in part, of the political economy rather than merely competitive markets. It is all too easy for the public sector to become profligate, as it is not constrained by either revenue or borrowing in the manner of the private sector. A country is not a company[109]. This is not to say that the state may spend without limit, but rather that those limits are typically determined by prudence rather than some external agency[110]. The 'inter-temporal budget constraints' of so many academic models are, in fact, self-imposed. Modern views of the role of government tend to express its role as one of redistribution of risk, as opposed to resources, within a society. This includes the protection of consumers where information asymmetry puts them at a disadvantage in relation to producers.

'The state is different' argument is central to a branch of economics known as the fiscal theory of the price level, rather than the more usual monetary theory. To quote Craig Burnside[111]: "*In fact, this theory would not even admit that the equation (1.9)* [the inter-temporal budget constraint] *represents a constraint on the government.*" The theory is contentious. However, Kocherlakota and Phelan[112] write: "*The key force behind the fiscal theory is that a government is fundamentally different from households. Households need to satisfy their budget constraint for all prices, regardless of whether or not those prices are equilibria. A government does not.*" Woodford[113] by contrast argues that if such a constraint exists it may be, and is, violated by government; and points out that in models of overlapping generations the government 'budget constraint' does not hold even in equilibrium. Cochrane[114] in "*Money as Stock*" provides a good introduction to the debate and goes far in resolving it by observing that this inter-temporal 'budget constraint' is "*a valuation equation, a market clearing condition, it is not a constraint.*"

The model illustrated in boxes 1 and 2 and analysed in box 3 includes bequests as the residual wealth of a pensioner at death. The effects of house price inflation on aggregate household wealth have been pronounced in recent decades. In the mid 1990s, housing and pension savings were approximately equal in amount. By 2008, UK residential housing, at some £2.5 trillion, was valued at nearly double the value of pension assets. This makes bequests[115] all the more significant, since house price increases progressively disadvantage younger generations. In fact the number of houses left as bequests has hardly changed from the figures recorded in the 1960s and 1970s in spite of the increase in the elderly sector of the population. One of the reasons for this is undoubtedly the sale of properties to fund residential care, but that alone is not sufficient. The point is that the old age generation are selling or securitising[116] their properties prior to death in order to fund retirement consumption needs[117].

The attitude to housing in the UK is surprising; it is time inconsistent. In addition to the much-discussed inequities for first-time buyers, higher house prices mean lower future disposable income, but most home-owners view gains in prices positively. In fact, this inconsistency is even more widespread: higher bond and asset prices mean lower investment yields available for future savings and investment. Warren

Buffett described this situation memorably in the 1997 Berkshire Hathaway shareholders' report: "*A short quiz: If you plan to eat hamburgers throughout your life and are not a cattle producer, should you wish for higher or lower prices for beef? Likewise, if you are going to buy a car from time to time but are not an auto manufacturer, should you prefer higher or lower car prices? These questions, of course, answer themselves. But now for the final exam: If you expect to be a net saver during the next five years, should you hope for a higher or lower stock market during that period? Many investors get this one wrong. Even though they are going to be net buyers of stocks for many years to come, they are elated when stock prices rise and depressed when they fall. In effect, they rejoice because prices have risen for the "hamburgers" they will soon be buying. This reaction makes no sense. Only those who will be sellers of equities in the near future should be happy at seeing stocks rise. Prospective purchasers should much prefer sinking prices.*" Regulation based upon immediate values encourages this time-inconsistency.

> ***"But now for the final exam: If you expect to be a net saver during the next five years, should you hope for a higher or lower stock market during that period?"***

It is clear that the private sector should provide pensions if it is more efficient than the state in doing so. Though we will deal with regulation more fully later, we recommend here that the state should not, in pursuit of its consumer protection role, regulate the private sector provision so heavily that it ceases to be as efficient as the public sector. With UK pension administration costs, which are overwhelmingly related to regulatory compliance, now running annually at around 7% of pensions in payment, it seems unlikely that this efficiency limit has not been surpassed[118]. In a recent presentation[119], Michael Green reported that a 0.1% reduction in fund management expenses was equivalent to a 4.5% reduction in contribution cost which, for the membership of this Medical Research Council scheme, is equal to about 0.8% of salaries. These figures will vary greatly from scheme to scheme but the non-linear relations will be persistent. The costs of the regulatory time-inconsistency are unmeasured but substantial, as may be gauged from the massive increases in 'special' contributions[120]. Much of this regulation is misguided. Much of it is misinformed. In large part, these faults are due to failing accounting standards for pensions. On the time scales considered here, it is likely that these standards will have to change.

> ***"It is clear that the private sector should provide pensions if it is more efficient than the state in doing so."***

Accounting for Pensions

We will begin our analysis of pensions accounting by considering private sector accounting, but will note that public sector accounting can and should differ in both principle and practice[121]. The current UK private sector accounting standards have been debated and discussed *ad nauseam*, but an understanding of them, and their limitations and biases, is necessary if we are to deliver a sustainable pension system. The current UK standards specify that scheme assets should be valued at market prices and that liabilities should be valued as discounted present values. The suggestion is often made that the risk-free or long-term government securities yield is the 'correct' rate for discounting these liabilities, rather than the current AA bond yield standard.

A financial liability is the property of its owner; it is the owner's asset. There is little that any obligor can do to change the terms and conditions of the liability, without the permission of the owner of the asset. Arbitrary sale or transfer by the obligor is usually not possible. The obligor can, of course, vary or manage its own estimate of the present value of this liability. However, the ultimate liability is unchanged. Much of the current practice in pension risk management is misconceived as it fails to understand this elementary point. In particular, pension liabilities are not very sensitive to interest rates – they do not form any part of the determination of those amounts ultimately payable as pensions. Length of service, salary, wage and price inflation and longevity in retirement are the prime determinants of pension benefits. The hedging of interest rate exposure in these 'risk management' strategies is misconceived. The interest rate fulfils the role of a measure; and what is being hedged is variation in this measure. Of course, all hedging strategies have a

cost. To quote Rampini and Viswanathan[122]: "*Financing and risk management are fundamentally linked... Engaging in risk management and conserving debt capacity have an opportunity cost – current investment is forgone. This cost is higher for more constrained firms.*" It is also more costly for more productive firms.

Many commentators have lamented the absence of a market in pension liabilities from which to extract their values. This could, in principle, be achieved; but it would be the pensioners' assets which were traded in this market, not the sponsors' liabilities. The inherent asymmetry of information in such a market – between the seller, the pension beneficiary and an investor buyer – would be substantial, with the result that the price should be expected to suffer the problems of Akerlof's 'lemons'[123] and be low. This would render these prices of little use for accurate valuation of the sponsor employers' liabilities. The prices that arise under transfer of liabilities to insurance companies (such as 'buy-out') lie above the best technical estimate of their value – this difference occurs because insurance companies are regulated to ensure their security. These are far from free market values. If a free market for such transfers existed and such liabilities could be transferred to any company, it seems likely that the liabilities would trade at steep discounts due to their attractiveness as capital financing for commerce and industry. A pension liability that may cost about 140% to transfer to an insurance company in the current, regulated market conditions would probably cost about 70% to transfer in a free capital market. However, such markets are unlikely to be allowed to develop as a matter of public policy. If individuals can freely sell their pension rights, those individuals may subsequently become indigent and state dependent.

Discounted present values are widely used in finance, but nonetheless the significance of the values that result is worth a little thought. High interest rates imply that future liquidity will be scarce and is highly valued; low rates imply the converse. If we discount future sums payable at low rates we arrived at high present values; but liquidity at the future date(s) is implied to be high, which makes borrowing at that time to meet liability payments all the more feasible[124]. The inference that we need to fund more today as provision against a liability is suspect, unless it is our intention to fund that liability with the asset producing the yield that was used. The significance of a scheme deficit is also questionable when valuation is performed using discounted present values. We will discuss this later in the context of scheme funding. The much debated question is which rate is 'correct' for use in pension evaluations? This can be answered by considering first the position of a company offering pensions to its employees. Ordinarily we might be unconcerned with this debate since the passage of time corrects any errors arising from the choice and use of an inappropriate rate; reality prevails as benefits payments come due for discharge. However, this view is confounded by the use of pension valuations in the management of pension schemes, giving rise to a situation where the room for compounded error and unnecessary expense is both manifest and meaningful.

"Those who argue that pensions are corporate debt should note that the pension liability displaces shareholders' funds."

A pragmatic approach, appealing only to elementary realities, can avoid the quasi-religious fervour of many of the contributors to this accounting debate. A pension is simply one possible form of deferred compensation, awarded by the employer, for employee service. In common with all other deferred items, such as deferred tax, these liabilities form part of the capital resources of the employer company. In fact, the latest communication from the Basel Committee on banking supervision reinstates recognition of deferred taxes as Tier 1 capital alongside common equity. The creation of a pension liability is reflected in accounting terms by its absence from the company's incurred current expenses and required working capital.

The award of a pension creates a new liability; and, as no new assets are created by this action alone, requires that we reorganise the other liabilities to accommodate the pension liability. This reorganisation requires that we lower shareholders' funds (retained earnings and equity capital) to introduce the pension liability into the balance sheet. With the company's earnings on assets unchanged, there is an implicit subsequent accrual of the pension liability at the company's return on shareholders' funds. Those who argue that pensions are corporate debt should note that the pension liability displaces shareholders' funds.

However, as we only know the ultimate cash amounts payable, which are parametrically determined, under the pension award, the question of how much of this to recognise immediately arises quite naturally. This recognition is a matter of amortisation to the ultimate amount over the remaining lifetime of the liability. The obvious and naturally correct rate to use in this amortisation choice problem is the rate of return on shareholders' funds; discounting the ultimate benefits payments required at this rate returns the minimum current amount that the company needs to recognise and that it may expect to deliver. It is also the only rate which does not otherwise distort the company's reported financial position. The company may choose other rates at which to amortise the pension liability; and, provided these are below the initial level of returns on shareholders' funds, can expect to be able to discharge the liability on time and in full. The effect of these rates, however, is to increase the amount recognised immediately and to lower shareholders' funds; at the same time, perhaps perversely, the rate of return on these lowered funds is also increased.

This is not some 'risk-free' government bond rate, nor is it an arbitrary AA or other corporate bond rate. This analysis also makes obvious the futility of specifying some single rate for all companies, given their diversity. The description so far has not considered any explicit scheme funding which can, when suitably structured, enhance member security and lower dependence upon the company's performance. However, increased scheme funding reduces the consequence of sponsor insolvency but also increases the likelihood of insolvency occurring. In terms of standard credit analysis, it mitigates the loss given default but increases the likelihood of default – pricing is the product of both.

The question for the public sector can be approached in a similar fashion. Here, the analogue of the shareholder's return on equity is the real growth rate of the economy – which takes us back yet again to productivity, population growth and related micro-issues such as participation in the labour force. A 2% growth rate such as we have seen over the past 100 years rapidly diminishes the apparent burden of public sector pension liabilities that has resulted in so many calls for revision of their terms. As these calls arise in many cases from the use of techniques associated with generational accounting[125] we shall re-state some general principles.

A state may borrow; its ability to service this debt arises from its ability to tax its residents or to print money. It does not need revenues in order to pay pensions – there is no need at all for any state's revenues and spending to balance in the short term, or ever. In this respect a state differs from a company or household where spending is determined by income and the ability to borrow against, or sell, assets held. In a closed economy[126] the extent to which a state borrows equates to the savings of its resident individuals. The extent of non-state savings equals at least the extent of the state's borrowing capacity. The government liability is an asset of the private sector. The contrast with the private sector is stark: there, borrowing is matched by some other sector's savings and can continue only as long as that sector continues to hold savings. In an intergenerational context such as the earlier model (boxes 1 and 2), the working generation saves and then 'lends' this to the succeeding generation until sale and consumption. In the context of the scare stories of unsustainable pension costs, the liability, but not the asset, is being considered. The fact is that these are equal and opposite in amount – state liability is equal to private asset. This private asset is, of course, a form of savings. We shall discuss the related issue of funding later.

"...studies which claim that the current level of DB scheme funding is inadequate for recovery without further additional contributions will be proved incorrect."

The mixed attribute nature of current pensions accounting is also problematic. Using market prices to value dedicated scheme assets and discounted present values for pension liabilities involves two different measures. Applying different measures to different parts of an object will, in the absence of a way of unifying these measures, lead to distortion of reality. The fable of the Sufi's blind men touching different parts of an elephant and reaching very different descriptions of reality comes to mind. We know the discount function we have applied to estimates of pension liabilities, as we chose it. When this is market based, it varies with time; in many ways these

variations could be considered arbitrary[127]. The measure is elastic. With market prices for assets we do not even know the implicit discount function[128] being applied by the market to the future cash-flows of the securities traded. If the measures were compatible, we would always be able to reproduce equity asset price behaviour with the bonds we used to derive our discount rate; but we cannot. This introduces both bias and volatility into our valuations. We have estimated the bias to be of the order of 30% of liability values in recent times[129]. The volatility is amply demonstrated by the Pension Protection Fund (PPF) produced index of funding levels, which has a standard deviation of £68 billion, compared to an average surplus value of just £0.2 billion. This is a case where the noise entirely obscures any signal present. Many academics have looked at the relation between fundamentals and market prices for financial assets, and show that market price volatility is a multiple of the volatility of fundamentals. Misalignment of values is also evident. Moreover, far from disappearing, these anomalies are becoming more pronounced. This is one reason why studies[130] which claim that the current level of DB scheme funding is inadequate for recovery without further additional contributions will be proved incorrect.

An unbiased evaluation would apply the same discount function to the estimated cash-flows of both liabilities and assets and would not rely on market prices. Use of the rate of return on corporate equity, as recommended for discounting liabilities, can also be used to evaluate the market price of securities – if a security's (likelihood-adjusted) cash-flows are projected and discounted using this rate, the result may be directly compared to the market price. If the discounted present value is higher than the market price, the security is attractive as a pension scheme asset; if lower, then not.

Market prices also pose greater difficulties in the long-term context of this paper. What is the relevance of a market price today to the value of that asset in one, two or three hundred years? We have noted elsewhere in this essay the requirement for the older generation to liquidate savings assets in order to finance their consumption needs in retirement – this sale to the succeeding generation brings a profound inefficiency into the intergenerational process, by introducing market dynamics in practice. The challenge for the future of pensions is to introduce institutional structures designed to eliminate, by sharing, the current inter-generational dependence in both public and private pension provision.

The accounting which should accompany this sharing structure is described earlier in relation to corporate schemes' liabilities; and is developed further in box 4: Pensions Accounting. However, these accounting standards will be positive, or descriptive, in nature rather than normative or, as the accounting standards-setters currently phrase it, 'decision useful'. The overarching criticism of these accounting standards is that they encourage and perpetuate the problem of time inconsistency[131].

Box 4 – Pensions Accounting

Though the discussion as to which discount rate is correct for pension liabilities seems to be eternal, the answer for any company remains the prospective return on its equity (RoE). This is the only rate which does not distort the company's balance sheet. This rate also returns the minimum cost commensurate with an expectation of complete and timely performance of the obligation by the company. The equivalent rate for the state sector is the rate of growth of the economy with GDP growth the usual proxy, as is used by the Treasury.

In addition, changes in this rate have meaning. A low return on equity – and therefore, a low discount rate – indicates higher current values to these liabilities and greater difficulty for the sponsor in meeting its obligations, the ultimate pension payments. A high return on equity indicates greater ease of payment, and security for pensioners. This property shows that this rate or measure is time consistent.

A company might use other rates. If it uses a rate above the return on equity, it is understating pension liabilities and overstating shareholder's funds. If it uses a rate lower than the return on equity, it is attributing a higher present value to those pension liabilities and diminishing apparent shareholders funds, though perversely increasing the stated returns to those shareholders' funds. In essence, the use of a rate below the RoE is altering the priority of the pension scheme in liquidation. The pension claims precede those of shareholders in both situations but here the claim is larger in amount. This use of some lower rate also weakens the perceived credit status of the company and raises its cost of credit – two unnecessary and costly consequences. This lower rate may be interpreted as offering additional security to the scheme but, unfortunately, it is a 'beggar-my-neighbour' strategy, which increases the potential harm to the scheme of the apparently increased likelihood of default since the 'distance' to default now appears to be lower than is actually the case.

If the company uses some arbitrary fixed rate, then the valuation of the liabilities varies in relative security, since it is the difference between this present value of pension liabilities and overall assets which determines security. This difference is the buffer cushion, much discussed in European insurance regulation such as Solvency II. Obviously, as return on equity varies so will the distance between these assets and the present value of pension liabilities calculated in this manner. The variation in security, however, is not directly observed in the pension liability valuation. It should be clear that, for some fixed rate, the overstatement is most severe for those companies which have the highest returns to equity; which, perversely, are those that are most able to pay.

When a market-based interest rate is used, this security mis-statement problem is further compounded. Firstly and most obviously, the rate may be higher than the rate of return on a company's equity, resulting in understatements of pension security, and potential unsustainability. It may, in fact, be entirely infeasible for the company to be able to expect to perform at this rate, when the scheme size is large enough. Secondly, even when the rate is lower than the return on equity, the relative security varies. In fact, pensioner security is now determined by the correlation between the interest rates used for discounting and the company's return on equity. This, of course, tends to be low – it is the basis upon which the equity/debt diversification strategies so widely used in asset management are built.

The use of lower rates can be seen as a variant on the credit-enhancements that featured so prominently in the securitisations and collateralised debt obligations (and their 'tranching') of which all, surely, became aware during the financial crisis. The problem for pensions is that, in the absence of the prospective return on equity, the extent of this 'over-collateralisation' or implied extra security is unknown and not estimable.

This rate of return on equity has another function which is most useful. When the projected cash-flows of any asset are discounted using this rate, the resultant value can be compared with the market

price. If the market price is lower than the present value of the liability, it should be considered for purchase as this will improve the performance of the company. Company performance is, first and foremost, the principal source of risk to any pension scheme. Only when company performance is very poor would government securities be attractive as investments for the scheme and sponsor; this observation is also time consistent. Funding alternatives become progressively wider, more secure and attractive as the company's own performance declines.

In a correct analysis, assets contained within a scheme are consolidated with sponsor's operating assets for the purpose of calculating return on shareholders' funds, even though those assets are segregated and unavailable to the sponsor. Only in the case of local authorities, where scheme assets serve the express purpose of defraying future liabilities, do we need to consider those securities independently.

Member security is enhanced when the correlation between the returns on both these traded assets and the company's operating assets are low; and they usually are. The sponsor company also benefits if these traded assets exhibit low correlation with its operating assets as this lowers the idiosyncratic risk of the company. The interests of scheme and sponsor are well aligned. This traded versus operating asset diversification is the most important diversification for the protection of scheme members. By contrast, hedging pension liabilities, the most common recommendation of the 'modern' school, relies upon the purchase of assets which are highly correlated with those liabilities. When competing paradigms clash in this manner, one must be wrong.

The failing of modern finance is one of myopic time-inconsistency. It is brought to the fore by the recent debate on pro-cyclicality in the regulation of pensions, banking and insurance. In the same manner as the Black Scholes Merton option pricing model, value at risk has a bank buying more assets when their prices rise and selling them when they decline. This strategy of 'buy high and sell low' is more than counter-intuitive; it is pro-cyclical, amplifying the financial cycle. The pension solvency problem is a little more subtle.

