

**DEPARTMENT OF
ACTUARIAL STUDIES
RESEARCH PAPER
SERIES**

**The Major Actuarial Challenges:
a partly idiosyncratic view**

by

Anthony Asher

Visiting Fellow
Department of Actuarial Studies

Anthony.Asher@apra.gov.au

Research Paper No. 2004/04
September 2004

Division of Economic and Financial Studies
Macquarie University
Sydney NSW 2109 Australia

The Macquarie University *Actuarial Studies Research Papers* are written by members or affiliates of the Department of Actuarial Studies, Macquarie University. Although unrefereed, the papers are under the review and supervision of an editorial board.

Editorial Board:

Piet de Jong

Jim Farmer

Copies of the research papers are available from the World Wide Web at:

http://www.actuary.mq.edu.au/research_papers/index.html

Views expressed in this paper are those of the author(s) and not necessarily those of the Department of Actuarial Studies.

The Major Actuarial Challenges: a partly idiosyncratic view

Anthony Asher

1 Introduction

This paper is partly idiosyncratic in representing personal views, although I know many are widely shared within the profession. It is also partly idiosyncratic because I suggest that actuaries face the challenges of all financial risks, of which the idiosyncratic form but part. It scarce needs to be pointed out that what are described as challenges are also opportunities that might keep the profession busy for all of the foreseeable future.

It will be seen that it is something of a potpourri of other papers of mine, so I ask forgiveness from those who have seen parts of it before.

2 Credo

I believe that that the social function of the actuarial profession, and our vocation as actuaries, is to meet people's need for financial security. I arrive at this belief from two paths.

2.1 What is our business?

Marketing theory insists that the business of an institution is to provide for the real needs of its clients, and not to sell more of the products it happens to be producing. In the classic exposition of this idea, Levitt (1975) shows the dangers of failing to appreciate this distinction. He suggests, for instance, that the American railroads lost their dominant position by failing to see they were in the transport business rather than being providers of railways.

I believe that that the business of a profession can be considered similarly. It would follow that we should not see ourselves as bearers of the actuarial toolkit, looking for problems to solve. The creative alternative is to see ourselves as the engineers of financial security, fashioning the tools as we find them necessary.

2.2 Vocation

Another approach is to seek our vocation or calling: that of a life's work, requiring ongoing growth in particular skills, knowledge and virtue - ultimately in the service of others. Drucker (1990) suggests that asking the question: 'What do I want to be remembered for?' is the beginning of adulthood.

Actuaries are unlikely to answer the question in the same way, but to the extent that they have lived a fruitful professional life, I would expect us all to be able to look back and say that some people slept more securely - in the financial sense - because of the work we have done.

2.3 Financial security

Drucker (1977) emphasises that determining our business is a fundamental question, not immediately obvious and requiring protracted intellectual effort. It is not necessary therefore to believe that the founders of the profession had a particular aim in mind. The question relates to how we can relate most constructively to the world in which we now live. As I see it, the argument that financial security provides the actuarial mission can be outlined as follows.

- People need financial security: their future incomes are both uncertain and limited, while the value of their property is also exposed to various risks. Perhaps the best illustration is the place given to security of all sorts in Maslow's well known hierarchy of needs. While the hierarchy has not always been found to reflect people's real needs, it is my experience that financial security ranks high in the values of older adults. In a recent study, Oleson (2004) finds that the hierarchy applies to students' view of money.
- This need for financial security is provided by the extended family and in modern economies by governments through social security and the private insurance and superannuation industries.
- It has become the statutory responsibility of actuaries to provide the necessary professional skills to ensure that these industries are run soundly.
- It does not follow automatically that the business of the profession should be extended to all elements of financial security. My contention would be that it is uniquely placed to do so.
- It would then be the role of the professional body to train actuaries for, and support them in, this responsibility.

As Trowbridge (1989) puts it: "Actuaries are those with a deep understanding of financial security systems, their reasons for being, their complexity, their mathematics, and the way they work."

3 The financial life cycle

The financial life cycle provides a coherent structure for the consideration of the people's financial needs. The basic idea of the financial life cycle is spelt out in Modigliani's (1986) Nobel lecture. The elements of the cycle have been intensively investigated in the economics literature. Polachek and Siebert (1993) give an excellent coverage of factors affecting income, and Hadjimatheou (1987) provides a useful treatment of some consumption and savings questions. Some relevant items are discussed in the following paragraphs.

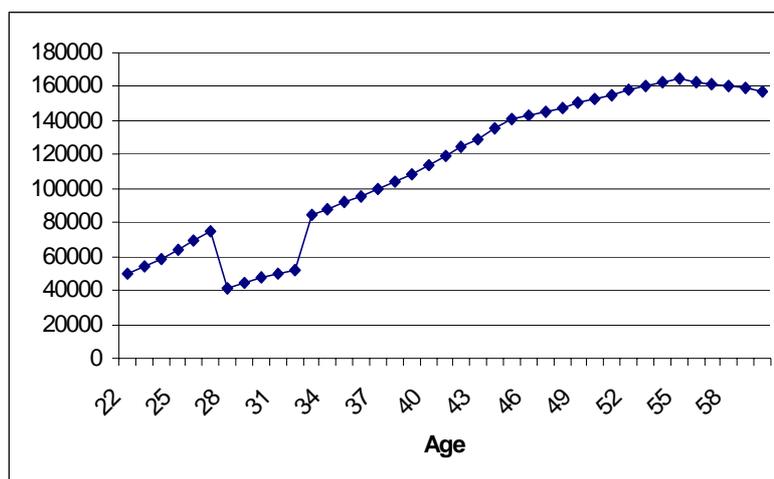
The financial life cycle is a middle class phenomenon in developed economies with nuclear family arrangements. It has a different application to the poor, whose needs are largely supplied by social security, and does not apply to the very rich who need neither insurance nor superannuation. In less developed economies financial security, where it exists, is supplied by the extended family.

3.1 Income

Income levels depend on education levels and age as follows:

- For educated men, income rises with age until the late forties (later in organisations with promotions based on seniority), and then declines until retirement.

Figure 1 - Typical income: educated family



- Non-skilled men peak at or about 30.
- Single women's salaries largely follow single men's salary patterns.
- Married women's income drops significantly while their children are young and they seldom catch up.
- Figure 1 illustrates the incomes of an educated couple where the mother takes time out of the paid workforce for children.

The process has been explained by human capital theory, of which Gary Becker (1983) is the originator—and for which he received a Nobel Prize.

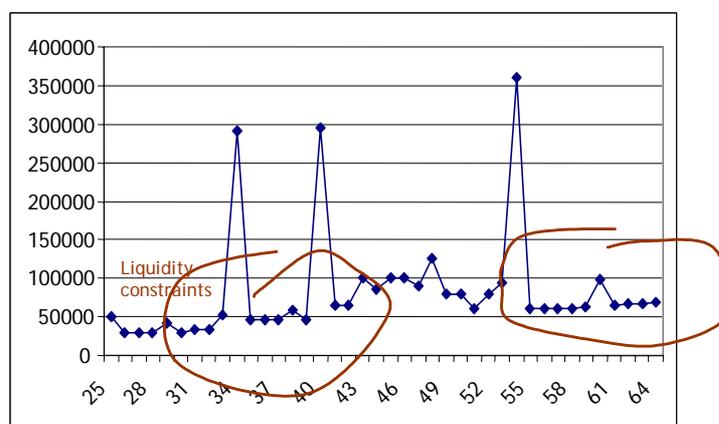
3.2 Expenses

Expenses have a different trajectory, as figure 2 illustrates:

- Setting up house—and, for the wealthier, buying cars—is expensive.
- The cost of children generally rises with age and drops when they leave home.
- Medical costs are currently more or less proportional to the number of people in the household until retirement, after which they rise rapidly.
- Other expenses reduce after retirement, especially as health deteriorates.

Figure 2 shows a typical family spending pattern.

Figure 2 - Typical family spending



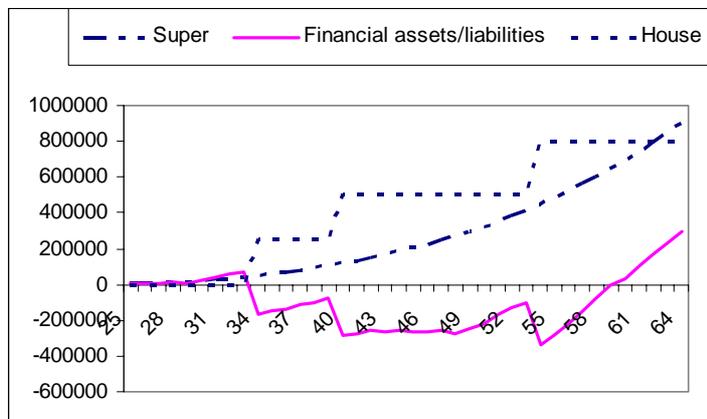
3.3 Savings

Savings—in which life insurers play a key role—depend on the interaction of the two.

- Paying off early debt is usually prudent. Saving for retirement can then begin. Modelling of the process can show that it might be reasonable to start this at 40 or even later if a house has been purchased.
- Retirement means living off investment income and capital. The failure of most people to buy voluntary annuities is a puzzle often debated. One possibility is that the bequest motive is widespread.

Figure 3 gives an indication of what savings look like.

Figure 3 - Savings over the lifespan



The determinants of saving constitute a major debate in economics, which has addressed the effects of increases to income, self-employment, tax incentives, income volatility etc.

3.4 Liquidity constraints

There is evidence that many people are 'liquidity constrained' when they start work. This means that their consumption is constrained by their inability to borrow enough to live at a level that is likely to be justified by their future earning power. Even if they want to borrow, fears of moral hazard and the lack of the ability to insure risks lead to reluctance on the part of lenders.

The constraints are most often manifested as difficulties in acquiring a house or maintaining home loan payments. This means, as illustrated in figure 2, people have less money to spend in their thirties than in their sixties.

Liquidity constraints are not easily overthrown. Table 1 overleaf shows that parents of young children, especially mothers, are busier than at any other stage in their lives. Young parents have neither time nor money.

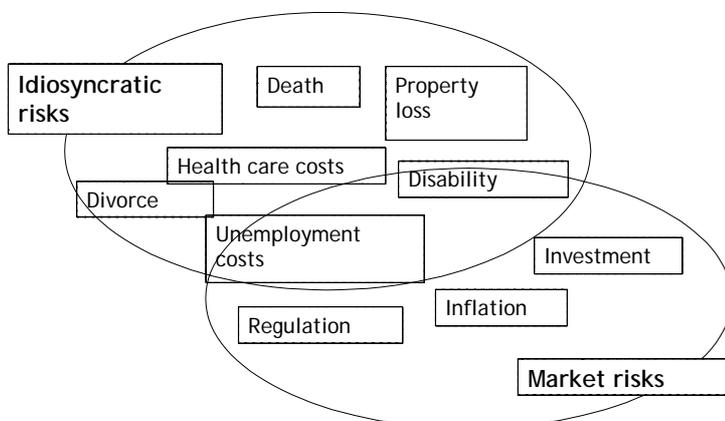
4 Challenge 1: Know what we are doing

This brings us to the first challenge. Actuaries are actively involved in the management of the insurable risks in the financial lifecycle. They are shown in figure 4, which divides them into idiosyncratic and market risks. The idiosyncratic risks are susceptible to insurance if we can manage anti-selection.

A significant problem is that we know surprisingly little about the effects of insurance on the lives of people - insured and uninsured. Do we know how much insurance is enough? Can there be too much? Do people waste their lump sums? Even worse, do large sums have the disrupting effect that anecdotes about lottery winners suggest, or the disincentives that do accompany social security payouts? Are partially disabled people better off if they are encouraged to go back to work?