In times of boom, the sponsor's prospective return on equity and its ability to service its pension liabilities is high, but the central bank then takes away the punchbowl, raising interest rates to cool the economy. This lowers the present value of the pension liabilities under current accounting standards and it also lowers the prospective return on equity of the sponsor employer, indicating, to the contrary, that pension liabilities have indeed become more difficult for it to bear.

In the depths of the resulting slowdown, the central bank then lowers interest rates to levels below normal to stimulate the economy; and the present value of pension liabilities under the current accounting standards rises markedly. At this time, the company's prospective return on equity increases, and its ability to service obligation improves, but its current capability to pay cash contributions is still impaired. It also has an increased need for working capital to address the resurgent demand in the economy. At this time there are calls for further funding or alterations to liabilities, such as we have just seen in the Netherlands, precisely when the company would like to use its available funds to increase employment, build inventories and accommodate the resurgence of demand. These time inconsistencies have found expression in the calls for 'counter-cyclical' measures and policies.

The rather confused debate on counter-measures to pro-cyclical effects needs to distinguish between restructuring and recapitalisation. Restructuring is either reclassification of liabilities in hard times, including such ideas as dynamic provisioning for credit exposures in banking; or excess funding of pension schemes in good times. These are re-arrangements of the deck-chairs on the Titanic in the hope of rebalancing the ship; they also imply that the ship was listing in the opposite fashion prior to striking the iceberg. Restructuring is not an efficient arrangement. Recapitalisation, by contrast, brings new assets into the firm or pension scheme.

Insurance[132] is the preferred form of recapitalisation as it does not bring with it an accompanying new liability.

Many pension schemes have adopted liability-driven investment strategies which hedge the interest rates used as measures or discount functions. In part, the motivation for this is elimination of the apparent time inconsistencies, though the practice itself, hedging the measure rather than the risk, is unsound. There is an equivalent 'hedge' under the use of the return on equity, but that hedge consists of buying securities for the scheme which would perform well when the sponsor company performs badly. This is intuitive and sound – it is time consistent.

Time inconsistency was identified long ago[133] as being important in the formation of expectations in the context of monetary policy operations. Independent central banks were the solution to this problem of time inconsistency. In the jargon of economists, commitment devices are necessary; for pensions, credible scheme arrangements are all that is necessary. Without correct and accurate accounting these problems will recur.

Scheme Funding

The fundamental question which needs to be asked is: when should a scheme be fully funded? The answer to this, clearly, is only at the time of payment of the final pension liability. This raises the question of sponsor capability – the state, for example, may fund any payment to meet its liabilities by the issue of money. This removes any requirement for funding at any time. By contrast, a company sponsored scheme should be fully funded[134] by the date at which it is expected to fall into insolvency. A local authority scheme technically does not need to be fully funded until the final payment; but, as funding in this case is a cost offset mechanism, this funding is a question of preferences over the current and future taxes that it would need to apply to meet pension payments.

"The pay-as-you-go system is not an inefficient insurance device destroying economic resources; it is a zero-sum game between generations."

Accusations that state and public sector pensions constitute inter-generational 'theft' have, in recent times, been growing more frequent and vituperative. The rebuttal of these claims requires only an elementary analysis (see box 5: Theft by Pension). Public sector employees' pensions, like those of private sector workers, are deferred compensation for employment. Having been awarded for service, they constitute an asset for the employee and a liability of the state. Public sector pensions lower the current expenditures of the state as they constitute lower cash wages paid to these active employees, lowering any need or purpose for taxes. The award of a pension has increased the assets, or savings, of one group within the private sector. The arguments for prefunding of state schemes are covered[135] and dismissed in box 5: Theft by Pension. The pay-as-you-go system is not an inefficient insurance device destroying economic resources; it is a zero-sum game between generations. If there is any argument for funding, it lies in an extended view of burden smoothing, which implies partial funding to the extent that human capital is lacking and real capital could be used to fill that shortfall[136].

"We do not regard DC 'pensions' as pensions at all – the description 'pension' in this context is at best euphemistic and at worst may be misleading or deceptive."

The arguments relating to private sector pensions differ from those concerning public sector pensions. The principal difference is that private sector employers may become insolvent and be dissolved. In fact, the sole risk with private sector pensions faced by an employee and pensioner is insolvency of the sponsor company. We do not regard DC 'pensions' as pensions at all[137] – the description 'pension' in this context is at best euphemistic and at worst may be misleading or deceptive. DC 'pensions' are savings schemes and require a means of converting the assets into income to qualify as pensions. Other so-called risks arising from the incomplete nature of the pension contract, such as

maladministration, can be resolved by the Courts[138] which can, of course, effectively reverse adverse financial events by judgement. This is not therefore correctly a form of risk, since the irreversibility of time is a necessary condition for that. Only in the event of insolvency and the unenforceability of Court judgements and remedies does this become an issue of risk.

Insolvency risk exposure is particularly acute for active employees as they face both unemployment and loss of their pension savings. It may be mitigated by using funding to provide collateral security. As was noted in the earlier section on pension accounting, in the absence of such security the pension savings are part of the capitalisation of the sponsor employer. There are, however, problems with the level of security offered. It is inequitable to other creditors to offer more than 100% of the best estimate of liabilities to a pension scheme prior to insolvency; but, post insolvency, the scheme requires more funding in order to be able to cope with the risk that it subsequently faces without sponsor support. The levels of pricing of pension liabilities as insurance contracts, such as bulk annuitisation, indicate the extent of this additional funding requirement[139]. Moreover, the contributions made by the sponsor to funding are diversions subsequently unavailable to the sponsor business[140], which increases its likelihood of failure and insolvency. There is a complex trade-off between these funding and insolvency elements. There are also questions as to the relative returns and efficiency of such collateral security investments. Pension indemnity assurance, which is discussed in detail later, fully resolves these problems. With this form of assurance the scheme member may be assured full security of all benefit entitlements, while the costs to the sponsor are minimised as this assurance contract capitalises the sponsor's obligations, their covenant. It is unfortunate that the PPF was not established as a pension indemnity assurer rather than as the mutual compensation fund that it is.

When the UK regulatory focus is upon deficits and protection of the PPF, the immediate is all-important. The effect of the discount rate used is directly material in evaluations of funding adequacy – a deficit of 20% derived from market prices for assets and a 4% discount rate is very different from that which uses a 10% discount rate. The length of time available before the scheme must raise additional funds is far longer in the low interest rate case than in the high. In fact, depending upon the discount rate used, a scheme may appear in either surplus or deficit. Regulation which sets repair schedules that do not take explicit account of this difference in time to funding shortfall is costly and inefficient[141]. The time inconsistency is evident here yet again.

Many papers[142] advocate full funding of schemes at all times; that is to say 100% of estimated liabilities of a defined benefit scheme by a corporate sponsor. Among the reasons proffered are benefits security, tax incentives and corporate cash-flow management. In relation to benefits security, we have already noted that, post-insolvency, a scheme needs far more than 100% funding as a risk buffer. In relation to tax incentives, it is true that a company might borrow to fund scheme contributions and that the interest cost of this borrowing would be a tax deduction. However, this would limit the company's borrowing capacity markedly and could restrict its ability to pursue viable commercial projects. In fact, it only makes sense from the perspective of a shareholder to fund a scheme if the post-tax returns on assets in the scheme exceed the post-tax returns on assets employed in the firm. These assets are taxed differently, but it is far from unusual for even the long-term returns from market investment portfolios to be lower than a specific company's return on assets. Adding debt to the picture does little good: borrowing to fully fund scheme assets explicitly lowers the company's profits by the borrowing cost, but it increases the reported return on equity as this now appears to be levered. Moreover, discounting scheme liabilities at that increased and distorted return on equity would understate the liabilities. In addition, use of this increased discount rate hides the true risks faced by the company. The employer-sponsor is still faced by variations in the scheme's now larger asset portfolio; and these variations can still have pronounced cash-flow effects due to the required supplementary scheme contributions acting on a corporate treasury already committed to debt service payments.

The funding of any pension liability is related to the investment returns available at that time; if there are only low real returns, then the correct decision may well be not to fund now, but to borrow at the dates when these pensions become payable. A low real interest rate implies that future liquidity is expected to

be high and borrowing will then be feasible. This strategy is not available to the individual, whose borrowing capacity in retirement is limited. The unavailability of this borrowing strategy to the individual is further motivation for the creation of the collective inter-generational institutions of defined benefit schemes; and further evidence of the weakness of the individual DC structure.

Box 5: Theft by Pension

In this section we examine the accusation of theft by pension by considering the alternate forms of financing that might be adopted by the state.

If these pension awards are funded by taxes demanded at the time of award, those taxes fall upon the entire working population including the tax-paying pensioner population alive at that time. However, the state also has an investment problem, since it does not need these tax receipts until the pensions are payable. The state may productively invest these tax receipts either in the private sector or in government-sponsored investment projects, such as infrastructure. This choice should be a matter of the relative productivity of each form of investment[143]. If the government chooses to invest in private sector projects, it is investing its savings as a claim on the private sector. Such an investment is commercial in form rather than arising from the sovereign nature of the state. If the state chooses to invest in publicly-owned infrastructure, this also constitutes a claim on the private sector – the future revenues arising from that investment can only ultimately come from the tax-paying public. If the investment venture is unsuccessful and no future revenues arise from it, the state pension is then effectively unfunded once more. These investments would also have the effect of increasing current economic activity; but whether this fully offsets the lowered post-tax disposable income of the working age and pensioner populations is a matter of the precise detail[144] of the investments and the distribution of tax and tax-payers. Any inequity present in taxed funding of state pension awards is that part of this cost is borne by the current generation of tax-paying pensioners for the benefit of part of the succeeding, currently working, generation.

If, instead, the state decides not to fund the claim awarded to employees, it is saving. The amount of this saving is the reduction in current spending on public employees' salaries and wages. In other words, those who decry unfunded state awards of pensions are denouncing the state for saving. Ordinarily, it may be possible to criticise saving on the grounds that it has the potential to reduce current demand; but in the situation being considered, the entire private sector tax-paying population benefits as taxes are lower.

If the state decides to borrow, by issuing securities or otherwise, to finance pension awards, it raises these funds from the savings of the private sector. It is 'substituting' claims on the state for claims on other parts of the private sector. This borrowing is not used by the public sector for productive investment but for consumption – the state is dissaving. The extent to which it can do this is limited to the pool of domestic savings and that which is available to it internationally. In part, this borrowing capacity is a question of national wealth, not just the potential taxable national income.

If this dissaving reaches the point that the apparent costs of borrowing are excessive, the state may issue more money or tax the population more onerously. In extreme situations, the state may in any case expropriate private savings assets and dispose of them – substituting claims on the state for claims on other parts of the private sector, including international assets[145].

Note that if the government borrowing is conducted just-in-time to pay pensions and is long term in nature, the cost of service of this debt falls only in part upon the generation who are currently children – when they join the succeeding working age population. This is a privileged childhood in which their parents have had higher disposable incomes from which to support them, to invest in their

education and to save. Much of this childhood support is, in fact, investment in their health and education, and though principally supplied by parents it is inalienable from the child. The residual savings of their parents and grandparents who purchased these government debts also pass, in part, to their children as bequests. The size of a bequest is determined by the extent to which pensioners have sold their assets to the succeeding generation to finance their retirement. If the debt service obligation exists so also must the asset, and it is now the property of that succeeding generation.

It is entirely circular and redundant to require the state to borrow to pre-fund state promised pensions. It might, perhaps, make sense to do this if the returns to state chosen investment could be expected to exceed the returns to state borrowing. This implies that private sector savers will accept lower returns from government debt than from private sector investments, which they may do on grounds of relative risk. If an individual is going to be paying the service costs of a security through taxes on his income, that security really isn't risky to him. However, if it is the case that this arbitrage exists when an investment is controlled by the state, the question must arise why this borrowing and investment was not already being conducted by the state. Alternately, with investment in the private sector by the state, the question must arise as to why the private sector was not already investing its savings in this direction.

The much-publicised concept of 'theft from future generations' can only occur where pensions are financed by borrowing for immediate consumption – disbursement as pensions; and then only in distribution among the succeeding populations. This is separation of the obligation to pay taxes from ownership of the security outstanding. The borrowing creates an asset for its purchasers – these assets exist as long as the obligation to service them through taxes also exists.

If these assets arising from state borrowing were fully taxed at death the obligation and the asset would both be extinguished. In the absence of such taxes, the succeeding generation is not disadvantaged in aggregate; collectively, it inherits these assets. The succeeding generation has, in effect, acquired an asset, against which it may borrow from other savers in the current private population, which capitalises not just their future obligations but also the past service contributions of previous generations. There are possible effects in distribution among cohorts of succeeding generations, which can be perfectly well addressed by taxation policy more generally.

Pensions Saving Arithmetic

The problem of asset liquidation is faced by all retirement savings schemes since they rely upon the savings of the succeeding generation to realise their investments. With DC there is the further complication of conversion to an annuity or similar arrangement to provide income[146]. It is remarkable that many DC 'pension' plans do not address either of these issues, or indeed the related question of investment allocation while saving. DC arrangements cannot be regarded as pensions, which constitute retirement income provision. This asset to income conversion is an issue for the compulsory UK state sponsored scheme NEST. Risk is being borne by individuals alone and there is an explicit point-in-time dependency upon financial markets for both the value of assets to be liquidated and the price of the annuity to be purchased with those liquidation proceeds.

The inter-generational realisation problem may be very simply illustrated by considering a stylised sustainable population. Let us consider a uniformly distributed population which dies at age 95 and retires at 65. There are 95 people in this population, 30 of whom are pensioners, 15 children and 50 working age. The support ratio is therefore 1.67. The population is 52.6% working age and 31.6% old age. It is, therefore, an elderly population with an average age of 48 years. Wages are fixed at £100 per annum and always have been. Interest rates are zero. The working age population consistently saves 20% of its annual income which makes the total annual working age savings £1,000. With pensions set at two thirds of final salary

the old age population needs to liquidate £2,000 of its savings every year. The savings of the working age population are simply insufficient to accommodate these sales. Moreover, the pensioner only has assets of £1,000 at retirement which will be fully consumed after 15 years. The maximum sustainable pension which can be afforded is, in fact, one third final salary.

If we now introduce an investment return of 1.7% on savings, the individual pensioner's wealth at retirement is £1,583. This is just sufficient, in theory, to support, by liquidation, a pension of two thirds salary. Investment income in the post-retirement period makes this up to the total of £2,000 needed for two thirds final salary pension for thirty years in retirement; this investment income is material at almost 42% of total investment income[147]. The total annual pension payments obviously still amount to £2,000, and pensioners have adequate resources to fund two thirds final salary pensions. The total investment income for the year of the working age population amounts to just £583. This leaves a cash shortfall even if all investment income is dedicated to the purchase of pensioner assets. This aspect is not obvious when considering overall wealth alone – the working age population has total savings of £34,870 and the retired population has total savings of £24,940.

When we reach investment returns of 2.5%, the working age annual saving reaches £2,000, consisting of equal parts salary and investment income, which is sufficient to purchase the older age group's entire sales. In this situation the older age group also bequeaths its residual wealth at death, a sum of £1,192 annually to its successors. In the steady state, these bequests generate another £713 of income to the working age population. Pensioner age total wealth is £48,929 and working age total wealth is £71,380.

The most important point here is that it is the savings of the succeeding generation which determine whether any amount of pension savings for retirement income provision is sufficient. It is not feasible for an individual to save the capital required to support a retirement income of two thirds final salary solely from investment income on lifetime earnings of just £5,000 (unless the returns to capital investment are very high indeed). As capital investment returns are bounded by the productivity growth of the economy, high levels could not be expected to be sustainable.

No individual can know with precision their expected lifespan or their consumption needs in retirement. Few have the cognitive skills or desire to develop a retirement consumption plan; and, even if they have, they still face the problem that they will need to liquidate savings assets in markets to generate the cash resources necessary.

"One thing which is immediately obvious is that pension legislation has been increasing in frequency and volume in recent years."

Pension Regulation in the UK

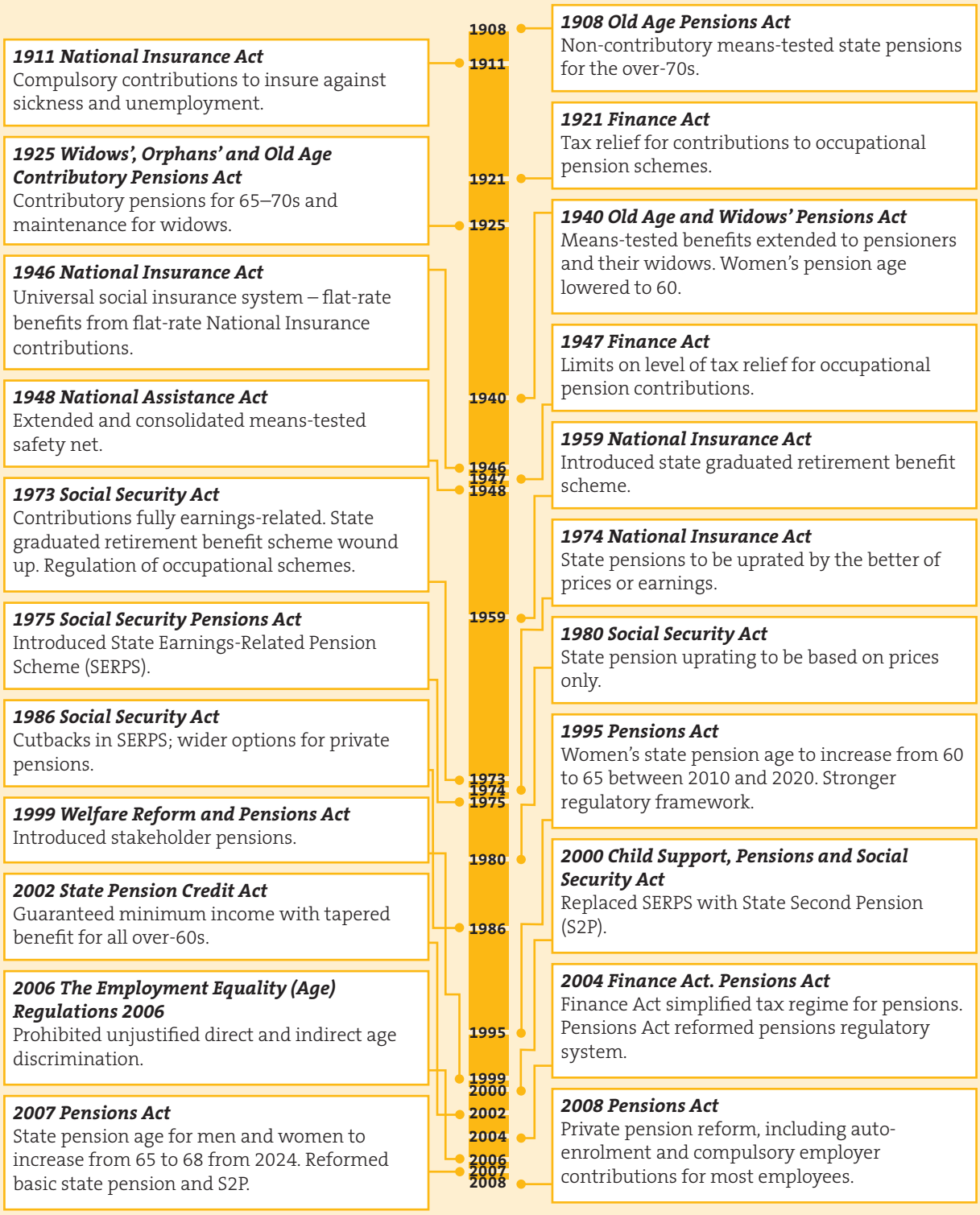
Before considering the risk structure of pensions and pensions institutions, it is necessary to consider the framework within which they exist. Box 6 shows the historic development of pensions legislation[148] as outlined in Chapter 1 of the ONS *"Pension Trends"*. These are the principal Acts; in addition there are numerous statutory instruments dealing with particular aspects of legislation. We do not propose to discuss the historic development in any great detail, since this has received treatment at length in numerous other publications[149]. One thing which is immediately obvious is that pension legislation has been increasing in frequency and volume in recent years.

The result is ever more complexity, which Alan Pickering's 2002 report, "*A Simpler Way to Better Pensions*", had already identified as a fundamental reason quoted by 71% of employers for their lack of provision of occupational pensions. Incidentally, this report also made the point that complexity inevitably raises administration costs and lowers investment returns.

One of the more 'interesting' episodes not documented in that timeline is the period prior to the 1959 National Insurance Act. In 1956, the Finance Act gave favourable taxation treatment to pension schemes, their sponsor employers and also to insurance companies. The result was a dramatic increase in occupational pension provision; in 1956 some 8.1 million people, 33% of workers, were in occupational schemes; and by 1967 this had reached 53%. The model for qualification or approval of these schemes was that already offered by

Box 6: UK Pension Legislation Timeline
Source: ONS Pensions Trends Chapter 1

Pensions legalisation timeline, 1900 to the present



local government: the two thirds final salary pension was established[150]. In response, and perhaps motivated by a desire to limit the power of the pension funds, the Labour Party developed their 'National Superannuation' proposals. This state-run scheme would have offered a pension of about 50% of final salary and was redistributive between higher and lower-paid workers. The fund accumulated was to be invested by the state in stock markets, with promotion of faster growth a central objective. There was considerable electoral appeal to these proposals. For the first time, the pensions industry had a voice in both the Labour proposals and the Conservative response; their interests could not be ignored by the politicians[151]. Among the concerns discussed during this period was the treatment of part-time and casual workers, many of whom were women; the position of small firms; and transferability. The ultimate result was the Conservative government's 1959 National Insurance Act and the introduction of graduated state retirement pensions. Incidentally, this Act gave another incentive to employers to provide self-administered occupational pensions, since, if they did, they were not liable for contributions to the state scheme.

By 1970, private sector provision of occupational pensions reached 78% of non-manual full-time employees, though the figures were lower for manual and unskilled workers. It is important to realise that the final salary DB model, which reached its zenith in 1973 at 92% of schemes, was not always the dominant model – in 1953 it accounted for only 23% of all schemes[152].

"The regulation of pensions in the UK changed character in the wake of the Maxwell Mirror Group Newspapers scandal of the early 1990s. Before this regulation was economic in nature, transferring ever more pension liabilities to the private sector; now it is overwhelmingly social in nature, seeking to protect scheme members from perceived risks."

The Social Security Act 1973 introduced into private occupational pension provision the first guarantee for early leavers with a minimum of five years service; and at the same time established the first explicit funding and security requirements. The Occupational Pensions Board was created by the Act to supervise these regulations, although it must be noted that, as a proportion of most schemes, the guaranteed amounts were small.

It is obvious that one part of the problem now faced is 'lock-in' – a phenomenon most commonly known now from the Betamax and VHS wars of the early 1980s. In the jargon of economists it is known as 'path dependence'. The early arrival of a technology in a market, even though it is inferior to other technologies, is able to dominate that market even when superior technology becomes available. A number of authors, notably Pierson[153], have argued that the short political cycle, the non-market nature of state goods and services and institutional inertia all confer path dependency on the political process.

"The PPF is not sustainable."

The regulation of pensions in the UK changed character in the wake of the Maxwell Mirror Group Newspapers scandal of the early 1990s. Before this regulation was economic in nature, transferring ever more pension liabilities to the private sector; now it is overwhelmingly social in nature, seeking to protect scheme members from perceived risks. The current UK legislation, its subsequent modification and its implementation have created a widespread aura of distrust, with the predictable effect that sponsors and schemes now comply rather than co-operate, a situation which is economically sub-optimal.

Effective regulatory interventions, which seek to increase the security of a scheme member's pension by reducing the uncertainty associated with it, will inevitably raise the current cost estimate of provision of those benefits. The accounting debate can be seen in these terms – the choice of discount rate is one of priority within the liabilities of the company sponsor. A gilt rate would be tantamount to attributing super-senior status and the correct return on equity would reflect the commercial prospects of the company alone. Regulation which requires intervention in the financing process also inevitably increases the ultimate cost of a benefit, by introducing path dependency to the funding process. Ineffective regulation simply introduces deadweight costs of compliance and administration.

Through measures such as compulsory limited price inflation and preservation of former employees' benefits the interventions of the 1970s and 1980s raised the total amount of pensions ultimately payable; and reflected a shift of responsibility from the public to private sector, raising the amount of the public good. Regulatory interventions have since raised costs for the corporate sponsor but not improved the ultimate benefits payable – and it is debatable whether they have raised the true or perceived security for members. In economic terms, in the first pre-Maxwell period the costs represent capital formation, while in the second, post-Maxwell, they are an element of current consumption.

Taxation concessions[154] for pension schemes – where contributions and investment accruals are exempt from income and capital gains taxation but pensions in payment are subject to income tax – were originally justified with the argument that this was inter-temporally fiscally neutral[155]: total taxes received were the same, though separated in time. If this were true historically, it is no longer the case – the distinction between capital formation for ultimate post-tax consumption as retirement income and immediate tax-advantaged consumption is material. This aspect, the difference between consumption and capital formation expenditure, and its consequences for social welfare policy, has not been widely discussed.

"In late 2009, the UK High Court reinforced this sunk cost aspect with a ruling that schemes may not rely upon the presence of the PPF when determining their investment strategy."

One of the more important innovations of the Pensions Act 2004 was the creation of the Pension Protection Fund (PPF) which was introduced to address the risks of sponsor insolvency faced by schemes. It is a 'poster child' for inept and inappropriate institutional design. The PPF is a mutual compensation fund, not an insurance company; its costs are borne entirely by pension schemes and their sponsors.

The PPF does not pay the full benefits entitlements of members who enter after their sponsor has failed; it has estimated its coverage at approximately 83%[156] of members' accrued entitlements under their schemes' rules. The sole justification for these lowered benefits is reduction of the potential PPF exposure[157]. The lowered benefits introduce a new sunk cost to the administration of pension schemes, incurred by the need to produce periodic Section 179 actuarial valuations where the liabilities are based upon the PPF reduced benefit rules. Properly designed insurance would pay full benefits to members and, inter alia, obviate any need for such valuations.

"The effect of legislation has been to drive employees into grossly inadequate DC schemes, where they bear every risk to their retirement income alone, despite being overwhelmingly unequipped to do so."

The PPF is not sustainable[158]. Schemes which fail in the early decades of the PPF's existence will not have contributed adequate sums to offset their deficits. With a declining population of schemes, as is the case in the UK, the levy will prove to be profoundly inequitable over time. This can be illustrated most forcefully by consideration of the pathological case of the last man standing, the scheme which outlives all others. It will have made contributions to the costs of all other prior failures, in increasingly large proportions of those failure costs, but there is no surviving scheme to cover its shortfalls. Before that, however, we may expect the PPF to invoke its right to lower benefits further.

In late 2009, the UK High Court[159] reinforced this sunk cost aspect with a ruling that schemes may not rely upon the presence of the PPF when determining their investment strategy. By contrast, if the levies represented insurance premium provisions against their own future failure, they would create an asset for the scheme. The private sector costs of defined benefit pension provision have now risen to the point that it is grossly inefficient for any corporate sponsor to offer them, principally as a result of the compliance costs of regulation. The result is that no new defined benefit schemes are being created. If the cost of withdrawal were lower than the full buy-out costs of insurance provision[160] far more companies would have entirely ceased provision. The effect of legislation has been to drive employees into grossly inadequate DC schemes, where they bear every risk to their retirement income alone, despite being overwhelmingly unequipped to do so.

At a conceptual level the problem of current institutional pension regulation is that it is analytic in nature when, for the purposes of sustainability, a time consistent systems approach is necessary. Much of the regulation arising from the current analytic approach conflicts with the need for adaptability to ensure sustainability; the systems method resolves many of these issues.

Pensions Institutions

The fundamental problem for sustainable pensions is one of adequate savings for retirement, not just for the current generation but for many. The institutions created must overcome the problem that saving tends to be from what's-left-over after ordinary consumption preferences have been met; and also the tendency for savings, once made, to be myopically consumed by individuals rather than held for retirement. Occupational schemes capture income savings at source, eliminating many of the disposable income difficulties. They are also devices for commitment to saving for the long-term. The earlier section on pension arithmetic illustrated one real demographic problem that pension institutions must counter – the possibility that a particular cohort may save at adequate rates for themselves, but that these savings are inadequate to satisfy the savings liquidation needs of the retirement cohorts. The institutions for pension management must be resilient in order to deal with these issues; they must have multi-generational permanence.

When pension institutions have permanence, the current level of funding is immaterial. They are sustainable. This permanence has been discussed in the context of local authority schemes where it is constitutional in nature; but it is also true of the PPF, which is organised as a statutory company. If the PPF were an ordinary insurance company collecting premiums, its £1.5 billion shortfall would require it to apply for insolvency protection immediately[161]. The challenge for private sector companies is to devise institutions with this property of permanence; the independent pensions trust, underwritten by the company, is defective in this regard. There is also a challenge here for quasi-government institutions and insolvency. Some of us cannot forget the 1970s 'restructuring' of the Mersey Docks and Harbour Board when the bond-holders' losses were almost total. As the Hansard Report on the Windfall Tax in 1996 records: *"I recall the debate that we had on the Mersey Docks and Harbour Board, and I am sure that he, too, remembers it well. We were dealing with a statutory trust, which had statutory trustees. All the pensioners who invested in the trust thought that they had Government bonds, which were as safe as the Government."*

"A collective DB scheme with its intrinsic risk sharing is far more efficient that DC: whereas two thirds final salary can be delivered as pension at a cost of 20% of salary, the same two thirds pension would cost more than 30% of salary under an individual DC arrangement, before considering the well-known cognitive and behavioural biases of individuals which add to the cost."

Pensions institutions are clearly necessary, no matter which sector provides them. Their purpose is to resolve the uncertainties applicable to individual provision, which is a matter of economic efficiency. If they are to be sustainable for the long-term, the design and location of these institutions must therefore be determined by their ability to live with the risks and uncertainties associated with retirement income provision. Resilience and adaptability are the key characteristics. It is clear that these institutions should be multi-generational in nature, as is the retirement saving and income problem; and unless they are time consistent[162] in operation, they are unlikely to prove sustainable.

The difference between DB and DC organisation is particularly important. A collective DB scheme with its intrinsic risk sharing is far more efficient that DC:[163] whereas two thirds final salary can be delivered as pension at a cost of 20% of salary, the same two thirds pension would cost more than 30% of salary under an individual DC arrangement, before considering the well-known cognitive and behavioural biases of individuals which add to the cost. DC scheme organisation is economically highly inefficient in addition to being extremely costly to society in tax terms.

It appears that the role of the state in pension provision, other than for its employees, should be limited and simple. This limited role may be motivated by

paternalism, public opinion or economic arguments, such as the relative productivity of state investment. The economic arguments supporting social security provision of this limited form suggest aggregate welfare gains which exceed the simple transfer values – it is not a zero-sum affair. This limited form need be no more than a safety net for the unfortunate and disadvantaged. The alleviation-of-poverty role of the state is distinct from the encouragement of pension provision more generally. The current level of state pension is clearly inadequate as so many pensioners qualify for means-tested additional or supplementary benefits. The UK state system offers one of the lowest income replacement rates in Europe: it is reported at just 35%, while in France and Italy this figure is above 60%. Furthermore, the UK has one of the highest rates of pensioners at risk of poverty, reported at 27% by Eurostat. This is not a record meriting any pride. Simplification of the current UK system along with an increase in basic state pension payments is feasible[164] – it is no more than a restructuring of the current situation. The existing pay-as-you-go arrangement is perfectly sustainable, particularly in a world where employment rates and labour market participation are likely to increase precisely because of demographic shifts.

A broader sustainable system for the provision of pensions based on employment can be developed. The recurrent difficulties of provision for casual and part-time workers and those working in small businesses can be addressed by the creation of industry-wide schemes in which companies and other employers are obliged to participate, if they have not elected to operate their own comparable pension schemes. In fact industry-wide schemes are the predominant form of organisation for pension provision in the Netherlands. Trades unions can have significant roles. Such arrangements can also go far in resolving the difficulty of declining industries, by including their successor trades and professions – the blacksmiths become motor mechanics. Declining industries, particularly those which previously employed large numbers, such as coal and steel, change the nature[165] of the pension problem for their management institutions; the scheme effectively moves into a run-off position just as the ability of sponsors to support their underwriting of scheme risks becomes limited. Such industry-wide arrangements also go far in resolving questions of labour mobility as portability, to a large degree, means transfers between participating employers.

> ***"If it comes to be proven that private sector investment is unequivocally superior to the productivity growth of the state sector, then the situation should be revisited."***

These industry-wide schemes should be funded and intrinsically mutual in nature; they could be capitalised as insurance companies, or operate on Dutch lines using variable indexation of benefits to protect solvency, or be insured by a pension indemnity assurer. The operational management must be time consistent if they are to be economically efficient, sustainable and credible to their members.

Occupational pensions for state employees do not need organisational change. Their projected cost of a maximum of 1.9% of GDP, approximately one quarter of which is actually funded by employees' contributions, is a relatively modest employment cost for what is nearly 20% of the active labour force. These pay-as-you-go schemes certainly do not need to be funded. If it comes to be proven that private sector investment is unequivocally superior to the productivity growth of the state sector, then the situation should be revisited. However, the introduction of funded portfolios would require the creation of a body independent of government and the political process; it would be a sine qua non for the efficient management of these private sector investments. We deal later with the position of UK local authorities.

The prudential risk management of state schemes is intriguing. Most risks are internalised between scheme and sponsor – an efficient organisation. Unlike a private sector scheme, state schemes are not exposed to the risk of sponsor insolvency; they face the same inflationary and restructuring risks as a government debt-holder, but salaries are protected with some lag against the risk of inflation. The lag effects principally arise from the willingness of government to restrict wage increases and shed staff in times of fiscal stress. Ultimately, however, the government will need to raise salaries to market competitive levels in order to recruit attractive candidates.

The scheme, or at least its sponsor, the government, is exposed to longevity and productivity growth risks. The government is already concerned with maximisation of productivity growth in the same manner as the scheme might be – hedging is entirely inappropriate as it is costly. The government is also hedged against longevity risk to the degree that it applies consumption taxes such as VAT and also charges for the provision of public goods arising from state investment; infrastructure is the obvious public good, but this extends to other services such as the legal and educational systems. This is a question of increased capacity utilisation arising from the larger population. Hedging is again inappropriate.

Local government schemes in the UK are funded but the benefits are defined in statutory regulation. Current valuations indicate that schemes have an average deficit of 25% of the present value of liabilities. These schemes may include the employees of companies and other bodies which may experience insolvency. In England, the Local Government Pension Scheme is the umbrella for 79 local funds. There is wide variation in employer contribution rates. The average pension payable is small, as there are many part-time employees and low-paid women with broken service. Following the Barber judgement[166], this class of member has increased significantly.

As insolvency is not a problem for these local authority employers, the role of pension funds is to defray future costs and taxes. Accordingly, they should be invested for the long-term. The appropriate discount rate for liabilities is more complex than for corporate sponsors. If sustainability is the objective, the 'correct' discount rate should be determined, after account of the investment returns from assets held, by the rate of increase of local taxation receipts necessary. Sustainability is a matter of the growth of the local economy, the authority's taxation base. Standard accounting should be a matter of stewardship and monitoring of the administration of the scheme, rather than a policy determinant.

Savings and Impediments

Savings rates in the UK are notoriously low[167]. In recent times they have declined even further, to fifty year lows by some accounts. According to the Institute for Fiscal Studies[168] the median wealth in 2005 was just £65,808. This consisted principally of housing wealth, where the median was £60,070, rather than financial wealth[169], where the median was just £1,091. The age distribution of wealth in this study and others is consistent with the 'life-cycle' theory, rising steadily to peak in the 60 to 64 year-old cohort and then declining in older age. The median peaks at about £200,000 and declines to around £140,000 in the 75+ age group. The Second Report of the Pension Commission asserted: "*Savings through house purchase and inheritance of housing assets will make a significant contribution to pension adequacy for many people, but housing cannot be considered a sufficient response to pension adequacy problems for all people.*" The IFS study does illustrate (but does not comment on) another facet of housing versus financial assets, which is that houses are purchased earlier than financial assets and sold later. The later section on investment will consider other aspects of demographics and asset prices.

Of course, in an economy which is financially deep and sophisticated, the need for precautionary savings is lowered; for example, households can borrow for many of these needs. Financially deep economies may also benefit from the virtuous circle of higher returns, increased savings, greater corporate capital investment and formation, and the resultant higher future output. To maintain a sense of balance, it should be recalled that the financial system consists of much more than just capital markets and that the user constituency is far broader than just pension schemes. Levine[170] classifies the financial system functionally. Financial markets "*facilitate*: 1) *the trading, hedging, diversifying, and pooling of risk,* 2) *allocate resources,* 3) *monitor managers and exert corporate control,* 4) *mobilise savings, and* 5) *facilitate the exchange of goods and services*." There is a substantial literature which considers the effects of frictions on savings and savings accumulation; these frictions include the costs of information acquisition, contract enforcement and management expenses.

"Government regulation... should promote the long-term but currently seems only too often to be concerned with the short-term."

In addition to their role in minimising such frictions, pension institutions can go far in resolving the inconsistencies between the short- and the long-term. The Friendly Societies of the nineteenth century were collective risk-pooling institutions which had specific long-term objectives, such as meeting burial expenses[171]. The role of government regulation in the decline of Friendly Societies merits academic study. Government regulation, which should promote the long-term but currently seems only too often to be concerned with the short-term, seems to have had the same attritional effect a hundred years ago that it is now having on the corporate DB pension sector.

Early in our working careers we face much necessary expenditure which makes saving difficult. The competing demands are obvious; saving for house purchase deposits, the costs of parenthood and the repayment of student loans for many. In such circumstances saving for the far future becomes a low priority. In order to maximise savings, the form of the savings contract matters; to reduce or overcome the problem of competing needs for savings the contract should have a form which allows the saver to draw up on it when needs arise. This structure, known as a provident fund, allows the saver to 'borrow' from the fund for qualifying purposes. The US 401 K arrangement permits this, as does the main Singaporean state-run scheme.

Low-paid workers face the greatest impediment to pension saving; post-retirement, these individuals may find that their income from pension saving is fully offset by reductions in means-tested supplementary benefits. The technical appendices to the Audit Commission's report "*Local Government Pensions in England*" provide an illustrative calculation based on 2009/2010 rates. They show that the net financial benefit of pension saving to a pension beneficiary with the average entitlement (a pension of £4,500 per annum) may be as little as £500. For those earning less than about £15,000 this represents a loss on the individual's contribution savings[172]. The UK NEST scheme has been widely criticised on these grounds.