Household type	Life Cycle phase	Male hours of work			Female hours of work		
		Market	Domestic	Total	Market	Domestic	Total
I & II	1	2314	554	2972	1811	1014	2285
I	2	2359	1369	3775	15	4103	4118
	3	2394	1358	3859	111	3664	3762
	4	2415	1185	3600	355	3170	3525
	5	2362	817	3179	504	2393	2897
	6	2367	815	3182	670	1781	2451
	7	1862	1093	2955	0	2026	2026
II	2	2432	1464	3943	1378	2908	4286
	3	2478	1306	3784	1615	2679	4291
	4	2464	1095	3559	1915	2285	4200
	5	2527	856	3383	2120	1753	3873
	6	2369	958	3327	2217	1568	3785
	7	2062	1083	3145	1202	1458	2660
I & II	8	0	1458	1458	0	1750	1750
*Weighted data means, hours pa.							
Type I	Traditional - female partner has minimal workforce participation						
Type II	Non-traditional - female partner works long hours or full-time						
Phase 1	No dependent children and a female partner under 40.						
Phase 2	Children with an average age under 5.						
Phase 3	At least one child aged 5 to 9 years.						
Phase 4	Children are predominantly in the 12 to 14 year age group.						
Phase 5	Older dependent children still living at home.						
Phase 6	No children, female under 55 or male under 60; one working						
Phase 7	Between phases 6 and 8						
Phase 8	Both partners retired.						

Figure 4 - Major risks



The list of such questions is long - and many actuaries would think that there should be little trouble in developing a believable answer to them. I confess that at times I have, but such answers are speculative at best; at worst, they stem from arrogance and prejudice and merely reflect our self-interest. A recent Australian example has been the call for a 65% replacement ratio for retirement income. There appears to be absolutely no underlying research into the reasonableness of this figure, although it clearly benefits the superannuation industry.

In order to answer these questions, I believe one has to have data from a panel (cohort) study that particularly investigates the financial impacts of insurable events. Cross sectional studies largely record the impressions of those interviewed. Given that we know most of them have not taken the time and effort to understand all their financial arrangements, they are often a poor source of information.

The University of Michigan has run the Panel Study on Income Dynamics that has provided material for over 2,000 academic papers over the last three decades. It has been copied widely. In Australia, the Melbourne Institute oversees the Household, Income and Labour Dynamics in Australia (or HILDA) which has just run its second wave of data collection. I give some more detail about panel studies and their uses in Asher (2001).

This is not the place to give a detailed analysis of the results, but they do appear to be similar in all countries. Divorce proves to be the major contributor to financial instability. On the insurance front, it is of interest that one large group in relative poverty are elderly widows. Relatively few families remain persistently in poverty, but a third and more of the population can suffer significant drops in income at some point in a decade.

The challenge to us, and one crucial to our social role, is to discover ways of reducing that third. First however, we need to know much more about what it is our industries are, and are not, achieving. We need to know what we are doing.

5 Challenge 2: Idiosyncratic risks

The next two groups of challenges relate to devising and distributing new products and institutions that manage risk: idiosyncratic and market related. Better products and institutions are unlikely to receive immediate acceptance. Our challenge is to develop and "sell" them to new and existing institutions, regulators, the distribution channels and to the customers.

There is no fixed line between idiosyncratic and market risks, but this section covers the former. We conventionally divide them into risks relating to salaries and wages and the working life - that is dying too soon, and those related to retirement and living too long. Issues of disability relate to both phases of life.

This section is covered in more detail in Asher (2003a).

5.1 Insuring death and disability

We already have developed most of the products here. The challenge is whether they are adequately distributed. There is a widespread view, backed up by Auerbach and Kotlikoff (1991a) for instance, that people are inadequately covered. As discussed above, this is invariably based on *ex ante* research. No one appears, for instance, to have investigated how widows cope with too little insurance and whether the question is important or not. If the view is correct, there is a significant challenge in finding ways of increasing the coverage of insurance. In doing so, one must also address the common criticism that the cost of distribution and financial advice is already excessive.

One exception to the adequacy of the product range is whether disability contracts adequately cover rehabilitation. Disabled people need rehabilitation. Some return to the workforce and "normal" life is almost always a possibility, and is generally recognised as the best cure. Rehabilitation may require special equipment and other provision, and needs special effort from family, employer and insurance provider. It is difficult and even painful for the disabled person: ask any therapist. It is however not only superior from a human point of view, but likely to be less costly in the long run not least because it can reduce moral hazards.

5.2 Annuitization

Annuities give protection against the risk of living too long and seem to offer obvious advantages to retired people who do not want to be dependent on their families - or the state. The puzzle is that annuities are not popular anywhere in the world. In Australia, of the \$26bn paid out in lump sum benefits by superannuation funds in the year to June 2003, less than 20% found its way into income stream products, and of this only \$200 million was in respect of life annuities. (The rest were in allocated and term annuities.)

A number of explanations have been given, many of which are summarised and explained in Davidoff *et al* (2003). One can mention:

- People want liquidity, especially for emergencies
- Tax and means test disincentives
- Bequest motives
- Poor value for money, especially for those in poorer health
- Distrust of life offices, which may go under or charge too much
- Investment that expose annuitants to market or inflation risks
- Myopia, or misunderstanding
- Inadequate selling of the product by financial institutions and intermediaries.

Wadsworth *et al* (2001) also look at the issues and make some product suggestions.

Annuitization can actually begin before retirement. This is obviously true for single people. Even couples however can augment their post retirement income if there is some death release before retirement: they will inevitably need more if both survive. The improvement is of some significance, depending on mortality rates. Using normal mortality the savings might amount to about 20% of contributions for single individuals, and about 10% - if a spouse's pension is to be paid. The differences are even greater for those in poor health, who need separate treatment.