This also defuses, rather effectively, the arguments of those who claim that local authority schemes are an unsustainable addition to state liabilities, since these pension liabilities are, to a very large extent, offset by reductions in the state liability for other means-tested benefits. As the Audit Commission notes: "*Cutting pension benefits would reduce total liabilities but this may not translate directly into reduced public spending.*"

Taxation

We have already made the point that the elderly pay income taxes. The most recent figures (2007 to 2008) from HM Revenue and Customs indicate that males beyond state retirement age constitute 15.4% of the working and old age male population; and have 18.5% of the total income on which they pay income taxes amounting to 14.2% of the total. Women pensioners are 22% of the female population and have 29% of the income, paying 24% of the total female working and old age population income taxes. Perhaps the most surprising statistic associated with income taxation in the UK is that in spite of the population exceeding 60 million, there are only 32.5 million tax-payers[173]. These figures deserve some consideration as they imply either a considerable level of tax evasion or, even worse, material misstatement of the levels of poverty in this society.

Income taxes account for 29% of Exchequer receipts in the UK. Value added tax accounts for 15% and there are many other consumption taxes which apply equally to the old age population and to the working population. There is currently no analysis of the net costs – that is to say the true inter-generational transfer costs – of the old age population[174]. For the UK, the European Commission 2009 projection of age-related government expenditure reports pensions at 6.6% of GDP rising to 9.3% in 2060; health care at 7.5% rising to 9.4%; and long-term care at 0.8% rising to 1.3%. Expenditure on and by the elderly and the net transfers are clearly areas of considerable future research interest. There are too many 'studies' which treat the old age population solely as a dead-weight on the working age cohort.

The principal policy issue associated with pension taxation is the structure of the incentives. Incentive concessions are currently estimated at approximately 1.7% of GDP. This incentive issue is first a question of the tax deduction from income of contributions made to qualifying arrangements. The deductibility of these contribution payments in the case of corporate employers is in fact no real concession – these are employment expenses which, if paid as cash wages to an employee, would be deductible[175]. In 2008/9

employers benefited from £11.9 billion in tax relief on contributions made to occupational schemes and £2.5 billion in contributions to personal pension schemes. In that year, the total 'cost' of tax relief on investment accruals was reported by HMRC as £6.7 billion, but even though this figure relates only to income received by schemes, it seems far too low given the amount of capital investments of pension schemes. Following the 1997 revocation of advanced corporation tax credits, the exempt accrual description has, in fact, not been entirely valid, since there is no longer any credit for taxes paid by companies in which pension schemes are invested. The 'contracting-out' rebate, the incentive created by the 1959 National Insurance Act, the exemption from National Insurance for qualifying schemes, was £8.2 billion in 2008/9.

> ***"In terms of final pension, periods of non-saving are more significant if they occur earlier, say during the first decade of employment, rather than later, during the last decade of employment."***

Does tax relief for individuals produce higher personal savings? The low rate of personal saving suggests that effects are small in aggregate although they may be large in distribution. Whether these tax incentives merely divert savings which might have already been made otherwise is an open question. This issue of incentives is further compounded by the possibility that lower savings might result since smaller initial investments could otherwise achieve the same resultant wealth. The second incentive issue is the compounding effect of the exemption of investment income from taxes. This is certainly the more important concession with respect to corporate sponsored pension schemes and also not trivial for individuals[176]. The insurance industry has developed a wide range of products for individual and institutional pension provision which depend upon the precise detail of these concessions. The periodic agreement of special tax rates for insurers was, in part, recognition that some of their capital funds were pension savings – for example, the 'with profits' pension policy was expressly participating capital[177].

This tax treatment is usually justified as being fiscally neutral[178] – a transfer of tax receipts from the present to the time of receipt of pension income. Even if this fiscal neutrality argument is no longer true, as may be the case for the compliance and administrative costs of corporate sponsored schemes, the use of pension schemes may still help to counteract a short-term approach to saving as the funds are inaccessible until pension age has been reached. It is younger pension savers who benefit most from this concession as they have longer accrual periods; and, when the scheme design is personal, such as most DC schemes are, provides direct incentives for them to save more. In terms of final pension, periods of non-saving are more significant if they occur earlier, say during the first decade of employment, rather than later, during the last decade of employment. It should also be noted that, with the increase in price of an individual's principal private residence being exempt from taxation, modification of this investment accrual concession would increase the attractions of residential housing for an individual and mostly likely divert further savings to that form of asset.

This system of pension taxation, known as EET[179], is not without its critics. It is amongst the most expensive of the possible forms and exacerbates inequalities[180]. With progressive personal taxation, the high earners benefit most, yet this group is the wealthiest and most able to provide for itself without such concessions. These incentive effects are visible in the participation rates of individuals by income decile in voluntary funded pension schemes. Only 8% of the poorest tenth are covered, while 70% of those earning most, in the top decile, are covered. In the UK, there are also noticeable age differences – 26% of the 20 to 24 year-old age group has individual or occupational pensions, a figure which rises to 54% in the 45 to 54 year-old age group.

As pensions are a form of long-term saving and investment, the importance of even small levels of taxation on accruals cannot be over-emphasised.

Investment

There is no better practical introduction to investment and financial markets than that provided by J.M. Keynes[181]. The subsequently developed capital asset pricing models and theories of efficient markets have all been found severely lacking in the recent crisis, as well as in many academic critiques. This introduction is necessary to ensure comprehension of the potential

consequences of over-reliance upon financial markets, rather than as a prelude to some fabulous investment strategy.

"It happens, however, that the energies and skill of the professional investor and speculator are mainly occupied otherwise. For most of these persons are, in fact, largely concerned, not with making superior long-term forecasts of the probable yield of an investment over its whole life, but with foreseeing changes in the conventional basis of valuation a short time ahead of the general public. They are concerned, not with what an investment is really worth to a man who buys it "for keeps", but with what the market will value it at, under the influence of mass psychology, three months or a year hence. Moreover, this behaviour is not the outcome of a wrong-headed propensity. It is an inevitable result of an investment market organised along the lines described. For it is not sensible to pay 25 for an investment of which you believe the prospective yield to justify a value of 30, if you also believe that the market will value it at 20 three months hence."

Since Keynes wrote this, markets have become even more short-term in their outlook. The average holding period, previously measured in years, is now measured in months. This trend towards short-termism is global. High frequency, algorithmic traders, pure speculators in Keynesian terminology, now dominate equity market trading, accounting for 30% to 60% of all activity by some estimates[182]. Make no mistake: high frequency trading is pure speculation from which no productive return is assured, or expected. The problem for the long-term is investment, the selection and management of assets whose value is fundamentally determined by their productive returns. At these short horizons, price volatility will dominate income, even though academic studies demonstrate that long run performance is dominated by dividend yields[183].

"Liquidity has a cost – if it did not, all assets would be liquid."

"Thus the professional investor is forced to concern himself with the anticipation of impending changes, in the news or in the atmosphere, of the kind by which experience shows that the mass psychology of the market is most influenced. This is the inevitable result of investment markets organised with a view to so-called "liquidity". Of the maxims of orthodox finance none, surely, is more anti-social than the fetish of liquidity, the doctrine that it is a positive virtue on the part of investment institutions to concentrate their resources upon the holding of "liquid" securities. It forgets that there is no such thing as liquidity of investment for the community as a whole. The social object of skilled investment should be to defeat the dark forces of time and ignorance which envelop our future. The actual, private object of the most skilled investment to-day is "to beat the gun", as the Americans so well express it, to outwit the crowd, and to pass the bad, or depreciating, half-crown to the other fellow."

The short- and long-term liquidity needs of funded pension schemes are known with high certainty, making liquidity central to the investment of those funded pension scheme funds. Investment should, therefore, be for the long-term and capture the liquidity premium. Liquidity has a cost – if it did not, all assets would be liquid. The liquidity premium is time variant in amount. This implies that derivatives contracts, with their collateral provisions that introduce the potential of immediate calls for liquidity, should be avoided. The institutional design of DB pension schemes reduces dependence upon markets. Pension payments may be provided fully or in part from the contribution inflows of currently active members, allowing minimisation of the disturbance to investment portfolios. A significant risk is internalised. The amount of payments is also material: a scheme which pays the full lump sum at retirement (which may be used externally for annuity purchases) is inferior to one in which pensions are paid directly over an individual's lifetime in retirement.

"This battle of wits to anticipate the basis of conventional valuation a few months hence, rather than the prospective yield of an investment over a long term of years, does not even require gulls amongst the public to feed the maws of the professional; — it can be played by professionals amongst themselves. Nor is it necessary that anyone should keep his simple faith in the conventional basis of valuation having any genuine long-term validity. For it is, so to speak, a game of Snap, of Old Maid, of Musical Chairs — a pastime in which he is victor who says Snap neither too soon nor too late, who passes the Old Maid to his neighbour before the game is over, who secures a chair for himself when the music stops. These games can be played with zest and

enjoyment, though all the players know that it is the Old Maid which is circulating, or that when the music stops some of the players will find themselves unseated."

> ***"By focusing on the here and now of valuations and deficits regulation introduces a short-term dependency into the investment management process which is highly inefficient."***

Keynes poses a direct challenge to the use of market prices as the basis for long-term valuation. In pathological extreme, what is the meaning of a market price today with respect to some time, thirty years, forty years or even more in the future, when a fund may need to sell part or all of this asset? By focussing on the here and now of valuations and deficits regulation introduces a short-term dependency into the investment management process which is highly inefficient. Regulation creates the illusion that these valuations are meaningful and introduces the prospect of inducing actions which serve to reduce the variability of the valuation rather than maximise the likelihood of achieving the promised pension payments. Too many of today's popular 'risk management solutions' are concerned with the former at the expense of the latter. Such solutions offer time-inconsistent strategies to combat problems which only arise from time-inconsistent policies and practices; the recent PPF *"Long Term Strategy"* is a prime example.

"Or, to change the metaphor slightly, professional investment may be likened to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole; so that each competitor has to pick, not those faces which he himself finds prettiest, but those which he thinks likeliest to catch the fancy of the other competitors, all of whom are looking at the problem from the same point of view. It is not a case of choosing those which, to the best of one's judgment, are really the prettiest, nor even those which average opinion genuinely thinks the prettiest. We have reached the third degree where we devote our intelligences to anticipating what average opinion expects the average opinion to be. And there are some, I believe, who practise the fourth, fifth and higher degrees."

Keynes makes it absolutely clear that risks are endogenous to market price formation and starkly non-linear in nature, unlike the widely used models of modern finance which are overwhelmingly linear and short-term. His description also suggests that systems approaches, rather than analytical methods, are the appropriate technique for analysis.

"If the reader interjects that there must surely be large profits to be gained from the other players in the long run by a skilled individual who, unperturbed by the prevailing pastime, continues to purchase investments on the best genuine long-term expectations he can frame, he must be answered, first of all, that there are, indeed, such serious-minded individuals and that it makes a vast difference to an investment market whether or not they predominate in their influence over the game-players."

Markets initially dominated by long-term investors will be attracted to a fundamental equilibrium, while those dominated by short-term investors will be characterised as biased, skewed and volatile. Whichever dominates initially, however, will recruit ever more newcomers to its 'investment' model, perpetuating these short- and long-term differences. It seems that most markets are currently dominated by investors with short-term horizons rather than long-term investors. Keynes' earlier reference to the passing of a bad half-crown, of course, reflects Gresham's law that the bad will drive out the good. It appears that there is an analogue for financial markets more widely.

"But we must also add that there are several factors which jeopardise the predominance of such individuals in modern investment markets. Investment based on genuine long-term expectation is so difficult to-day as to be scarcely practicable. He who attempts it must surely lead much more laborious days and run greater risks than he who tries to guess better than the crowd how the crowd will behave; and, given equal intelligence, he may make more disastrous mistakes. There is no clear evidence from experience that the investment policy which is socially advantageous coincides with that which is most profitable. It needs more intelligence to defeat the forces of time and our ignorance of the future than to beat the gun."

It is, however, possible to demonstrate the effect of long- versus short-term 'investment' – in a recent speech[184], Haldane observed that a notional investment

of $1 made in 1967 and held for the long-term would have returned $2,650; while the returns to a momentum trader, practising a much-favoured short-term strategy, would have been just $75. These are returns of 20.6% and 10.8% respectively. Of course, neither considers the effects of fees, expenses, taxes or other frictions.

"It is clear that the sponsors of pension schemes should not fund liability commitments when real returns are low; in that circumstance the liability should be funded by borrowing at the date at which the pension liability payment comes due and payable."

"Moreover, life is not long enough; human nature desires quick results, there is a peculiar zest in making money quickly, and remoter gains are discounted by the average man at a very high rate. The game of professional investment is intolerably boring and over-exacting to anyone who is entirely exempt from the gambling instinct; whilst he who has it must pay to this propensity the appropriate toll."

It was interesting to note that after the financial crisis the commonly offered defence to conflict of interest accusations was market-based rather than investment-based, concentrating on the exchange itself rather than the purpose of the exchange. This misses the central point that the gains from trade in an economic sense arise from the resultant improvement in individual utility[185], not from any price movement.

"Furthermore, an investor who proposes to ignore near-term market fluctuations needs greater resources for safety and must not operate on so large a scale, if at all, with borrowed money — a further reason for the higher return from the pastime to a given stock of intelligence and resources."

This is a statement of the requirement for buffers or capitalisation to ensure that an institution is able to withstand the vagaries of markets. Insurance, of course, is a more efficient resolution of this problem of market volatility and unexpected real losses. The caution on the use of debt is interesting – obviously debt creates demands upon liquidity and increases the possibility of insolvency. However, although there is a prohibition on the use of debt by pension schemes in European law[186], there are many pension funds which have acquired securities specifically because they are intrinsically highly leveraged – hedge fund participations are a prime example. Of course, bank equity is similarly highly leveraged. The suitability of these investments is principally a question of whether they can sustain productive post-expense returns that are justified by their high levels of risk.

It is clear that the sponsors of pension schemes should not fund liability commitments when real returns are low; in that circumstance the liability should be funded by borrowing at the date at which the pension liability payment comes due and payable. For corporate sponsors, which can become insolvent in the interim, this inter-generational smoothing may be infeasible, which offers further motivation for the creation of institutions offering pension indemnity assurance. For the individual with limited borrowing capacity in retirement, the borrowing strategy is infeasible – another drawback of the DC form of retirement provision.

"Finally it is the long-term investor, he who most promotes the public interest, who will in practice come in for most criticism, wherever investment funds are managed by committees or boards or banks. For it is in the essence of his behaviour that he should be eccentric, unconventional and rash in the eyes of average opinion. If he is successful, that will only confirm the general belief in his rashness; and if in the short run he is unsuccessful, which is very likely, he will not receive much mercy. Worldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally."

The instances are legion of fund managers who defied conventional wisdom and were dismissed in consequence, even though subsequently they proved correct. The biases that the observation above builds into institutional fund-management behaviour are also worth a little thought. In part, markets only function because of the convention that, in pursuit of the gains from trade, much uncertainty is ignored. Consequently, cautions from risk managers will, in pursuit of the short-term, tend to be ignored and overridden in the manner of Cassandra's prophecies.

Regulations and accounting standards reinforce the tendency towards short-term management of pensions. A prime example of this problem can be found in the Chartered Institute of Public Finance and

Accountancy (CIPFA) guidance on application of the Myners' principles: "*Although returns will be measured on a quarterly basis in accordance with the regulations, a longer time frame (typically three to seven years) should be used in order to assess the effectiveness of the fund management arrangements and review the continuing compatibility of the asset/liability profile.*" Well intentioned, but what gets measured, gets managed[187]. Measuring what should not be managed is simply wasteful.

Keynes' comments on liquidity are particularly relevant for pension schemes and they are echoed by the Audit Commission report, which also notes the following pertinent characteristic, positive net cash flow: "*One approach is for LGPS[188] funds to seek higher long-term investment returns by adopting value investment principles, which seek out undervalued unfashionable assets and hold them for a long time. This is a well-established approach and there are some features of LGPS funds that make it relevant. The strong cash flow position means that LGPS funds can invest in assets with low liquidity; LGPS funds can afford to take the long view on investments rather than focusing on avoiding the short term ups and downs of the market.*" This approach brings into question some forms of investment, for example, hedge funds, where profits are, in theory at least, driven by the short term. Part of the problem with hedge funds is the corrosive effect of the high, returns-based fee structure. In fact, it can be argued that the investment might best be valued as an impaired asset, though obviously it can be redeemed at full market value. In a calculation attributed[189] to the actuarial consultants Hymans Robertson, just 37% of the gross returns of these hedge funds are retained by investors after ten years. Private equity is another area where such fees structures abound – a recent report from the Centre for the Study of Financial Innovation, *"Private equity, public loss?"* by Peter Morris casts considerable doubt on the performance of this 'asset class'.

The principal long-term concern of funded schemes must be the extent to which their investment actions influence the behaviour of financial markets. This concern is rooted in the inter-generational sale of assets to produce consumption income and the baby-boom demographic bulge. Mankiw and Weil[190] forecast an asset price meltdown due to these demographic influences. A number of empirical studies have found that demographic shifts have only muted effects on financial asset markets – for example, Poterba[191] in 2004. A more measured recent study of house prices by Elod Takats[192] of the Bank for International Settlements found minor but still significant demographic influence in asset pricing. In this report, the forecast downward pressure on UK house prices to 2050 is less than in other English-speaking countries, but still amounts to around 18%. It is interesting to note that Takats finds that demographic shifts did not contribute to the growth in UK house prices in the period 1970 – 2009.

"Regulations and accounting standards reinforce the tendency towards short-term management of pensions."

There is an international dimension to these demography-based asset price influence concerns. Housing is predominantly driven by domestic savings and developments while financial markets may be heavily influenced by the international setting. Indeed, Takats notes: "*If ageing affects asset prices, investors living in ageing (i.e. low return) economies should move their assets to more youthful (i.e. high return) economies until expected returns equalize. Indeed, Higgins (1998[193]) and later studies show that this is exactly what is happening: capital flows from ageing economies to relatively younger ones.*" It seems that international diversification may be motivated by more than the standard asynchronicity of business and monetary cycle arguments.

There is a related argument with respect to interest rates and the sustainability of debt finance. Lower asset prices will place upward pressure in the future on interest rates, making both government borrowing and household accumulation of housing assets more difficult. We have avoided general discussion of the econometric and international issues in these empirical studies due to their potential complexity. There are, however, some important caveats which should be borne in mind. In "*Demography, National Savings and International Capital Flows*", Higgins notes: "*the estimates are also influenced by the changes in the world age distribution which took place during the sample period. The effects of a given change in a country's own age distribution on, say, its current balance might be different when it occurs against the backdrop of a world population which is growing steadily older rather than*

steadily younger. Out-of-sample projections cannot capture the general equilibrium effects of a novel pattern of global demographic change.

Even so, it is possible to draw certain tentative conclusions by recalling that the world as a whole is a closed economy. A declining youth-dependency ratio (and the resulting slowdown in laborforce [sic] *growth) should act as a brake on world investment demand, while the increase in the share of prime-age adults should swell the supply of savings. The equilibrium of the global capital market should then lead to lower real interest rates."*

A further issue concerns the extent to which the short-term management of pension funds increases the volatility of financial markets and the compounded effect that this increased volatility has in diminishing growth. More volatile capital markets raise the cost of finance to industry, lowering economic growth. Regulation which induces short-term actions on the part of long-term investors increases this volatility and harms the long-term growth rate.

Financial markets are, and will remain, volatile and largely unpredictable. Deficits and surpluses are a fact of life for funded schemes and introduce the need for costly short-term hedging instruments when these are measured and managed in the short-term. Institutions are needed which are able to weather the short-term to enhance realised returns. Consider the effect of a 20% loss in value at time of sale for an investment which is returning 10% annually. The return that a pension scheme might achieve if sold after one year is -12%; after five years it is 5.2%; after ten years it is 7.6%; after twenty years it is 8.8%; and after fifty years it is 9.75%.