The challenge is to find ways of ensuring that people can find ways of annuitization when they want to augment their retirement income.

5.3 General insurance

5.3.1 Distribution

The challenge of extending coverage is perhaps also an important social issue in this area.

5.3.2 Tort issues

This covers the question of claims for punitive damages for causing others unnecessary pain and suffering, as well as claims for loss of support. It also incorporates compulsory road and workers' compensation cover. Legislative reforms have addressed this question, but it seems to me that the principles of meeting people's needs have not all been addressed.

In particular, punitive damages should be connected directly with their causes: whether sins of omission and commission. It is not appropriate to punish the insurance companies and the whole profession for the sins of a few. While this is a legal issue, there may be ways of creating participating contracts which isolate other insurance business from the effects of superimposed inflation.

5.3.3 Catastrophes

This heading covers natural catastrophes as well as those caused by terrorism and war. Gurenko (2004) covers many of the issues.

Some risks, like protection of property against individual acts of terrorism, may be beyond the capital of the insurance industry, but do lend themselves to a funded national scheme because insured parties can and should be charged for the cover. Other risks, such as a significant nuclear explosion in a major city, cannot really be charged to people and can be left unfunded.

In both cases, the challenge is to develop formal agreements between governments and industry: that the former would offer compensation, and that the latter can therefore exclude cover.

5.4 Medical expenses

The Australian Institute of Health and Welfare (1996) reports an average increase in nine developed countries from 6% of GDP in 1971 to 9.2% in 1995. If living standards continue to increase, it can be safely predicted that the health care industry will enjoy above average growth industry for most of this century.

5.4.1 Rights and commerce

While I do believe that health care necessary for life is a basic human right, a growing majority of the expenditure in this industry should - in my opinion - be regarded as a hotel type benefit. Finance professionals are in conflict with medical professionals over this issue. It will be an ongoing challenge to resolve the debate.

5.4.2 Managing selection

For wealthier people, insurance is entirely inappropriate for smaller medical costs. Making it compulsory, or highly tax advantaged, as is the case in many countries including Australia, is wasteful. The administration costs to insurer and insured greatly exceed the marginal insurance benefits and moral hazards distort people's choices.

One private sector solution is to remove the insurance element but to benefit from the tax concessions by offering savings accounts to cover these "risks". One objection is that this will discourage regular visits to doctors who might then sooner diagnose major diseases.

Selection is a problem at all levels. Managing medical costs means making cost benefit analyses - never easy when lives are directly at stake. The challenge is to simultaneously consider health, costs and people's freedom.

5.4.3 Long term care

Frail care in the last few years of life is perhaps a separate issue. A number of attempts have been made to prefund it. No satisfactory solution appears to have yet been found.

6 Challenge 3: Market related income risks

This section covers the risks to personal income that arise from changes in the economy. Some relate to the industry or profession of the individual. Changes in the balance of supply and demand can make a significant difference to incomes. This uncertainty means that people are likely to invest something less than the socially optimal amount in their own human capital in order to diversify their risks. Can risks be diversified in other ways?

6.1 Income futures

Shiller (2003) summaries his work on what he calls macro markets. He suggests the development of a very wide range of income indices would allow people to swap a portion of their own assets and future income for someone else's. The swap could protect against unforeseen falls in the demand for their chosen profession or in the economy of their region or nation. The idea is an intriguing one and may well prove a useful way of sharing risks. My suspicion is that individuals will shy away from directly investing in the income of others: information asymmetries are too high.

6.2 Income contingent loans

An income contingent loan is a similar idea that involves swapping a portion of future income for cash now. The lender faces information asymmetries but, as an institution, is better placed to evaluate the income stream it is purchasing.

Friedman and Kuznets (1945) suggested that students could share the risks of their future incomes by taking out study loans with repayments contingent on their future earnings.

Yale University used a variant for some years in the seventies. It was not an overwhelming success not least because the repayments were based on the earnings of student cohorts and were not perceived to be fair. Barr (2001) is an enthusiastic advocate, and the idea seems to be gaining ground. The Australian government's HECS scheme was a leader in this area.

6.3 Housing finance

The uncovered income risk makes itself most acutely felt in the liquidity constraints mentioned in section 3.4. Overcoming the liquidity constraints means more borrowing to be repaid later, with a greater proportion of retirement income coming from the few years before retirement. Figure 2 shows the significant growth in financial assets that occurs in the period from when children leave home and retirement. Much depends on the ability to work until normal retirement age, but this is less of an issue if the borrowed money is invested in housing, which can later be sold down to release money for retirement.

Relief for liquidity constraints can therefore be given by facilitating additional housing finance. This means reducing the initial cash flow and protecting borrowers against changes to interest rates. The issue is addressed at greater length in Asher (1994). One alternative, then advocated by the World Bank, is a "double indexed mortgage" where the one index refers to the rate at which instalments are increased - often in line with average salaries. The other index is the interest rate used to determine the amount of loan outstanding. This is the model used for the income contingent loans described in the previous section.

Another alternative is a salary-linked mortgage, where the instalment is fixed in advance as a percentage of income. (The fixed percentage could be determined by dividing the amount to be lent by the term of the loan and again by current salary.) In this model, it is not only the cash flow but the return that is dependent on the rate of growth in the borrower's salary. In addition to lower cash flows and protection against fluctuations in interest rates, salary linked finance could provide investors with an investment that grows in line with salary inflation.

6.4 Unemployment insurance

Income risks are particularly challenging because of the attached moral hazards, in which we see that higher replacement ratios make a significant difference to claim rates for disability and unemployment insurance. This is especially so for the latter, which is one reason why it is more often left for government. Whether provided publicly or privately, it remains an actuarial challenge.

As with disability, part of the challenge is to see if we can change the insurable event so that payment is less dependent on the insured's own behaviour. Funding of training and moving costs might provide an example.

6.5 Enhancing labour mobility

There may be other ways in which actuaries can enhance labour market mobility and thus participation in the workforce. Some actuarial firms have diversified by utilising their knowledge of remuneration patterns derived from defined benefit funds. They already play an important role in remuneration surveys.

Would the profession be able to give more advanced warning of changes in the supply and demand for different occupations? At the moment information finds its way in a haphazard and anecdotal manner to students making career choices. An authoritative survey of actual salaries would probably speed up the process by a year or two. A more speculative survey of recruitment intentions would add at least another few months - possibly more once one developed an ability to identify the better predictors.

6.6 Housing mobility

Unemployment is aggravated by the reluctance of people to move to areas with more jobs. Amongst the many reasons, will be a fear of being locked out of the housing market in their preferred area of residence. Properly designed house price indices, as described by Shiller (2003), would allow these risks to be hedged. Dwonczyk (1992) describes a model for Australia, which I gather is still in the process of being implemented.

7 Challenge 4: Equity or justice

As Lucas (1980) puts it: "Justice is the bond of society ... the condition under which I and every man can identify with society, feel at one with it, and accept its rulings as my own."

We cannot discuss our social contribution without evaluating it and ourselves against the criteria of justice. The challenge of developing just institutions in a just society is therefore placed at this point of the paper as a central challenge to all our work.

The issues that particularly concern us are the exercise of discretions, the fair the rate of profit and pay, conflicts of interest, access to our services and the products we support, and our interaction with government on regulation and tax reform.

7.1 A definition

Justice is notoriously difficult to define. In Asher (1998a) I try and spell out a traditional model. It is not possible to define precisely but should incorporate a number of specific considerations: first is perhaps reasonableness, followed by a close attention to the dignity and particular circumstances of those involved. I suggest that equitable decisions must attempt to achieve equality, liberty, efficiency, to provide for people's basic needs, and to recognise their deserts. Compromise is likely to be necessary, but it is important that none of the considerations are ignored.

7.2 Profit

Our view of profit in the form of a fair return on capital is used in pricing and valuation. For this purpose, we can divide profit into four elements:

- An interest portion, which allows for the deferment of the use of the money. This is the risk-free rate.
- A risk premium, which consists of one part to allow for expected losses and another to reimburse providers for uncertainty. In financial economics, the latter part is the market or equity premium.
- A reward for entrepreneurial activity (in the sense of the creative, and not the risk-taking, elements) if customers are prepared to pay more for quality or innovation.
- A monopoly rent, which can be extracted from customers if they are somehow prevented from obtaining better value elsewhere.

On the political left, there are those who see each element of profit as morally reprehensible, on the far right those that see all profit as acceptable. Table 2 sets a middle course that would seem to provide a justification for free markets and for the anti-monopolistic legislation present in modern economies.

The challenge to the just actuary is to pursue profits from innovation and eschew those that derive from monopoly.

Table 2 A Traditional Scheme of Justice and Profit

	Desert	Efficiency & Prosperity	Equality & Need	Completely Free Markets
Pure Interest	Capital	Capital	Related Poor	Capital
Risk Premium	Risk Bearer	Risk Bearer	Related Poor or Government	Capital
Innovation: Genius ----- Institutional	Entrepreneur ----- Capital	Entrepreneur ----- Capital	Everyone	Everyone
Rent: Natural ----- Monopoly	Everyone ----- Customer	Capital ----- Everyone	Everyone	Tightest organised

7.3 Underwriting

Questions of equity also arise when discussing discrimination in underwriting. Discrimination is an offence against equality in that people are treated differently, and against desert if the grounds for discrimination were not self-inflicted. Prohibiting it would be an infringement of liberty. Efficiency is debatable: Polachek and Siebert (1993), under the headings of 'statistical discrimination' and 'insurance underwriting', show that there are arguments on both sides. The second debatable question is whether people's basic needs are endangered by discrimination. Perhaps we can develop a fair approach and create a broad consensus around it.

7.4 Redistribution

The redistribution of wealth is one of the central political issues. It can be divided into two parts: collection and distribution. Actuaries have a particular interest in the distribution side because many of the beneficiaries are also beneficiaries of our institutions: pensioners, children and the disabled, although we are concerned with orphans rather than all children.

On tax collection, actuaries inevitably become embroiled in debates about the taxation of superannuation, which leads on to the general taxation of investment earnings, and should - in my opinion - lead on to a consideration of various means tests applied to pension income.

It would be obvious to actuaries with the experience of life office and superannuation data management, that means tests are expensive, impractical and grossly unfair. These are illustrated by a recent audit of Centrelink, the agency responsible for implementing the tests in Australia - reported in Pender (2004). The audit found the agency made some 250,000 errors a month, with an "actionable" error in 52% of the cases investigated, and that almost all folders contained administrative errors. I would think that Centrelink probably has a better record than most. Given our practical knowledge, I would wish we were more vocal - even though it might expose the administrative weaknesses of our employers.

7.5 Defending the powerless

Justice also involves defending the powerless. Both the previous subsections deal with elements of this.

The challenge is to be aware of those who are voiceless in debates. Small firms are, for instance, often overlooked in policy debates because they have too much else to do. The same applies to young mothers - it being quite clear from table 1 that they have the least time of any group in society. Apps and Rees (2003) show, not surprisingly, that working mothers bear a disproportionate tax burden. On the other side, Mulligan and Sala-i-Martin (1999) describe how the worldwide gerontocracy, with plenty of time to lobby, extracts its greater share of resources. The old do however include a group that is perhaps society's poorest members: elderly widows whose husbands spent the lump sums before leaving them - as described in Auerbach and Kotlikoff (1991b).

7.6 Compulsion

This brings us on to the extraordinary mishmash of insurance and savings instruments that have been made compulsory - in different ways but in every country. The compulsion can arise as an emotional or political response to poverty or pain of some sort, and is, of course, invariably supported by the providers whether in the public or private sectors.