Pension Risks and Hedging

This paper has already touched on the complex subject of 'hedging' practices. For example, the life cycle investment model for savings plans such as DC arrangements[194] progressively allocates increasing amounts to fixed rate and other bonds. The arguments to support such a model include the lower volatility of bonds compared to equity; the increased need for income certainty as a worker approaches retirement; and even that life (and other) annuities are priced by insurance companies to reflect the available bond investments. However, if we progressively sell equities to buy bonds, we lower the returns available on those bonds and increase the costs of annuitisation. Another illustration: it is sometimes argued that state pension schemes should be funded and then invested overseas – which would reduce the scheme members' exposure to the state. It would also allow the state to pursue a mercantilist trade policy since the flow of capital overseas would have depressed the exchange rate and allowed the (predominantly private sector) exporters to thrive on the basis of price competition. The argument usually stops here, but the sting is in the tail. The export earnings cannot be repatriated, because if they are, the exchange rate rises and the competitive price edge is lost. So foreign reserves rise – and the ratings agencies upgrade the sovereign credit. But these reserves (and the original overseas investment) equate to deferred domestic investment and consumption, which means that the economy is operating at a fraction of its capacity, and in turn means that the state's ability to tax its residents and service its debt is more limited than need be.

Analytical risk management for assets uses just two techniques: hedging and diversification. Hedging consists of taking a position which is expected to act in a manner which differs from the asset of concern. The perfect hedge, of course, is the outright sale of the original asset. All other hedges inevitably leave open some level of risk exposure, known as basis risk. The case of using longevity indices is a prime example of basis risk – for most schemes, the idiosyncratic longevity risk of their membership can exceed substantially the risk evident in the index. It might help to think of hedging a single equity with the stock index – idiosyncratic risk in the single equity is substantial but it is precisely this risk which is diversified away in the index. Hedging, of course, is costly.

> ***"The sole risk faced by a DB pension scheme is sponsor insolvency."***

Diversification – division of resources among many investments – is perhaps the oldest[195] and most widely used risk management technique, though it is widely misunderstood in a financial context[196]. Systemic liquidity risk constitutes a real threat to the effectiveness of diversified strategies. As was evident during the recent financial crisis, when liquidity fails,

diversification strategies will also fail as all financial assets tend to move down together causally in these circumstances. In fact, most of the models of standard financial economics, such as those[197] that underpin the capital asset pricing model and modern portfolio theory, implicitly assume that liquidity is constantly available. Diversification, by lowering risk, increases risk-adjusted returns; the maximum return which can be earned, that is the highest return on any asset, is unchanged. Diversification is not without its critics; how many generals have been castigated for dividing their forces and losing battles and wars. This criticism is not the same as Mark Twain's advice[198]: "*Put all your eggs in the one basket and watch that basket.*" For long term investors however, diversification and lowered volatility do have one pronounced beneficial effect: the lower the volatility for a given arithmetic average return, the higher the geometric average return. With normally distributed returns, an asset with an arithmetic average return of 5% and volatility of 10% will return 4.5% as its geometric return; and an asset with a return of 8% and volatility of 20% will have a geometric return of 6%. These geometric returns are also known as certainty equivalent returns. Portfolio arithmetic returns decline linearly in the allocation weights away from the higher return asset. Only if it is possible to lower the volatility effect by more than this decline can the portfolio geometric return be raised above the geometric return of the asset with the higher certainty equivalent or geometric return. In practice, this phenomenon is simply not observed, and would, in any case, be small. This analysis suggests that the diversification we observe in actual portfolios is driven by risk aversion – in the short-term. However, for DB pension funds where the sponsor is the underwriter of all risks, the fund position is fundamentally one of risk neutrality[199], which is to say that it ought to be completely indifferent to volatility or risk.

The sole risk faced by a DB pension scheme is sponsor insolvency. This is therefore the only risk which it should attempt to manage. The sponsor faces just three risks – variation in longevity, variation in earnings and price inflation, which are related; these, together with length of service, determine the amounts of pension payments that are the sponsor's liabilities as deferred compensation. The investment performance risk, discussed earlier, is determined jointly with its commercial assets. The sponsor should, therefore, be the institution managing these risks[200], not the scheme or fund. The sponsor does not face any interest rate risk. As was noted earlier, this interest rate 'risk' is the variability of the present value estimate of liabilities not the liabilities themselves. Only if the sponsor is risk averse in the short-term[201] should it consider hedging this variability in interest rates. The long-term 'solutions', known as liability driven investment and sold usually to pension schemes, are fundamentally misconceived in this regard. The regulations on scheme funding – based as they are on current valuations and entailing demands for further contributions[202] when adverse developments arise – reinforce the sponsor's motivation[203] for hedging interest rate risk. This regulation actively encourages and 'rewards' time-inconsistent behaviour on the part of trustees and sponsor employers.

As was noted earlier, a company should only be concerned with longevity to the extent that exposure exceeds its ability to profit from a larger market in its ordinary commercial activities[204]. Another real risk to the sponsor wage inflation is within its control, though within the limits of competitive labour market pressures. Wage inflation is also driven at times and in part by retail or consumer price inflation. Non-monetary compensation can be important here as a risk mitigant. Retail price inflation is directly related to the prices charged for the goods and services produced by companies, of which the sponsor is one. The primary concern is whether the sponsor is producing intermediate or final goods or services, and the degree of competition in the markets for those goods and services. The point here is simply that all of these risks are partially internalised within the sponsor company and it is the company specific circumstances which determine the net exposure, on which hedging requirements and decisions may be made.

"There really are no circumstances in which it is in the interest of members to plunge a sponsor into insolvency."

The standard model of pension schemes is a highly efficient risk-sharing institution in its own right. Some of these risk hedging aspects are not immediately obvious, such as the role of international investments in a pension fund in hedging inflation risk. In the long run, foreign currency investments are very good hedges of domestic inflation risk. This phenomenon has been

raised in the academic literature to the status of a theory: purchasing power parity. There is much smoothing in the DB pension process – both contributions and pension payments occur repeatedly, eliminating single point in time dependencies for investment purchase and realisation. These recurrent payments are a form of dollar-cost averaging. The fixed fractional year of service award rate for members, in return for that member's contribution and the sponsor's contribution, endows the scheme with the property of risk-sharing among members. A young member will typically have a lower salary and lower contribution amount than an older member. This contribution is invested for longer for the younger member. By contrast the risk faced by a younger member with respect to his retirement income is far higher as it is more remote than for an older member. This inter-member sharing aspect has found expression in the term 'solidarity' in much of the pension literature. The collective nature of these schemes also lowers the idiosyncratic elements of risks, such as longevity, in a manner which cannot be achieved by the individual alone, but which also benefits the sponsor. In the jargon of economics, this is a positive externality. There are economies of scale associated with the collective scheme – fund management fees and safe custody charges are the obvious examples. Moreover, there are usually also economies of scope arising from the fact that some forms of investments may only be done at large scale.

In this DB arrangement the incentives of active scheme members are well-aligned with the sponsor employer. Even the existence of the PPF does not change this. There really are no circumstances in which it is in the interest of members to plunge a sponsor into insolvency. Active members, for example, lose both their jobs and some of their accrued pension benefits. Pensioners lose some of their future pensions, or at the least some of their pension security. Even deferred members will be disadvantaged because the scheme will not be funded to the level of full commercial buy-out. Prior to the advent of the PPF, regulation favoured pensioners in payment, with the result that disproportionate losses could be inflicted on active members close to retirement; this led to a considerable outcry concerning the inequity of treatment among scheme members. Only in rearrangements which are inequitable in the treatment between scheme and other creditors, and to the detriment of scheme members, does the possibility arise that the pension scheme trustees should press to formal insolvency. The Audit Commission report on local authority schemes noted that they are cash-flow positive – pensions currently being paid are less than contributions received in a period, which entirely eliminates any requirement to realise investments by sale in a market[205]. The extent to which this surplus cash-flow position will endure is determined by the age structure of the current membership and the hiring intentions of the sponsor employer which, of course, are related to the sponsor's prospects and likelihood of insolvency. It is perfectly possible in theory that a company sponsored scheme might reach a benign equilibrium in which the investment returns on the portfolio pool of savings and the contributions of active members remain perpetually in balance with pensions payable. In this situation, the inter-generational liquidation is entirely eliminated. It is not necessary that the scheme have the attributes of a Ponzi scheme, i.e. an ever-increasing recruitment of new members.

The one real problem for a pension scheme, of course, lies with sponsor insolvency; and pension indemnity assurance can fully resolve that.

'Risk-sharing' has also acquired a specific meaning with respect to the design of occupational schemes. While we have considered only the polar extremes of DC and full DB, there are many intermediate or hybrid arrangements possible. Among these is the Dutch variable indexation model, where the member is promised increases of pension in retirement which may not be delivered if the scheme's funding and resources are impaired. In essence, 'risk-sharing' is a misnomer. All such arrangements and their many permutations represent a transfer of risk from the pension institution to the individual; and lower pension incomes in adverse circumstances. The one variant absent from any such scheme is the possibility of true solidarity, under which pensioners with higher entitlements might forgo more than those with lower pensions.

"It is interesting that the contributions to DC schemes are consistently substantially lower than to DB arrangements."

Some[206] have suggested the annual purchase of single premium deferred (life) annuities from insurance companies as a way in which companies may avoid the underwriting of scheme residual risk, which would also eliminate the risks faced by pensioners. The problems are that this would provide the employee with a career-average rather than final-salary pension, and due to the additional costs of insurance-regulated security, a far lower retirement income than under standard DB arrangements.

> ***"Individuals may innately understand the high level of risk of DC and settle on a lower contribution; higher individual contributions to the 'sure thing' of DB should be expected."***

It is interesting that the contributions to DC schemes are consistently substantially lower than to DB arrangements. In the UK, the average contribution rate to DC[207]in large schemes totalled 9.6% of salaries consisting of 2.8% individual contributions and 6.6% employer contributions. Clearly this is grossly inadequate if the objective is a two thirds final salary retirement income. By contrast, with DB, the member contribution is 4.0% and the sponsor employer contribution is 16.5% totalling 20.5%; this is consistent with a two-thirds final salary objective. One possible interpretation of the differences between DC and DB schemes is that they reflect the relative risks and value for money perceived by the contributor and individual employees. Individuals may innately understand the high level of risk of DC and settle on a lower contribution; higher individual contributions to the 'sure thing' of DB should be expected. Employees should be able to negotiate a higher current wage than under DB given the lower current employer cost of DC. Further research is needed on the motivation of contribution levels by employers and employees.

The Supervisory Attitude to Corporate Occupational DB Schemes

The institutions created by the Pensions Act 2004 seem to desire the complete demise of voluntary occupational DB pension provision despite the fact that this was certainly not a stated objective in any government publication, parliamentary statement or debate at the time, or since. The recent PPF publication on its proposed long-term funding strategy is particularly informative in this regard. It states that: "*We will also work with the Pensions Regulator and others to reduce the level of risk to members' pensions in the UK defined benefit system.*" However, it is evident from subsequent paragraphs that the cessation of any further provision of this form of pension is an acceptable resolution of this risk exposure. The PPF paper notes: "*The trend towards closure of schemes to new entrants or new accrual is expected to continue, as is the increasing preference for defined contribution schemes as the solution to employer-sponsored provision.*" It goes on to state that: "*Current activity points to growth in pensions buy-out and buy-in activity that reduces risk to the fund.*" To the first of these points we would ask what the counterfactual might be: to what extent is this new-found 'preference' for DC the result of the regulatory regime in place? Pension buy-out by an insurance company does indeed limit the risk exposure of the PPF – it results in the closure and wind-up of the scheme. This view is further supported by the PPF's discussion of the projected ageing of scheme members which, of course, is a product of the closure of schemes to new members and new accruals rather than the demographic trend of an ageing population.

It now seems that the Pensions Regulator and the PPF have been economical with the truth when denying their influence over scheme investment strategy, as we conclude by highlighting the following observation from the PPF report:"*It is, however, likely that the impact of claims on the Fund will decline over time... Schemes are expected to participate increasingly in risk mitigation strategies such as funding triggers, and interest rate and longevity hedging.*"

Anyone who has read Sunstein and Thaler's[208] classic "*Nudge*" – which made a most compelling case for how government, when it designs systems, affects people's choices without resorting to compulsion – would recognise similar tactics being employed by the PPF.

> ***"It is a very strange form of medicine that regards the death of the patient as a satisfactory cure for an illness."***

The PPF publication, for all of its emphasis on 500,000 Monte Carlo simulations, is a classic illustration of the analytical approach to risk management rather than systems dynamics. It considers only one future – where corporate voluntary occupational DB pensions are confined to the history books. The formulas that result are exactly those which might be employed in the regulated run-off of a closed book of life insurance. The creation of the Pension Archive Trust, located at the London Metropolitan Archive, was just-in-time rather than a far-sighted development.

In "*Funding for the Future – a long-term funding strategy for the PPF*", the PPF states: "*We want to show that we are intent on becoming self-sufficient by the time the level of risk to the PPF from future insolvencies has reduced substantially.*" This time is indicated to be 2030. The main report states that "*self-sufficiency*" will mean "*being fully funded on a "risk-free" measure of liabilities, having zero exposure to interest rate and inflation risk, having zero exposure to financial market risk, and having acquired protection against residual risks such as longevity and residual insolvency risk.*"[209]

It is not obvious that this meaning to 'self-sufficiency' is at all necessary for their principal purposes: "*The primary purpose of the funding strategy is to enhance the clarity with which the Board can gauge the impact of market, insolvency and longevity events on the long-term direction of the Fund. By the same token, the monitoring framework will assist to provide a context for developments in our funding position in communication to external stakeholders.*"

The depth to which the inherent time inconsistency is ingrained is evident from the ordering of these risks. The heart of the proposal contained in this report is the accumulation of a surplus which will amount to some £8 billion by 2030. This figure is not explicitly stated anywhere in either of the two publications – the report itself or the accompanying 'factsheet' – but may be calculated from other statements. It is also not precisely obvious how they propose to accumulate this sum, but that is perhaps not surprising as the relevant legislation[210] simply doesn't envisage such a thing as a surplus.

It is a very strange form of medicine that regards the death of the patient as a satisfactory cure for an illness. This criticism is not new: Harrison, Byrne et al.[211], in their extensive 2005 survey paper "*Pyrrhic Victory? The unintended consequences of the Pensions Act 2004*", make the point well, stating that: "*There is no point in having the best regulation in the world, if there are no schemes left to regulate.*"

If the objective of government is the cessation of provision of voluntary private sector occupational pensions, it should say so. If not, it should not allow its civil servants to adopt policies and practices which ensure that this will occur.

Pension Indemnity Assurance

"Pension indemnity assurance draws on the two principal strengths of collective DB organisation: its long-term nature and the balance of cost underwriting by the sponsor employer."

The motivation for this form of insurance is that it recognises the beneficial nature of the classical collective DB pension scheme and encourages the continuance of provision in this manner. In terms of the economics and time inconsistency, this institution is a commitment device which enables credible pension provision. Too many of the so-called 'solutions' to aspects of defined benefit risk are inflexible, which reduces the adaptability, resilience and sustainability of a DB scheme; some, such as buy-out, are predicated on the scheme closing and being wound-up.

Pension indemnity assurance draws on the two principal strengths of collective DB organisation: its long-term nature and the balance of cost underwriting by the sponsor employer. It supplements the underwriting capacity of the sponsor, resolving the problem of post-insolvency funding; and in doing so creates an asset for the pension fund which lowers the cost of funding a scheme for the sponsor.

The policy is assurance of the scheme against sponsor insolvency. Unlike insurance, where a policyholder is protected against the consequence of an event which may not occur, assurance provides coverage against events which will occur but where the timing of that occurrence is uncertain. The assumption implicit in this form of insurance is that insolvency of the sponsor will occur at some future date. Pension indemnity

assurance can be viewed as a form of collective saving provision against this future event. The company and policy are very long-term in character – far more so than any other form of investment institution. To illustrate this point: a company, thriving today, may continue in business for thirty or forty years before succumbing to the pressures of commerce and at that time have a scheme with pension liabilities extending another sixty, seventy or eighty years – the assurance policy may have a life that extends for 120 years or more. The policy is cost-effective precisely because the investment horizons are this length of time – £1 of premium compounded at 1% over 120 years accumulates to £3.30.

A brief description of the policy is necessary to inform the discussion. On the insolvency of a sponsor the pension indemnity assurer steps in. It issues[212] individual life annuities to the members of the failed scheme and takes possession of the assets of the scheme. These annuities pay the full benefits entitlements[213] of members.

The investment horizon of the pension indemnity assurer is determined in part by the degree of funding of the scheme at the time of employer insolvency. The employer sponsor may be expected to fail in, say, 25 years, leaving a scheme which has a life extending to 75 years and is 80% funded[214]. As the pension indemnity assurer takes over the assets of the pension scheme, the risk which it faces, a shortfall of investments from which to pay members' pensions, occurs after sixty years. The investment horizon of the pension indemnity assurer is 85 years from inception of the policy. An annual premium of 1% of liabilities compounding at 1% per annum accumulates to 28.5% of liabilities by the time of sponsor insolvency, but to 51.8% of current liabilities at the time that the assurer faces a shortfall on the scheme assets.

Both parties must be committed for the long-term[215] and the policy must be based upon the liabilities of the scheme, with the premium set as a fixed proportion of the liabilities. This pre-commitment overcomes the problems of time-inconsistency that bedevil risk-based regulation. The fact that the assurer has a longer horizon than the sponsor or scheme gives this policy additional value as an asset of the scheme. Under current accounting standards, and most foreseeable, the sponsor employer would be required to report as a liability the commitment to pay future premiums – this liability would typically have a value of less than 10% of scheme liabilities. It is important to recognise that this liability is unfunded and is capitalisation of the sponsor covenant. The scheme would report an asset with a value which would typically be in the range of 15% to 30% of scheme liabilities[216]. Unlike the PPF arrangement, there are no sunk costs here. In fact, the presence of the policy lowers the sponsor employer's overall cost of pension provision, making it one of the most efficient service benefits the sponsor can offer. This makes the provision of pensions by the private sector unequivocally more efficient than supply by the state.

Incentives are well aligned under this pension indemnity assurance contract; when a sponsor company finds itself in difficulty, it is usually in the interests of the pension indemnity assurer, as well as the scheme, to work with the company with recovery in mind. This practice follows the principles and guidelines of the London Approach to insolvency and restructuring developed by the Bank of England. It also draws attention to another unique characteristic of pension indemnity assurance; unusually, this is insurance where the insurer may influence the timing of the insured event.

There is another aspect of the policy as an asset of the scheme which is beneficial to scheme and sponsor and which arises from its long-term nature: the policy value is contra-cyclical[217]. If the sponsor's credit standing worsens, the value of the policy as an asset of the scheme increases. If the level of scheme funding declines, the value of the policy as an asset of the scheme also increases. These contra-cyclical policy properties remove the need for any special contributions arising from the underwriting commitment of the sponsor firm. The policy reduces both the requirement for full funding of the scheme and eliminates the need to make special contributions when investment market developments prove adverse. This contra-cyclical property arises from the role of the assurer as a commitment device overcoming time inconsistencies and runs counter to those effects which stem from time inconsistencies.

Members' security is substantially enhanced as a double default is necessary – sponsor and assurer in sequence – before they experience harm to their pensions. And in the unlikely event of default of the pension indemnity assurer, the Financial Services

Compensation Scheme will compensate annuity holders at the level of 90% of their benefits. Of course, the term of the assurance is very long – so the question must arise as to whether the assurer will continue for that term. One of the possible answers to this potential problem would be to structure the pension indemnity assurer as an industry owned mutual[218], since we know that pension scheme liabilities stretch that far.

> ***"Pension indemnity assurance lowers funding costs, which reduces the cost of employers' pension tax relief to the Treasury by something of the order of £4 billion annually if all were to adopt it..."***

The assurer need not concern itself in any way with the investment strategy of the scheme. This allows the sponsor and trustees full freedom to pursue asset allocations which reflect the realities of the scheme and the commercial prospects of the sponsor. There is no moral hazard to the assurer in this situation as the sponsor employer bears the cost of benefits until insolvent. In fact, with the assurance in place, sponsor and scheme trustees may pursue more aggressive asset allocation strategies in the attempt to further lower funding costs, or even to increase benefits. These riskier strategies are only of marginal consequence for the assurer. With the premium based upon the scheme's liabilities, the sponsor employer is free to follow the benefits strategy that its feels is appropriate; and, with the lowered costs, might even choose to increase pension benefits.

Pension indemnity assurance lowers funding costs, which reduces the cost of employers' pension tax relief to the Treasury by something of the order of £4 billion annually if all were to adopt it, since the cost to the employer of both ordinary and special contributions, and their inherent tax subsidies, has declined. In addition, pension indemnity assurance would save the £1 billion of sunk costs due to PPF levies and compliance expenses. In fact, the PPF would become entirely redundant. The only barrier to pension indemnity assurance is that the legislation did not envisage or provide for it.

One thing is absolutely clear: contrary to the assumptions of the PPF, the provision by corporate employers of voluntary occupational pension schemes of defined benefit form need not be an anachronism.

Trust

In researching this paper, a search was conducted for papers and articles which reflected optimism about the future of pensions; just one was found – the July 2010 ILC-UK discussion paper by Dr Susan Sayce, "*Living Longer is a Good Thing! Ageing, Employers and Employment Rights*". It seems that most commentators and researchers are vying with one another to produce ever more doom-laden forecasts. This can only have negative effects on the public perception of pension schemes and pension institutions. The constant stream of negative thinking acts corrosively on public trust, confidence and sense of well-being. This greatly harms any initiative to promote an increase of savings.

The effect of this stream is relevant to questions of time inconsistency. Attitudes which are time inconsistent are not credible as they condition expectations. Expectations can be, as we know from monetary policy operations, all important as a channel for policy makers. There is evidence[219] that pension schemes are already responding to these negative influences; it appears that they are now bringing forward future experiences which they perceive as unpleasant in order to shorten the period of dread[220].

There have been a number of high-profile failures and incidences of fraud, such as Maxwell. As was argued earlier these have prompted a response from the regulatory authorities, but unfortunately one which is excessively costly. When we examine the high profile failures we notice several errors of omission and commission in regulation. The disproportionately poor treatment of active members, who could receive little or nothing of their pensions, in favour of full payment of pensioners on scheme wind-up, was an error of commission; while the failure to set credit standards – the principal risk to members – for companies permitted to offer occupational final salary schemes was a significant omission. Notwithstanding the fact that these well-publicised failures were intensely stressful for the affected members, the fact is that these failures account for a very small proportion of pension scheme members. We should not lose sight of the fact that many millions more pensioners have been very well-served by occupational pensions and lived happy and contented retirements.

"Many regulatory actions have served the pension industry poorly and further eroded trust."

Trust is a strange animal. If there is no risk of loss, there is no need for trust. Regulation which eliminates risk also eliminates the need for trust. In doing so, it introduces a major moral hazard; the belief that the state will always provide.

"We should not lose sight of the fact that many millions more pensioners have been very well-served by occupational pensions and lived happy and contented retirements."

The role of trust and the pension system has been much discussed in recent years; the Tomorrow's Company 2004 report, "*Restoring Trust – Investment in the twenty-first century*" noted that *"The current system is not serving customers or the end beneficiaries well, be they companies or individual investors: a failure to align with customer needs and timescales, and a lack of transparency and accountability, are eroding trust in the system."* One of the outcome objectives of the FSA's "*Retail Distribution Review*" is to develop: "*standards of professionalism that inspire consumer confidence and build trust*." Notwithstanding all the recommendations made, little seems to have improved.

Many regulatory actions have served the pension industry poorly and further eroded trust. For example, Harrison, Byrne et al., in their 2005 survey, list first among their findings: "*The Act* [Pensions Act 2004] *disconnects the historic alignment of the interests of trustees and the sponsoring employer. Respondents argued that the legislation significantly raises tensions between trustees and sponsoring employers, putting at risk their traditional conciliatory approach to negotiating scheme funding*." The effect of regulation is to question the usual commercial convention of agreement between men of good faith, impairing trust. In part this influence is a reflection of the form and tone of the missives produced by regulators and supervisors.

The recent InterAcademy "*Review of the Processes and Procedures of the Intergovernmental Panel on Climate Change (IPCC)*" provides a useful model template for considering the issue of trust, confidence and communication. The PPF Long-Term strategy publication expressed its confidence in the proposed strategy using likelihoods.

The IPCC review had the following to say on the likelihood approach: "*Authors were urged to consider the amount of evidence and level of agreement about all conclusions and to apply subjective probabilities of confidence to conclusions when there was high agreement and much evidence. However, authors reported high confidence in some statements for which there is little evidence. Furthermore, by making vague statements that were difficult to refute, authors were able to attach "high confidence" to the statements. The Working Group II Summary for Policy Makers contains many such statements that are not supported sufficiently in the literature, not put into perspective, or not expressed clearly. When statements are well defined and supported by evidence—by indicating when and under what climate conditions they would occur—the likelihood scale should be used*." These criticisms and cautions are clearly relevant in the context of publications emanating from the UK pensions supervisors and regulators. The InterAcademy review also cautions: "*Straying into advocacy can only hurt IPCC's credibility*." This advice applies to a much broader constituency.

Trust can be rebuilt, but that process will take time. Trust grows with continuing good experience; it is the result of a repeated game. But, inevitably, trust requires that individuals accept some risk to their pensions and retirement incomes.

Concluding Remarks

The issue of pensions is multi-generational. It requires thought and organisation for the very long-term and is thus at the frontiers of predictive capacity. Sustainable pension systems need to be adaptable and resilient to change.

We have tried to avoid the usual structural description of three pillars – state social security, occupational and private schemes – and any classification of schemes beyond the polar opposites of voluntary occupational DB schemes sponsored by employers and individual DC schemes. In part, this is driven by a desire to avoid the confusions that can arise from the detail of differences,

of which there are many. We have omitted discussion of insurance based pensions, where market segmentation and individual tax positions can be all important. We have tried to restrict our recommendations to those which are novel, those where error is evident and those where the debate is still open.

"The current compliance costs of regulation will, in the absence of change, result in the complete demise of voluntary UK corporate DB schemes."

We have described selective aspects of the history of pension provision in the UK; this is a reflection of the fact that this record conditions much of what may be achieved going forward. It may also help us to recall the lessons of history. We have discussed briefly some of the attributes of sustainable systems in an uncertain world. The current vogue for ascribing financial risk management failures to uncertainty[221] rather than risk deserves the caution attributed to Pascal: "*It is not certain that everything is uncertain.*" Forecasts may be wrong but they can still be useful[222].

Fashionable though 'sustainability' and its prediction are, the regulatory bodies and supervisors are prone to use inappropriate analytical methods and to settle on regulations which are inflexible and costly. This limits the resilience and adaptability of any system and may render it unsustainable. The current compliance costs of regulation will, in the absence of change, result in the complete demise of voluntary UK corporate DB schemes. Though this outcome conflicts with the proclamations of politicians of every hue, this appears to be an acceptable conclusion to the regulators and supervisors.

The UK has a low historic household savings rate; like it or not pensions need to be funded from savings, consumption of wealth. Currently reported measures of societal wealth are incomplete in important ways. It is clear that pension issues require joint consideration of income, consumption and wealth[223]. Perhaps the behavioural psychologists can help to overcome the Augustinian mindset: "*Give me chastity and continence, but not yet.*" Until they do, however, institutional structures and well-designed incentives are needed. The alternatives – state saving, international borrowing or inter-generational borrowing – are less efficient and are also much misunderstood. The two thirds final salary formula places the required saving level as being of the order of 20% of income over a working lifetime; further research is needed on retirement income and consumption sufficiency. Occupational provision can ensure an adequate level of savings from income. This 'retention at source' overcomes the problem that so many regard saving as a residual activity, to be made from what's-left-over, which only too often results in grossly inadequate saving. Occupational organisation also implies that employers in the private sector must play a significant role. Compulsion[224], in forms such as the state sponsored NEST, is unlikely to stimulate either further saving or any sense of individual ownership.

The savings adequacy problem is compounded by the fact that DC 'pensions' are just tax-advantaged savings schemes which leave the individual exposed to risks which are unmanageable. Collective arrangements are superior as cost-effective risk-pooling mechanisms. When organised in mutual or co-operative form, they reflect and respect the public good aspect of pensions and introduce meaningful solidarity.

Society is ageing and the population is experiencing longer, healthier lives, a trend which seems set to continue. Fertility and migration trends also affect the demographic landscape. The simplest manner in which to deal with increased longevity is to allow the age of retirement to rise and to encourage retirement to become a process rather than a point in time event. There is much research to be done on the determinants of labour participation rates across ages and sexes. Labour productivity is part of this, but productivity more generally also needs insightful work. The question of economic growth has been challenged by the ecological and environmental champions, but it is perfectly possible to achieve economic growth with the limits of ecological and environmental sustainability.

"Until we are able to understand the productivity of the state sector more thoroughly, it is perhaps best to limit its role to the social welfare function of protection of the unfortunate and incapable – the provision of a basic safety net."

Retirement and working age incomes are related[225]. Income and wealth are distributed very unevenly in the UK[226], an observation of significance to our argument since income inequality is related to many other issues

such as health and longevity[227]. Tax incentives for pension provision should not be allowed to perpetuate and exacerbate these inequalities. This tax policy is less a social welfare, redistribution agenda than a desire to avoid a 'lock-in' attitude which resists change and constrains adaptability[228].

> ***"An inappropriate culture of short-termism pervades the world of pensions, in large part due to an over-reliance on markets."***

Until we are able to understand the productivity of the state sector more thoroughly, it is perhaps best to limit its role to the social welfare function of protection of the unfortunate and incapable – the provision of a basic safety net. However, the existing benefits arrangements are grossly over-complex, resulting in basic state pensions that are lamentably insufficient. Simplification could allow higher pensions at the same overall cost. The state also has a role in occupational provision, as an employer. Pension provision should be considered, as it is in the private sector, as part of the overall compensation package offered for employee service. It is unnecessary and inefficient for pension schemes to have funded form.

An inappropriate culture of short-termism pervades the world of pensions, in large part due to an over-reliance on markets. This culture is evident in the accounting standards, which need revision. It is evident from the focus on scheme funding. It is evident from the disproportionate amount of time now dedicated to consideration of pension issues by managers and boards of directors[229]. It is also evident in the calls for the creation of a market in longevity and the fixation upon risks more generally. Much of the hedging of 'risks' is misguided and serves only to raise costs and shorten horizons. Nowhere is this more evident than in the regulation of pensions.

Collective risk-pooling and sharing arrangements are efficient. The DB occupational structure is particularly so; when augmented by insolvency indemnity assurance, the DB structure is both flexible and resilient. The introduction of industry mutual schemes would go far in resolving the problems of portability and mobility of part-time and casual workers.

Above all it is time to recognise that the UK pensions system has served many millions well and will continue to do so, even in the absence of change. If the proposals we have suggested seem only evolutionary, rather than revolutionary, that is a reflection of a system which has evolved slowly. In the immortal words of Sir William Beveridge[230]: *"The scheme proposed here is in some ways a revolution, but in more important ways it is a natural development from the past. It is a British revolution."* The elements added to pension scheme management in recent years include oppressive, overly costly regulation and an over-emphasis on 'risk' and hedging. It is these aspects which are unsustainable.

Perhaps the EU "*Green Paper on Pensions – A Vision of the Future*" is the place to redress the balance, given that its first stated objective is: "*To ensure adequate and sustainable pensions.*" Though the problems of pensions are very long-term in nature, the debates on pensions really are timeless.

For those adherents to the conventional view of pensions, the 1650 pleading of Oliver Cromwell seems appropriate at this point: "*I beseech you … think it possible you may be mistaken.*"

And if…

… it comes to pass that the popular view is closer to correct than that offered here, then we should take heed of Alexander Hamilton's 1790 remedy[231]: "*Those who are most commonly creditors of a nation are, generally speaking, enlightened men; and there are signal examples to warrant a conclusion that when a candid and fair appeal is made to them, they will understand their true interest too well to refuse their concurrence in such modifications of their claims, as any real necessity may demand.*" The problem, of course, is establishing, beyond reasonable doubt, real necessity.

Omissions

This paper is incomplete in many regards, overwhelmingly in areas where we could add little to existing knowledge and discussion. As brevity has much to commend it, we have omitted extensive repetition of widely known arguments on subjects as well-trodden as migration[232] and as obscure as trends in

marriage. We have tried to limit the discussion here to those areas where understanding is absolutely necessary or where others seem to have gone off track; for example, the now nearly-universal assumption that an ageing population is unequivocally bad in economic terms, or the use of approximations which can severely mislead, such as simple dependency ratios. Many other issues have been introduced but left for the reader to pursue further elsewhere; this is particularly true of the systems methods that may be fruitfully employed by analysts and enhance our understanding of pensions materially. It is also true of areas such as taxation, where entire volumes might be produced (indeed, have been). Some issues, such as the much-discussed migration due to high taxation from developed nations, we have omitted, usually because these are either entirely insubstantial or lacking in empirical support. There are, in all likelihood, further omissions arising from the shortcomings of the author. Our hope – beyond a desire to see sustainable pensions – is well contained in three other lines from the lyrics of the Fleetwood Mac song from which we took our title: "*If it takes just a little while, Open your eyes and look at the day, You'll see things in a different way.*"

1 We do not consider alternative institutional forms for firms in this paper. The 2009 Demos booklet "*Reinventing the Firm*" by William Davies provides a good introduction to that topic.

2 The legal form of Trusts and Foundations can, in effect, be established such that they exist sine die.

3 Some elements were not finally abolished until 1967.

4 This is not intended to be exhaustive or exclusive. A quotation attributed to Brecht is appropriate: "*Change happens because things can always be different or because they are as they are.*"

5 Arthur C. Clarke, 'Hazards of Prophecy: The Failure of Imagination' in the collection *Profiles of the Future: An Enquiry into the Limits of the Possible* (1962, rev. 1973).

6 Leigh Brackett, 'The Sorcerer of Rhiannon', *Astounding* (February 1942).

7 R. Filmer, *An Advertisement to the Jurymen of England, Together with A Difference between an English and Hebrew Witch*, (1653) Reprint, R. Royston, London (1975).

8 F. Kydland & E. Prescott, *Time to Build and Aggregate Fluctuations*, Econometrica (1982). In this paper Kydland and Prescott show that technological change is very strongly associated with both growth and fluctuation of the economy.

9 It is generally accepted that weather is a chaotic system.

10 John Hajnal, 'The Prospects for Population Forecasts', *Journal of the American Statistical Association* (June 1955). In addition to these three most general points he also argued: "4) *that simple unpretentious short term projections should be used to meet most practical needs for population forecasts;* 5) *that greater flexibility and variety in forecasting births need to be developed.*"

11 Among the more startling illustrations of this might be the restitution of property litigation in Eastern Europe or the pursuit of the current Chinese government for compensation in respect of the defaulted bond obligations of former Chinese regimes by bondholders in the US courts.

12 These should not be confused with generational accounting – which we discuss later.

13 In much of the literature on ageing and pensions there is also an implicit assumption of independence between age structure, fertility and mortality; though the Easterlin hypothesis, for which there is considerable empirical support, states that an unusually large age group will exhibit low fertility.

14 There is a long history of philosophical debate surrounding this aspect, from Burke's assertion: *"Each generation is independent of the one preceding",* to Jefferson's: *"The earth belongs in usufruct to the living"* – usufruct meaning use and enjoyment from property not owned. These are the central issues to the ecological and sustainability debates.

15 A.M. Basu, 'Towards an Understanding of the Emotions in the Population of 2300' contained in the UN's publication *World Population to 2300* (2002). Basu provides an introduction and survey of work on the topic of emotions.

16 M. Weber, *The Protestant Ethic and the Spirit of Capitalism*, Charles Scribner (1958). Easterlin, for example, argues that the early emergence of the north European states in the industrial revolution was due to a combination of education and protestant tradition.

17 K. Marx, *The 18*th *Brumaire of Louis Bonaparte* (1852), International Publishers (1963).

18 J. Scott, D. Alwin & M. Braun, 'Generational changes in Gender-Role Attitudes: Britain in a Cross-National Perspective', *Sociology* (1996).

19 Assimilation is an important aspect of migration. For a good introduction to, and discussion of, the issues associated with migration see A. Evans, B. Jones & D. Stevens, *Migration in An Age of Uncertainty* (2010).

20 The academic time inconsistency literature distinguishes between rules and discretion in a number of contexts – rules are often referred to as optimal, 'pre-committed' or simply as a dynamic optimisation problem, while discretionary policy is described as 'inconsistent', 'cheating' or 'short-sighted'. In this essay we refer to time inconsistency in all of these contexts. See F. Kydland and E. Prescott, 'Rules rather than discretion: The inconsistency of optimal policies', *Journal of Political Economy* (1977); R. Barro & D. Gordon, 'Rules, Discretion and Reputation in a Model of Monetary Policy', *Monetary Economics* (1983); and O. Blanchard & S. Fischer, 'Lectures in Macroeconomics', *MIT Press* (1989).

21 Though this topic has been touched upon previously by many, the generally accepted first formal paper is by F. Kydland & E. Prescott, Op. Cit. Time inconsistencies refer to the situation in which a decision-maker's (policy maker) preferences change as time passes. They are usually associated with a change in the situation immediately faced. The too-big-to-fail nature of some banks is one well-known example of the problem. The 'We will let you fail policy' is not credible precisely because, in the heat of crisis, it is not followed. There are other more specialised meanings of the expression – for example, in game theory it is usually expressed as dynamic inconsistency, while in the behavioural finance literature it has a range of meanings. The time inconsistency implicit in current accounting standards is explicitly described later in box 4: Pensions Accounting.

22 As currently applied, there is an intrinsic problem with risk-based regulation – time inconsistency.

23 Author's calculations based upon published US Coast Guard spills size data.

24 This is an echo of earlier writings. The author first came across this expression as a decorative wall-hanging in 1973 in the office of an employee of the UK Crown Agents for Overseas Administration in Bandar Abbas. It was attributed as an old Arab proverb.

25 'Ruin theoretic' approaches to quantitative risk management, such as value at risk, are well-known to be time inconsistent. Time inconsistency also extends to modern school actuarial valuations for pension schemes. It can be demonstrated that time consistent processes are non-stationary, which carries the implication that the standard stationarity assumption of such analytical risk modelling is invalid.

26 W. Baumol, 'An Expected Gain-Confidence Limit Criterion for Portfolio Selection', *Management Science*, Volume 10 (1963).