The Australian superannuation guarantee is a case in point. It applies to younger people, who - life cycle modelling shows - do not need it especially when they are paying off their home loans. It does not however apply to those retiring, so allowing the perpetuation of the widows problem mentioned above.

Many states also offer life, disability or health cover for road or work related accidents. The reasons often relate to the tort issues mentioned earlier, but people need cover for financial loss regardless of the cause. III thought out compulsory cover for some causes creates unnecessarily expensive overlaps in cover and makes it difficult to insure or save for the gaps.

Developing and selling products to cover the gaps is the private sector challenge.

The policy question is to develop a coherent and just framework that provides for basic human needs, creates minimal distortions in social and economic behaviour and gives people maximum choice.

8 Challenge 5: Funding pensions

Population aging creates a number of challenges.

8.1 Macro flows

The first is to ensure that there are sufficient assets. This section suggests that the debate thus far has not ranged sufficiently widely.

In developed economies with better-educated workforces, gross national income can be divided approximately 70:15:15¹ into wages, profits and depreciation. Dividends count for some 5% of total income. These proportions can be compared with the proportion of pensioners in a population. People over 65 account for some 15% of the population if life expectancy averages 75; more if the population has been declining, life expectancy is higher or people retire earlier.

A small proportion of pensions can therefore come from dividend income; the rest must come from interest on loans, repayments on loans and the sale of assets. Assets can be sold to active members but their total contributions are likely to be less than 10% of national income.

The problem can also be seen from the national balance sheet perspective. Depending on assumptions, the average adult should have some 4 times their income in retirement savings. This equates to almost 3 times GNP or more than country's stock of assets. Fully funded and annuitized superannuation funds would be therefore unlikely to find sufficient assets in the private sector to fund their liabilities. Attempts to do so will lead to unsustainable increases in equity prices. The results in Davis and Li (2002) suggest that recent share price bubbles could serve as a warning.

It is of course aggravated by encouragement to save even more than is necessary during times of liquidity constraints.

¹ cf *Economic Trends Annual Supplement*, National Statistics, London shows a ratio of this order on page 29.

8.2 Defined Benefit vs Defined Contribution (DB vs. DC)

Most of the arguments for and against DC transfers are catalogued neatly in Barr (2001) and Holzmann & Stiglitz (2001). The arguments in the preceding section are another way of looking at Barr's argument that funded arrangements are also susceptible to demographic stresses.

It would seem to mean that we should retain significant pension arrangements that are unfunded to the extent that they rely on government promises rather than real assets. The challenges are to ensure that they are properly accounted for, and actuarially fair and sustainable. In this respect, notional defined contribution schemes seem to offer promise.

Many of the government schemes link benefits to average wages. Given that part of the problem is to match pensions to the ability of the working population to fund them, and that part of the solution is to increase productivity in order to do so, this produces a paradox if higher productivity goes with higher wages.

8.3 Alternative instruments

The income contingent education and salary loans suggested in section 6 above could also produce a new class of asset.

Reverse mortgages will also enable the home to be a retirement funding asset.

9 Challenge 6: Feast or famine

We now transfer our attention to investments. The first challenge is to manage their volatility in such a way to give a smoothed income to pensioners.

On this score, the move from a DB to a DC benefit design may be seen as a setback. The challenge is either to overcome the problems with DB, or to develop new smoothing mechanisms. In doing so it is probably helpful to think in terms of short and long term risks. The distinction effectively depends on the financial capability of sponsors and insurance companies to provide guarantees. They can do so for short term risks, but not for the long term.

9.1 Long term risks

Long term risks cannot be insured or absorbed by employers or government. Estimates of the long term net real rate of return vary from about one per cent to five per cent annually. The lower return is that available from indexed linked stocks - after inflation, taxes and expenses. The upper end of the range arises from the estimates of Dimson *et al* (2004) of the likely equity premium. Dimson's estimate of 3.5 percent for the equity premium is lower than that reported by Welch (2000) in a survey of economists, but probably more realistic. With typical contributions and expenses, the difference between one and five per cent would translate into a DC pension of between 35 and 130 per cent of average income when spread over a 60 year span.

If long term investment returns are lower than expected, it would seem that we will have to contribute more during our working lives, accept lower pensions or work for longer. The latter strategy can very effective: each year of additional contributions will increase a pension by some 10 per cent.

The challenge here is to build these strategies into our planning institutions so that they happen automatically. Currently they are managed expensively and in an ad hoc manner, sometimes dependent on inappropriately remunerated financial advisors.

9.2 Short term risks

9.2.1 Smoothing

The other traditional actuarial method of smoothing bonuses has also seen recent setbacks. It is too dependent on the discretion of directors to ensure that policyholders get value for money, and potentially allows arbitrage if single premiums or withdrawals are not.

There is however a way of objectively determining a fair bonus and of reconciling current values to the market. This is if smoothing can be regarded as analogous to rolling forward contracts between continuing and maturing policyholders. The smoothed maturity value, where the forward contracts were spread over n periods, could then be defined as:

$$\text{Maturity value} = \sum_{t=1}^n U_{-t} P_{-t} (1 + i_{-t})^t \quad (1)$$

Where:

- maturity takes place at $t = 0$
- n is the smoothing term
- U_{-t} is the number of units committed to forward contracts at time $-t$
- P_{-t} is the market price of the units at time $-t$, which includes reinvested dividends.

- i_{-t} is the spot rate of interest of term t at time $-t$

Some appropriate adjustment would have to be made for dividends. The actual interest rate can differ from the risk-free rate to allow for tax, expenses, and perhaps opportunity costs. It can also be expressed in nominal or real terms.

It is suggested that any smoothing method that cannot be fitted into this framework would be unfair to one or other party. The argument arises from a consideration of the replicating portfolio. A forward contract can be replicated by an immediate sale, the proceeds of which are placed on deposit, and an immediate purchase funded by a loan. The forward price (if no dividends are payable) must thus be at the current price increased by some rate of interest (assumed to be risk free in the naïve CAPM). If, for instance, it were known that the notional forward price, at which assets were to be passed on by departing policyholders, was to be significantly less than the theoretically determined price, then it would be better for the departing policyholders if their current share of the assets was realised and placed on deposit. To treat them otherwise would be unfair.