27 Risk may be viewed as the product of the likelihood and consequence of an event.

28 The precise definition of risk we favour is: risk is a subset, having at least two dimensions, likelihood and consequence, of the temporally uncertain events set, partitioned or defined by our preferences.

29 R. Gordon & H. Varian, 'Intergenerational Risk Sharing', *Journal of Public Economics,* Volume 37 (1988).

30 Though technically otherwise redundant, in the illustration of an intergenerational model shown later in boxes 1, 2 and 3, the transfer of common or state wealth between generations can be threatened with partial consumption by older generations in the event of defection or abrogation of the compact by a subsequent generation. It is not necessary that the compact be self-enforcing, even though it usually would be.

31 The related concept of common knowledge, which underpins much of games theory, does not carry these pejorative connotations, but can be disturbingly counter-intuitive in model application; for example, long delays before actions occur which reflect commonly known reality. For an application of this concept in the context of markets and the financial crisis, see C. Keating & B. Marshall, *Trust and Markets*, Brighton Rock Group (2010) available from www.BrightonRockGroup.co.uk

32 As early as 1924, A.L. Bowley projected that the UK population would be stationary by 1971. Other authors holding this view were Grace Leybourne, Enid Charles and, perhaps surprisingly, Richard Titmuss.

33 European Commission Green Paper, *Towards adequate, sustainable and safe European pension systems* (2010).

34 D.H. Meadows, D.L. Meadows, J. Randers & W.W. Behrens III, *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*, Potomac Associates (1972).

35 For a good introduction to the topic of systems dynamics see D.H. Meadows & D. Wright, *Thinking in Systems: A Primer,* Earthscan (2009).

36 D.H. Meadows, D.L. Meadows & J. Randers, *Limits to Growth: The Thirty Year Update,* Chelsea Green Publishing (2004).

37 G. Turner, *A Comparison of the Limits to Growth with Thirty Years of Reality* Working paper, Commonwealth Scientific and Industrial Research Organisation (CSIRO) (June 2008).

38 Though very widely cited, this may be apocryphal. No primary source for it could be found.

39 2020 Public Services Trust, an initiative of the Royal Society of Arts, actually took as its starting point "*a conviction that our current public services settlement is unsustainable in the face of huge demand and behavioural challenges.*"

40 G. Marini & P. Scaramozzino, 'Intergenerational Transfers and Growth', *Finance, Research, Education and Growth*, ed. L. Paganetto & E. Phelps, Macmillan (1997).

41 P. Samuelson, 'An Exact Consumption-Loan model with or without the Social Contrivance of Money', *Journal of Political Economy* (1958). Notwithstanding the opaque title, this paper is regarded by most economists as the seminal paper in modern pension economics.

42 J. Conesa & C. Garriga, *Optimal Response to a Transitory Demographic Shock in Social Security Financing* Working Paper 2007-041A, Federal Reserve Bank of St Louis (2007).

43 The incentive effect of this element is most interesting – tax discrimination by age has not been widely discussed.

44 The fallacy of composition is that what benefits one necessarily benefits all, which does not necessarily hold true. For example: a spectator at a football match who cannot see the action while seated, so he stands and this resolves his problem; but, if all stand, the situation reverts to one similar to that where all were seated.

45 See the work of Andrew Haldane at the Bank of England.

46 Early in the author's career, one of his mentors, Herbert Cherrill, offered the following advice: "*Never anthropomorphise financial markets; they have neither morals nor conscience.*"

47 Report of the Brundtland Commission, *Our Common Future*, Oxford University Press (1987).

48 J.S. Mill, *On Liberty* (1859), Penguin Books (1985).

49 This particular issue is considered at length in Ben Jupp's *Reasonable Force*, Demos (1998).

50 There are many arguments for compulsion in arrangements such as NEST; for example, the lack of individual financial education and cognitive capacity, the individual's use of inappropriate heuristics and the predatory and misleading practices of many providers of financial products. We can offer little that is new to this debate.

51 Technically, as pension contributions are deducted from salary at source, these borrowings are to fund other purchases.

52 See D. Harrison, A. Byrne, B. Rhodes & D. Blake, *Pyrrhic Victory? The unintended consequences of the Pensions Act 2004*, Pensions Institute (2005).

53 See www.labour-watch.com/cf.htm.

54 One of the more important differences between the public and private sectors is that the private sector is an open system, while most developed economies are effectively closed systems. Running a business is emphatically not like running a country and, as a consequence, some prescriptions that may be appropriate at the level of a business are completely inappropriate at the level of a country. One characteristic of closed real systems is that they tend to exhibit far stronger negative feedbacks and far fewer positive feedbacks than open systems. See P. Krugman, 'A Country is not a Company', *Harvard Business Review* (2009).

55 There is also recent research which suggests that some successful businessmen may have (self-controlled) psychopathic tendencies. Many of the more spectacular corporate collapses in history have been associated with autocratic management. There are a number of papers in the behavioural psychology literature which consider issues such as psychopathic behaviour in corporate affairs. See P. Babiak, S. Neumann & R. Hare, 'Corporate Psychopathy and the Law: Talking the Walk', *Behavioral Sciences and the Law* (2010) and B. Board & K. Fritzon, 'Disordered Personalities at Work', *Psychology, Crime and the Law* (2005).

56 UN, Op. Cit.

57 Population Reference Bureau (July 2010).

58 It is usual to describe this as first a financial revolution, occurring in the late 18th century, with capital markets coming to the fore, followed by an agricultural revolution, in turn an industrial revolution and finally a transport revolution. In *A Theory of Economic History*, Clarendon (1969) Hicks observes that, as the initial technologies were known prior to the commencement of the industrial revolution, the key new ingredient was explicitly the availability of capital in organised markets.

59 UN, Op. Cit.

60 P. Ogden & M-M. Huss, 'Demography and pronatalism in France in the nineteenth and twentieth centuries', *Journal of Historical Geography* (1982).

61 See R. Titmuss, *Poverty and Population: A Factual Study of Contemporary Social Was*te, Macmillan (1938) or the more balanced view of J.M. Keynes, *Some Economic Consequences of a Declining Population*, Macmillan (1919).

62 Her Majesty's Stationery Office (now The Office of Public Sector Information), *Population Panel Report*, Cmnd 5258 (1973).

63 UN Department of Economic and Social Affairs, *World Population to 2300* (first published 2002).

64 There is considerable academic debate as to the source or cause of this gender gap and, indeed, even whether women have consistently lived longer than men throughout history. However, obviously such a difference is important in the context of the costs of pension provision for women in both their direct beneficiary and spousal roles.

65 Office for National Statistics produces and publishes, together with the UK Statistics Authority, the majority of available UK statistics.

66 Payable from January 1909.

67 Sir Alfred Watson, "*The state is a master more feared than liked, may I say, with the Societies"*, Evidence by the actuary to the Royal Commission on the Aged Poor, cited also in J. MacNicol, *The Politics of Retirement in Britain, 1878–1948*, Cambridge University Press (1998).

68 *Report of the Select Committee on the Aged Deserving Poor* (1895). The Charity Commission oversaw the majority of Friendly Societies which were then the principal private collective means of sickness and pension provision.

69 This may have been a result of choosing the age of 65 as defining old age.

70 The response of Robert Knight, of the Boilermakers and Iron and Steel Shipbuilders Union, is particularly pertinent. He suggested that rather than paying pensions from the main commingled union fund, which might be endangered by an extensive strike, the union might create a separate state-audited superannuation fund as a condition of the introduction of state pensions.

71 The Friendly Societies, though perhaps rooted originally in the guilds and fraternities of the Middle Ages, were, in essence, mutual insurers providing sickness and death covers, such as burial expenses. The movement grew to such an extent that, by 1850, half the male population of England were members and by 1900 this had grown to some 5.5 million men. From the 1860s forward, there was considerable public concern over the financial stability of Friendly Societies following the collapse of a number of small societies. It could be argued that Friendly Societies were perceived as having failed. Further regulation ensued (Friendly Societies Act 1875), with the result that Friendly Societies are now only an extremely marginal provider of pensions. There is perhaps a lesson here that regulation can destroy the industry it seeks to make more secure.

72 This is not to say that pension schemes were entirely unheard of: the Chatham Chest for sailors from the Royal Navy was created in 1590, the Metropolitan Police scheme in 1829 and a (major) private sector employer, the Gas, Light and Coke Company, from which British Gas is descended, in 1842.

73 Prudent merely means rational and well-informed, rather than the conservatively biased interpretation of the term applied by the Pensions Regulator.

74 A tempo effect is defined as an inflation or deflation of the period incidence of a demographic event (birth, marriage, death) resulting from a rise or a fall in the mean age at which the event occurs.

75 This is the median value, rather than the mean, which is the simple average. Mean values are appropriate when distributions are symmetric or the quantity measured is ordinal. Median values are appropriate when the distributions are skewed – wealth is the obvious example, where a small number of people hold the majority with the result that the mean wealth is far higher than the median.

76 The term 'rectangularisation' has been employed by a number of actuaries to refer to the evident change in shape of the survival curve as time has passed.

77 There are two commonly reported measures of life expectation: period and cohort. Period measures the life expectation of a group of disparate age at a single point in time – the period life expectation at age 65 in a year, say 2010, is that of the 65 year-old at that time together with the 66 year-old in 2010 and so on. The cohort measure considers the life expectation at age 65 in 2010 and the life expectation of a 66 year-old in 2011, and so on. There are more sophisticated techniques – such as tempo-adjusted measures – designed to circumvent perceived failings of the basic measures. 'Tempo' measures correct for a bias in demographic projections of fertility arising from the later ages at which women are observed to have children. The changing mean age of childbirth distorts fertility estimates – it can be substantial at 0.2 children per woman higher than unadjusted estimates of fertility.

78 As would be usual in financial analysis.

79 See S. Scherbov, M. Mamolo & W. Lutz, *Probabilistic Population Projections for the 27 EU Member States Based on Eurostat Assumptions*, Vienna Institute of Demography (2008).

80 Club Vita is a UK longevity analytics service. Increases in the longevity assumptions adopted by pension schemes were initially overwhelmingly related to the fact that they had lagged behind experienced improvements in life expectation. Further increases were motivated by a desire to use assumptions which mirrored closely those used by insurance companies in bulk-annuitisation

pricing; and now it seems that some have moved beyond this to higher estimates, motivated, perhaps, by a desire to avoid further shocks.

81 Research conducted by the author suggests strongly that postcode at birth is a better predictor of longevity than postcode at retirement.

82 See J. Oeppen & J. Vaupel, 'Broken Limits to Life', *Science* (2002) and Olshansky, Hayflick, Carnes and others, 'Position Statement on Human Ageing', *Journal of Gerontology: Biological Sciences* (2002).

83 For an extensive discussion of the issues associated with the creation of financial markets for new risks, readers should see R. Shiller, *Macro Markets: Creating Institutions for Managing Society's Largest Economic Risks*, Oxford University Press (1993). Though Shiller considers the risk management issues for national income, he does not consider longevity.

84 Communication dealing with the impact of an ageing population in the EU (2009 Ageing Report), European Commission.

85 As the age range of childhood is usually considered to be birth to age 15, the working period (for men) from 16 to 65 and pensioners 66 and older, this would be a very strange dependency ratio which would oscillate wildly with the passage of time. If a population were uniformly distributed and these age partitions chosen, the total dependency ratio would, with death at 90, be (65-15)/(15 + 25) = 1.25.

86 There are other measures. For the UK the ONS calculates and publishes the economic support ratio – the number of people in employment aged 16 and over for every other person of any age, including children. These calculations are problematic in as much as unemployment is very difficult to forecast at long horizons.

87 The recent new standard, the European System of Accounts – ESA 1995 – is no better.

88 J. Crespo Cuaresma & W. Lutz, *Human Capital, Age Structure and Economic Growth: Evidence from a New Dataset*, International Institute for Applied Systems Analysis (IIASA) (2007).

89 See R. Lee & A. Mason, 'Fertility, Human Capital and Economic Growth over the Demographic Transition', *European Journal of Population* (2010).

90 Academic research on the relation between education and growth is rather mixed in conclusion. Micro-economic studies suggest a strong and substantial positive relation, but macro-economic studies find little evidence of a relation at all. In part this may be a question of the relative complexity of the analysis of these education and growth effects in a macro-economic setting. P. Stevens & M. Weale provide a survey and commentary for this body of work in 'Education and Economic Growth' in the *International Handbook on the Economics of Education,* eds. G. Johnes & J. Johnes, Edward Elgar (2003). It is particularly illuminating in its analysis of the role of education in the rapid adoption of new and available technologies.

91 Labour quality is a far broader issue than just the level of educational attainment; obviously there are many other factors, such as experience, which are relevant. One factor which is frequently overlooked is motivation.

92 A. Mason & R. Lee, 'Reform and support systems for the elderly in developing countries: Capturing the demographic dividend', *GENUS LXII,* Volume 2 (2006).

93 P. Samuelson, 'The optimum growth rate for population', *International Economic Review* (1975) and 'The optimum growth rate for population: Agreement and evaluations', *International Economic Review* (*1976).*

94 Pension preservation is now required of an occupational scheme in the UK. Members ceasing employment may have their vested rights preserved or transferred to another qualifying scheme.

95 The Central Government Superannuation Act 1934 established the civil service scheme and the Local Government Superannuation Act 1937 is self-explanatory – though there were other schemes established previously by Act of Parliament for specific groups, such as the Asylum Officers Superannuation Act 1909.

96 Capturing the black economy in the National Accounts, though desirable from the standpoint of tax collection, is not necessarily an unmitigated gain, as most of this income is spent on consumer goods and services.

97 The 2008 European Commission Demography Report projects that labour market overall participation rates will increase from the current 70.5% to 74% by 2060. However, they also foresee an aggregate decline of 19 million jobs in the EU.

98 European Commission Special Eurobarometer 317, *Discrimination in the EU in 2009* (2009).

99 This is not to say that the family or household is unimportant in inter-generational support; for many, this channel is more important than any benefits received from the state.

100 E. Wrigley, 'Fertility Strategy for the Individual and the Group' in *Historical Studies in Changing Fertility*, ed. C. Tilly, Princeton (1979).

101 *Reforming Public Sector Pensions,* Institute of Directors (2010).

102 Bank of England Industrial Dataset.

103 The political economy of pensions is important, but not discussed in any depth in this essay. The seminal work in this area is H. Aaron, 'The Social Insurance Paradox', *Canadian Journal of Economics,* Volume 32 (1966). A more recent discussion of the models and their empirical relevance can be found in V. Galasso & P. Profeta, 'The political economy of social security: a survey', *Journal of Political Economy,* Volume 18 (2002). In terms of the various causal models, we have rather pinned our preferences to the mast with our front-cover quotation of Cicero; and there really is little that we may add to that field of research and debate.

104 See J. Stiglitz, A. Sen & J-P. Fitoussi, *Mismeasuring our lives: Why GDP doesn't add up* (2010) – available from www.stiglitz-sen-fitoussi.fr The foreword, written by Nicolas Sarkozy, places these issues in a political context and the authors' recommendations go far in designing a programme for research and analysis.

105 This question of intangible capital is a significant concern. A country's legal system, including enforcement, is a prime example. This is the framework which enables commerce to thrive – specialisation of production (which increases productivity) will not occur

in the absence of confidence that the exchange of goods and services can be effected on mutually agreed terms. This point has been widely overlooked by those who currently see sovereign restructuring as inevitable. See A. Mares, *Sovereign Subjects – Ask not whether governments will default but how*, Morgan Stanley Research (2010).

106 Wikipedia offers this description of public goods: "*In economics, a public good is a good that is non-rivalrous and non-excludable. Non-rivalry means that consumption of the good by one individual does not reduce availability of the good for consumption by others; and non-excludability that no one can be effectively excluded from using the good. In the real world, there may be no such thing as an absolutely non-rivalled and non-excludable good; but economists think that some goods approximate the concept closely enough for the analysis to be economically useful.*" In addition, some of these goods are unavoidable in the sense that if anyone consumes them, all must.

107 J. Pitzer and J-P. Dupuis, *The General Government and Public Sectors*, paper presented at the fifth meeting of the Task Force on Harmonization of Public Sector Accounting (TFHPSA) (2004).

108 In fact the state is unique in another regard – the imposition of taxes on a population creates a demand for legal tender to pay them, the currency that the state itself issues.

109 This is the title of a paper – P. Krugman, 'A Country is not a Company', *Harvard Business Review* (2009) – which discusses the differences between countries and companies and many of the prevalent misconceptions more fully.

110 The belief that markets control state spending or borrowing is mistaken; any influence is a case of voluntary submission by the state, usually in order to maintain the ability to borrow internationally.

111 C. Burnside, *Fiscal Sustainability in Theory and Practice – A Handbook*, World Bank (2005).

112 N. Kocherlakota & C. Phelan, 'Explaining the fiscal theory of the price level', *Federal Reserve Bank of Minneapolis Quarterly Review*, Volume 23 (1999).

113 M. Woodford, 'Fiscal requirements for price stability', *Journal of Money, Banking and Credit*, Volume 33 (2001).

114 J. Cochrane, 'Money as Stock', *Journal of Monetary Economics*, Volume 52 (2005).

115 The issue of tax-advantaged saving and bequests is covered later.

116 The phenomenon whereby older people securitise their homes (or other property) is a form of reversionary funding that has been available (if uncommon) in England for many years. It is much more common in other countries, such as France, where the practice is known as 'vente en viager'.

117 There is an issue with the possible effects of a smaller working population on housing demand – crudely put, where does the demand for housing arise that justifies high prices?

118 It is interesting to note that administration expenses reported for local government schemes are far lower than this – they are not subject to the onerous Pensions Regulator and PPF requirements. For example, the Medical Research Council reports a total expense ratio of just 0.38%.

119 M. Green, *Comments from a Grumpy Old Trustee*, Presentation delivered at the SPS Pension Conference (2010).

120 These were sufficiently substantial following the introduction of the Pensions Act 2004 that HMRC adjusted the tax-relief so that these tax concessions are now spread over four year periods rather than taken entirely in the year paid.

121 Figures reported in UK Public Sector scheme resource accounts use the FRS17 accounting methodology, applied in accordance with guidance approved by the Financial Reporting Advisory Board (FRAB) for pension schemes funded directly by Central Government; or the Chartered Institute of Public Finance and Accountancy (CIPFA) for the pension schemes for police and fire fighters. Funded local government schemes follow CIPFA guidance. The discount rates used for pension schemes reporting under FRAB guidance was recently lowered to 2.8% above price inflation, compared to 3.5% above price inflation for the previous estimate. For schemes reporting under CIPFA guidance, the discount rate was around 1.6% above price inflation, compared to around 2.4% above price inflation for the previous estimates. The Treasury "*Green Book*" (2003) provides guidance to other public sector bodies on how proposals should be appraised before significant funds are committed; and how past and present activities should be evaluated. It is relevant to all appraisals and evaluations.

122 A. Rampini & S. Viswanathan, 'Collateral, Risk Management and the Distribution of Debt Capacity', *Journal of Finance* (forthcoming 2010).

123 G. Akerlof, 'The Market for Lemons: Quality Uncertainty and the Market Mechanism', *Quarterly Journal of Economics,* Volume 84 (1970). Akerlof discusses information asymmetry, which occurs when the seller knows more about a product than the buyer. It uses the market for used cars as an example of the problem of quality uncertainty – a low quality car is a 'lemon'. It concludes that owners of good cars will not place their cars on the used car market. This is sometimes summarized as 'the bad driving out the good' in the market, in the manner of Gresham's law for money.

124 This is a simplification. The level and shape of the yield curve is informative about forward interest rates and expectations of future liquidity.

125 The Office for National Statistics has produced a short explanatory paper entitled *"A Generational Accounts Approach to Long Term Public Finance in the UK" (2009)*. This notes, among much else, that the ONS has commissioned the National Institute for Economic and Social Research to produce a set of generational accounts for delivery to the Treasury and Office for Budget Responsibility to inform the 2010 Comprehensive Spending Review.

126 Introducing an international dimension changes nothing here; it merely makes the argument more opaque.

127 Return on equity, as proposed earlier, also varies with time but this variation is expressly related to the company's performance. Low rates of return suggest that a company is performing poorly and also that the burden of pension liabilities has increased.

128 Ex-ante, this problem is insoluble as neither the cash-flows nor the implicit discount rate are known, or knowable. Ex-post, when cash flows are known the implicit historic discount rate may be estimated.

129 There are a number of ways in which this estimation may be done – for example an equity risk premium of 1% above the AA corporate bond discount rate will result in a disparity of 28% for a scheme with an expected life of 25 years.

130 For example KPMG's Pension Accounting Survey (2010).

131 The time inconsistency in this context is sometimes referred to as 'procyclicality', the situation where high market prices suggest that a lower contribution is needed and low market prices suggest that a higher contribution is needed. Procyclicality compares directly with hedging strategies under the Black Scholes option pricing model where, to hedge a position sold, we buy more as prices rise in the underlying and sell as they decline.

132 The specific design of the insurance policy is important. Pension Indemnity Assurance eliminates the occurrence of the procyclicality rather than redressing its effects.

133 See F. Kydland & E. Prescott, 'Rules Rather than Discretion: The inconsistency of optimal planning', *Journal of Political Economy* (1977).

134 Note that the scheme still needs more than this as, post-insolvency, it stands alone and needs additional buffer capital resources.

135 Among the aspects of state schemes usually overlooked by those who contend that these are 'gold-plated' is the fact that members now contribute £4.4 billion annually to the schemes – if that were considered a purchase of gilts, it would imply that member contributions are an order of magnitude higher than the actual household saving in gilt form, which is currently only £9.3 billion. It is almost 1% of total government revenues or equivalent to 2p in the pound on income tax.

136 See H-W. Sinn, 'Why a Funded Pension System is Useful and Why It is Not Useful', *International Tax and Public Finance*, Volume 7 (2000).

137 It is interesting to note that in 2004 Eurostat made the decision to exclude DC arrangements from its classification of State Social Security systems.

138 The Courts, which serve to reduce the uncertainties of commerce and economic activity, constitute a most significant part of the national wealth. The legal system is explicitly a risk management institution.

139 By equal measure, the Solvency II regime would indicate similar levels for this buffer requirement. In fact, the Committee of European Insurance and Occupational Pension Supervisors (CEIOPS) has proposed, and is still proposing, that private DB pension schemes should carry these buffers.

140 Regulation makes surpluses irretrievable unless they exceed the Section 75 funding level. Below this, but above 100%, contributions may be withheld until the scheme position reaches 100%. The accounting regulations permit only recognition of surpluses that may be withdrawn.

141 The question of time in relation to funding or refunding has also come to the fore in the context of government securities markets. For example, the long-term profile of debt outstanding and the high short-term cash balances of the Republic of Ireland have allowed it to stop further borrowing when market interest rates have been unfavourable.

142 See C. Cowling, T. Gordon & C. Speed, 'Funding Defined Benefit Pension Schemes', *Institute of Actuaries* (2004). Current EU regulation (Institutions for Occupational Retirement Provision IORP Directive 2003) also advocates full funding of schemes at all times.

143 The relative productivity of investment choice is not trivial. It would involve also considering the positive externalities which arise from infrastructure investment. Rail transportation, for example, is an instance where these positive externalities – the beneficial spill-overs – can be significant.

144 The net effect is a matter of how the investment spending is distributed across the sectors of the economy and through time, together with the difference between public sector investment expenditure and private sector consumption expenditure.

145 The UK did, in fact, sell both public and private overseas investments during World War II.

146 The sale to succeeding generations raises cash but hoarding this, if all investments are sold at the commencement of retirement, can be very inefficient. Equally if realised as small annual sales, sufficient only to meet that year's consumption needs, the liquidation realisation can also be very inefficient.

147 Some (DC) strategies which purchase annuities at retirement may suffer from low, implicit post-retirement investment returns.

148 Actuaries would usually add the Finance Act 1956 (see text), the Health and Social Security Act 1984 (revaluation of non-GMP) and the Finance Act 1986 (excessive surpluses) to this list as significant to pension scheme evolution. In addition, the Social Security Act 1973 also introduced the concept of 'preservation'.

149 See A. Bozio, R. Crawford & G. Tetlow, *The history of state pensions in the UK: 1948 to 2010*, Institute for Fiscal Studies (2010).

150 Many other aspects were also incorporated – for example, the amount of lump sum cash commutations and absence of portability.

151 The politics of ageing is also relevant. Mark Field, MP for the Cities of London and Westminster, in response to a question suggesting that pensioners might be disregarded by government immediately answered: "*There are now twice as many people over 55 as under 35, and they are twice as likely to vote*." That a politician is even aware of these figures is telling.

152 *First Report of the Pensions Commission*, Turner Report (2005).

153 P. Pierson, 'Increasing Returns, Path Dependence and the Study of Politics', *American Political Science Review* (1997).

154 Of the two tax concessions offered to pension schemes in the UK, deductibility of contributions and exemption of investments from income and capital gains taxes, it is the latter which is usually the more significant determinant of the cost of pension provision. The fact that a pension is deferred compensation for service means that exemption as an expense would ordinarily

apply – the concession is simply one of timing. Unfunded schemes may be deducted as expenses at the time of payment of pensions.

155 It seems unlikely that the situation is fiscally neutral as only one ninth of employed higher rate tax-payers are also subsequently higher rate tax-payers in retirement.

156 The proposal to reduce inflation indexation to a consumer price index (CPI) basis, which is currently being discussed, would reduce this coverage by a further substantial amount – variously estimated at from 8% to 16%.

157 Unlike insurance, where the existence of a deductible in a policy is justified as it reduces problems of moral hazard and adverse selection, there are no such problems with DB schemes as the beneficiary is the member while the sponsor pays the premium costs.

158 This is explicitly recognised in the recent PPF "*Long-Term Funding Strategy*" which, for the first time, states: "*Indeed, the levy required to amortise an extremely large deficit beyond 2030 may be unsustainable given the expected reduction in the population of eligible schemes.*"

159 Independent Trustee Services Ltd. v Hope (2009).

160 *Occupational Pension Schemes (Winding Up and Deficiency on Winding Up) (Amendment) Regulations 2004*, SI 2004/403. The draft, with proposals for other measures, was published on 11 June, 2003. These regulations came into force and apply to all schemes which begin to wind-up on or after 11 June, 2003.

161 For further discussion see C. Keating, *No way to run a railroad*, available at www.SchemeXpert.com (September 2010).

162 It is interesting to note that government is aware of this time consistency problem. For example the Guardian quoted the following from among comments made by Nick Clegg, the Deputy Prime Minister, about the creation of the Cabinet Office 'Nudge Unit': "*The question is whether our capacity to balance the immediate with the long-term is keeping pace with the expansion of choice. In real life, people eat doughnuts, decide not to go for a run, and put off making payments into their pension fund. The economists say this means we are engaged in an 'irrational discounting of time'. The rest of us describe it as being human. The challenge is to find ways to encourage people to act in their own and in society's long-term interest, while respecting individual freedom.*" Perhaps the place to start is with reform of government's own time-inconsistent regulations.

163 There are two principal reasons for this difference in cost efficiency. First, in a DC scheme the individual has no sponsor support, unlike a DB scheme – the absence of support costs the insurance market 30% to 40% to address; second, within a scheme there is much risk-pooling, whereas an individual bears all idiosyncratic risks alone. There are, in addition, economies of scale in investment management and annuity purchase.

164 For an extensive examination of the costs and benefits of alternative arrangements see M. Johnson, *Simplification is the key*, Centre for Policy Studies (2010).

165 This decline of the scheme is a partial and progressive crystallisation of the risk position. Many other active interventions, such as closure to new members and accruals, also possess this crystalisation property. These interventions all impair aspects of the risk-pooling properties of DB schemes and raise costs of pension provision.

166 In 1993, the 15 hour a week minimum for membership of the Local Government Pension Scheme (LGPS) was removed following a European Court of Justice ruling (Barber v Guardian Royal Exchange Assurance Group [1990] ICR 616, ECJ case C-262/88) that occupational pensions were 'deferred pay' and therefore subject to the equality laws of the European Union.

167 Some caution is advised when comparing savings rates internationally. See R. Harvey, *Comparison of Household Savings Ratios*, OECD Statistics Brief No. 8 (2004).

168 T. Crossley & C. O'Dea, *The wealth and savings of UK families on the eve of the crisis*, Institute for Fiscal Studies (2010).

169 Excludes pension wealth.

170 R. Levine, 'Financial Development and Economic Growth: Views and Agenda', *Journal of Economic Literature*, Volume 35 (1997). This paper in essence considers the theory and evidence of the relations between finance, growth and development.

171 In Victorian society, funerals and memorials could be very elaborate affairs – as even a short visit to the municipal cemeteries built at the time would confirm.

172 Author's calculation.

173 This is actually a recent high – the number of taxpayers rose from 1997 onwards and peaked in this year (2007/8). The number of UK tax payers is now reported by HMRC as 30.5 million. Several papers have considered point in time (or cross-sectional) analyses, such as Volterra Consulting's 2009 paper for the Public Services Trust; and the Trade Unions Congress (TUC) 2010 paper "*Where the money goes: How we benefit from public services*". Both are based on the ONS annual redistribution of income study. The ONS also produced a study in 2008 which looked at the evolution of household income over the period 1977 to 2007. However, none of these studies can be considered complete.

174 There is a global project underway, the National Transfer Accounts project, but as yet it has not published anything on the UK.

175 The difference between members' and sponsors' contributions is reflected in the historical record – employer contributions became deductible from taxable income in 1918, but member contributions only became deductible in 1952.

176 Though not widely discussed, this tax exemption could be developed further to encourage long-term saving through time-progressive taxation; for example, scaled holding period rates.

177 In many regards the 'with-profits' pension policy is very similar to the Dutch variable indexation of pensions arrangement. It is participating and risk-sharing. The investment accruals on 'with-profits' policies depend upon the overall business performance of the insurance company. However, this accrual practice determines the fund available for annuity purchase at retirement and does not vary the subsequent pension in payment. Standard practice was for these accrual rates to be actuarially smoothed over years.

178 Some papers, for example Michael Johnson's (Op. Cit.) "*Simplification is the key*", have considered the amount paid in taxes on pensions received in a year with the tax reliefs received on contributions in that year. They find that the total sum of tax relief exceeds taxes paid. However, though this comparison does not invalidate the fiscal neutrality argument – that would require lifetime comparisons – it is strongly suggestive that the tax treatment is not fiscally neutral. In addition to the sunk costs elements mentioned earlier, the lack of fiscal neutrality is likely also a result of differing marginal rates of income tax between working age and retirement incomes. Only one in nine of those paying higher rate taxes during their working lives also pay higher rate taxes in retirement.

179 Exemption from income taxes for contributions, Exemption of Investment accruals and Taxable in pension payment – EET.

180 Based on HMRC figures, "*Simplification is the key*" reports the total net tax costs as: EET £27.1 billion, TEE £14.9 billion, ETE £29.9 billion and TTT £9.5 billion.

181 J.M. Keynes, *The General Theory of Employment, Interest and Money*, Cambridge University Press (1935).

182 See K. Swinburne, Draft Report o*n Regulation of trading in financial instruments – 'dark pools' etc.*, EU Committee on Economic and Monetary Affairs (July 2010).

183 See E. Dimson, P. Marsh & M. Staunton, *The worldwide equity premium: A smaller puzzle*, London Business School (2006).

184 A. Haldane, *Patience and Finance* Speech 445, Bank of England (2010). The speech ends with: "*Just as patience can ward off great disaster, impatience can ruin a whole life. Generations of dieters and addicts are testament to that. So too is finance, not least in the light of the crisis. It is important finance sticks to the patient evolutionary path. To do so, the fidgeting fingers of the invisible hand may need a steadying arm.*"

185 Utility in the context of this paper means maximisation of the pension receivable, rather than the value of an investment portfolio.

186 European Commission Directive on Institutions for Occupational Retirement Provision – 2003/41/EC.

187 Usually attributed to Peter Drucker.

188 Local Government Pension Scheme.

189 Technical Appendices *Local Government Pensions in England*.

190 N. Mankiw & D. Weil, 'The Baby Boom, the Baby Bust and the Housing Market', *Regional Science and Urban Economics*, Volume 19 (1989).

191 J. Poterba, 'Impact of Population Ageing on Financial Markets in Developed Countries', *Federal Reserve Bank of Kansas City Economic Review* (2004).

192 E. Takats, *Ageing and Asset Prices*, Bank for International Settlements (BIS) Working Paper 318 (2010).

193 M. Higgins, 'Demography, National Savings and International Capital Flows', *International Economic Review*, Volume 39 (1998).

194 This practice is itself contentious. There has been considerable debate as to whether pensioners would not benefit from maintaining high equity allocations even into old age. That argument relates to the relative importance of post-retirement income noted earlier.

195 Diversification can be traced back to the Bible: "*But divide your investments among many places, for you do not know what risks might lie ahead.*" Ecclesiastes 11:2.

196 The PPF, for example, recently announced that it was going to increase returns by greater diversification!

197 Such as Arrow-Debreu.

198 This quotation is also sometimes attributed to Andrew Carnegie and appears in his 1903 essay 'How to Succeed in Life', *Pittsburgh Bulletin* (December 19, 1903).

199 The scheme and fund are still faced with the risk of sponsor insolvency, but following an investment strategy which necessarily entails lower than maximal certainty equivalents for the fund, i.e. increases costs for the sponsor, this does not improve the likelihood of sponsor insolvency.

200 One reviewer has informed the author that this is explicitly the case for US DB schemes.

201 It should also be noted that companies are intrinsically risk-seeking – it is the existence of uncertainty that permits them to make profits. In the absence of uncertainty, the only source of profit for them would be the exploitation of scarcity.

202 These are the deficit repair schedules under the Pensions Regulator's scheme specific funding regime.

203 The sponsor is also motivated to have this hedging conducted within the pension scheme as this does not visibly encumber the sponsor's balance sheet under current accounting rules.

204 The precise detail of a company's produced goods and services is important; doubtless there are some that will not be able to profit in any way from the larger changed market.

205 The removal of Advanced Corporation Tax in 1997 carried with it not just the direct costs of this loss of revenue for schemes; for many it had the more important effect of taking them from a cash-flow positive to a cash-flow negative position, increasing their sensitivity to market developments.

206 See C. Sutcliffe, *Back to the Future: A Long Term Solution to the Occupational Pensions Crisis*, Pensions Institute (2010).

207 Government Actuary's Department (2006).

208 It is unlikely that the creation of a Cabinet Office 'Nudge Unit' led by Tony Halpern, which counts one of the authors, Richard Thaler, among its advisors, could have gone unnoticed by either the Pensions Regulator or the PPF.

209 These aspects, hedging of risks, are examined in detail in an article by C. Keating, *What a way to run a railroad*, available at SchemeXpert.com (September 2010).

210 Pensions Act 2004 (s173) or the PPF Payment Regulations.

211 D. Harrison, A. Byrne, B. Rhodes & D. Blake, *Pyrrhic Victory? The unintended consequences of the Pensions Act 2004*, Pensions Institute (2005).

212 It may also procure them from other insurers.

213 There is no need for any reduction of member benefits as there is no moral hazard present.

214 The arithmetic has been grossly oversimplified for illustrative purposes here.

215 There are inexpensive mechanisms by which a sponsor company could withdraw from coverage of a policy which is, prima facie, perpetual. In fact, any rearrangement which fully discharges the covered scheme's liabilities would achieve this.

216 There are other more technical reasons for the value of the scheme asset to exceed the value of the sponsor's premium payment commitment. One example is the recovery expected from the estate of the insolvent employer sponsor on the debt arising from any shortfall of scheme assets from the section 75 value, the full market cost of annuitisation.

217 There has been much debate in the banking literature on contra-cyclical capital measures. Most of the suggestions have been for instruments and policies which constitute a form of restructuring – dynamic provisioning is one example. Some have suggested a strategy of over-funding for pension schemes in good times with rundown of these excesses in times of distress. This can be likened to re-arranging the deck-chairs on the Titanic to rebalance a list; it is, of course, inefficient as it results in the ship listing prior to hitting the iceberg. It also presumes that we have perfect foreknowledge of the event. In most situations what is needed is not restructuring, i.e. the reorganisation of liabilities, but recapitalisation, i.e. the introduction of new assets. This can be achieved by insurance but would be very expensive as the risk is systemic and the payment trigger perhaps difficult to identify and verify. Long-term pension indemnity assurance which assures against sponsor insolvency resolves the problem of procyclicality as its value to the scheme at all points prior to sponsor insolvency is inversely related to the level of markets and scheme funding, including periods of financial market distress.

218 This is currently under investigation.

219 For example, precautionary overestimates of longevity and other risk factors.

220 See G. Loewenstein, 'Anticipation and the Valuation of Delayed Consumption', *Economic Journal*, Volume 97 (1987) for an extensive discussion of the effects of anticipation on an individual's implicit discount function.

221 In the manner of Frank Knight, whose classic 1921 work "*Risk, Uncertainty and Profit*" distinguishes between risk and uncertainty on the basis of the 'knowability' of their properties.

222 This is a variation to the econometrician George Box's dictum: "*All models are wrong, but some are useful.*"

223 In addition to this, a greater focus upon households, the distribution of wealth, income and consumption, and non-market incomes is needed. For example, the value of household work may be 30% of national income or higher. Another example: the time spent travelling to and from the workplace is an implicit subsidy to the employer from the employee.

224 It is interesting to note the changing political attitude with respect to compulsion. Prior to 1988, membership of a scheme could be compulsory for employees.

225 See R. Adami, O. Gough & A. Theophilopoulou, *The role of Labour Earnings in determining Post Retirement Income: Evidence from British Households Panel Survey*, Westminster University (2009).

226 The 2009 ONS survey of Wealth reports GINI coefficients of 0.42 for physical, 0.63 for property, 0.77 for pension and 0.81 for financial wealth.

227 Though perhaps not as simply as is asserted by Wilkinson and Pickett in "*The Spirit Level*" (2009).

228 This arises from the ability of the wealthy to save excessively with bequest rather than retirement income in mind. In fact, this behaviour entirely undermines the fiscal neutrality arguments that support tax exemption for contributions and investment accumulation. A lifetime limit on pension saving is justified in this context. One intriguing idea, that the tax relief for voluntary individual savings should be inversely linked to the occupational and state pensions already possessed, is contained in G. Dietvorst, 'Proposal for a pension model with a compensating layer', *EC Tax Review*, Volume 3 (2007).

229 This effect may also be pressing down on more productive developments.

230 W. Beveridge, *Social Insurance and Allied Services*, Her Majesty's Stationery Office (HMSO) (1942).

231 A. Hamilton, *Report on Public Credit*, US House of Representatives (January, 1790).

232 In demographic modelling the recent trend has been for errors in fertility and mortality estimates to be decreasing and errors in migration forecasts to be increasing. The errors in these models are smallest for the working age population and largest for the old age and childhood populations.

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