This approach would also allow for the fair pricing of surrender values, and the determination of adjustments that should theoretically be made to new-business premiums if the term to maturity is less than n .

Asher (2003b) describes this in more detail.

9.2.2 Other derivatives

Market traded options and futures also provide means of managing investment risks. There is an obvious demand for their risk reduction capabilities; finding the counterparties who can afford to take the risks in sufficient volume is something of a challenge. Brown *et al* (2004) record their findings of “informationless trading” that enhances returns under normal market conditions by effectively selling options, but significantly increases risks when markets move significantly.

10 Challenge 7: Making investment markets efficient

The investment managers of our financial institutions, who allocate assets between the different classes and select different stocks on the basis of expected future yields, fulfil the important economic function of allocating savings to where they are most productive. Many actuaries fulfil all or part of these functions.

10.1 Market beliefs

The efficiency of markets depends on prevailing economic theories and institutional incentives. Grossman and Stiglitz (1980) show that markets will not be perfectly efficient if there is a cost to obtaining the information necessary to establish the best possible prices. More generally, markets will be inefficient if there are insufficient participants attempting to make money by selling high and buying low. Such participants are discouraged by a belief that the market are efficient so - paradoxically - markets can only be efficient if enough people believe that they are not.

Another problem arises when investors naively follow trends. Behavioural economists have found people are prone to recognising random patterns where none exist. Ferson *et al* (2002) find that the problem can extend to experts using sophisticated statistical tools. Blake and Timmermann (2004) report findings that UK investors are influenced excessively by good past performance in spite of its meaninglessness.

Changing beliefs is a matter of education. The major challenge is to invest managers and financial advisors, but actuaries clearly play an important role in this industry, which could perhaps be enhanced by a greater profile in education.

10.2 Constraints

Investment markets will also be inefficient if there are unnecessary constraints on investment managers, so that they are forced to forego profitable investments and invest for lower returns. Government investment prescriptions frequently have this effect. An insistence on matching with fixed interest stock may have a similar impact unless more stock can be brought onto the market. Other distortions may be created by narrow and inflexible benchmarks of various types.

Actuaries play a central role in the creation of benchmarks, and it is a significant challenge to get them right - both for our traditional long only institutions and also for the hedge funds that have the flexibility to address all types of market imperfections.

10.3 Better accounting

Markets will function more efficiently with better information. New international accounting standards represent a brave, but at this stage largely failed, attempt to make published accounts give an estimate of the fair value of the company. It is by no means certain that International Accounting Standards Board will win its fight to require all tangible assets to be reflected at fair value. Even less is it likely that intangible assets will be shown.

Actuaries have played an important role in developing models to reflect the insurers' embedded values. The methods in use, in particular the analysis of surplus that reports on the development of the assets, and the reasonableness of assumptions, could be usefully applied to other intangible assets. Asher (2004a) analyses this issue in more detail. The International Accounting Standards Board's ED7 on disclosure cries out for a disciplined analysis of surplus, and perhaps offers some opportunities.

10.4 Governance

Superannuation funds and life insurers accumulate capital and then invest it. In a capitalist society, economic power rests with those who provide capital. The challenge is to control the capital so that it is not abused or used destructively. Although it is even less of an exclusively actuarial challenge than the others mentioned in this paper, many actuaries come across the questions, and others do look to the profession for some guidance.

10.4.1 Agency risk

In Asher (1998a), I cover the issue at greater length. The core issue seems to me to that of the principal-agent problem: how to manage the managers. In particular, shareholders need to protect their interests against excessive remuneration, ill advised mergers and acquisitions, and other uses of corporate assets for personal gain. There are also questions about whether the rules of the game that govern current management actions pay sufficient attention to the pressing social needs of, and the opportunities offered by, unemployment and environmental issues.

10.4.2 Enforcing the law of agency

The Agency cost problem has been investigated in the economics literature over the past three decades. The cure suggested in the literature largely to derive from greater monitoring and the alignment of incentives.² It is suggested here that the management of agency risks may lie more with a more appropriate application of the law of agency. This is the same as applies to fiduciaries: a ban on conflicts of one's financial interest in a matter and one's duty to one's principal, members or policyholders.

As actuaries are frequently the dominant professional advisors to boards of trustees and directors, the challenge is to ensure that they are aware of their legal obligations, and have the integrity and courage to meet them.

² Debatable perhaps, but see the Economist's useful economics dictionary at <http://www.economist.com/research/Economics>

10.4.3 Balancing interests

Another way of reducing the agency problem seems to me to be to attempt to spread economic power more widely. Figure 5 gives the outline of a circle of mutual control of companies and superannuation funds. Directors appoint managers who appoint staff who are members of superannuation funds. They in turn elect trustees who elect directors.

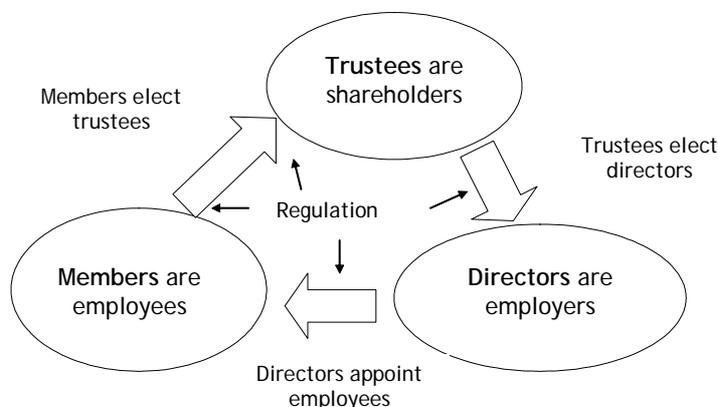
Two of the three controls need strengthening. The power of members to elect the trustees of superannuation funds needs reinforcement. Fund choice will undermine it further in Australia.

The power of trustees to hold directors accountable also needs reinforcement. One possible mechanism is the use of proportional representation on boards of directors as in some US states and Canadian life companies. Drucker (1991) suggest that institutional investors - especially if they cannot easily sell their shares - need an institutional structure to supervise management. He suggests an outside business audit covering the company's:

- mission and strategies
- marketing
- innovation
- productivity
- people development
- community relations, and
- profitability.

Even if this is not made compulsory, shareholders might take more action in setting standards for what ought to be included in companies' annual reports.

Figure 5: Circle of accountability



11 Challenge 8: Managing institutional risk

The offering of risk and investment products is of little value if the institutions which offer them are prone to failure. This challenge provided the original justification for the profession and underlies its statutory powers.

11.1 Computing

Actuaries spend a great deal of time developing, writing, and testing computer programs.

One challenge in this area is to work towards the equivalent of an international actuarial notation. Our notation gave actuaries a shorthand to thinking, calculating and communicating that was a significant competitive advantage in pre-computer days. It would be difficult, if not illegal, to seek a convergence between the packages now used for more sophisticated modelling, but a common approach to spreadsheets would have advantages. I certainly found that strict guidelines made student projects much easier to mark.

11.2 Managing data

Collating and checking data is not trivial. My experience and discussion with others suggests that it frequently takes up most of the actuary's productive time. A challenge for our practice, and our education system, is for us to approach the issue in a more scientific manner. I believe, as mentioned in section 10.3 that our analysis of surplus is an excellent tool in this area.

The analysis of surplus however comes too late in the control cycle once the data is already corrupted. There is considerable work to be done in the design of systems of data capture and maintenance. Pender's report, mentioned in section 7.4, describes computer based systems to interpret complex rules and reduce errors and is suggestive of some developments.

11.3 Modelling

While this may be thought of as a sophisticated statistical exercise, it is often performed perfunctorily and is seldom more than a comparison of actual and expected. The past is an unreliable guide to the future, even if there is sufficient data to draw statistically significant conclusions.

One of the challenges facing the profession is to improve the production of adequate data. The poor rate of contribution to mortality analyses illustrates the problem. Perhaps regulators could get more involved.

The development and application of the models represents another challenge. In this area, a thousand flowers have bloomed and will continue to do so. It is somewhat bewildering for practicing actuaries to be faced by the series of sophisticated new models coming through the education system and the market. We have seen the introduction of time series, Markov chains and Wiener processes - accompanied on occasions by unpleasant confrontations. We face challenges of courtesy, clarity, correctness and care in their use.

11.4 Virtue

The virtues I think are especially required of actuaries are integrity, prudence and courage to make a stand when prudential concerns are at stake.

11.4.1 Preaching

It has been suggested that we need to rehabilitate hypocrisy. It can be described as "the homage paid by vice to virtue" and we need to pay homage to virtue even if we risk hypocrisy. It is a necessary risk just as higher investment returns cannot be earned without risk of loss. We have therefore to confirm our allegiance to virtue in public and private. We need, in our frailty, both to reinforce our own commitments, and to train succeeding generations. The virtues speak for themselves, but they are not loud, nor are their advantages overwhelming evident. They have to be repeated as least as frequently as lower forms of propaganda.

11.4.2 Regulation

We are seeing a world wide increase in detailed regulation both of the profession and the industries in which we are involved. It seems to me that it is both excessive and inadequate. The inadequacy partly lies in its excess: the human impossibility of knowing and obeying it all. It is also inadequate in that it attempts to detail what is already implicit in existing regulation. This weakens the rule of law by creating loopholes and gives an excuse for not pursuing the always difficult task of prosecuting wrongdoers. An example is the limitations on the common law prohibitions on conflict of interest that I discuss in Asher (2004b).

Rolling back the wave of verbiage is a major challenge made more difficult by the interests it protects.

11.4.3 Diversity

One suggestion for monitoring our integrity is that we face regular peer reviews. While peer review would be a useful for coaching purposes, it seems to me that the major moral pressure on actuaries comes from other actuaries prepared to recommend lower reserves or premium rates or to accept a lower quality of data.

The bigger challenge is how to ensure that the profession remains critical of itself? I would suggest that we need to create positions for actuaries in organizations with a diversity of material interests so as to stimulate our internal debates. In this respect we should be looking at universities, government, consumer organizations and perhaps foreign bodies.

12 Challenge 9: Professional education

The educational system also faces the challenges of the preceding section.

12.1 Maintaining standards

It may also face the more difficult challenge of holding out against prevailing ideologies and standards in the secondary sector particularly. Wolf's (2004) title says it all: "Professional engineering bodies have been pretty much alone in insisting that there are such things as absolute requirements for competence." My 14 years teaching actuarial students has persuaded me that those without a thorough school grounding in mathematics will never become actuaries. Over a thousand made the attempt during my time.

Another pressure on the profession is to attempt to reduce the necessary qualifying time. It seems to me that 5 or 6 years of experience will normally be necessary before students can practice as a qualified actuary. The final actuarial qualification requires candidates to synthesise the variety of issues facing life offices and superannuation funds. Some students may develop these skills later than others. Wallis and Dell (2004) report recent research on brain development which finds that those parts most required for decision making, and prudence, are still developing in people's early twenties. This provides a plausible explanation of why it takes so long for some actuaries to qualify, and suggests that it is unreasonable to hope for much improvement.

12.2 CPD

A bigger challenge may be that of creating a system of lifelong learning. I find Erikson's (1982) eight stages of psychological development to be a helpful framework. He suggests that we face, at each stage of life, a particular choice or crisis, and the appropriate resolution of each choice leads to a particular virtue.

The table below sets out a simplified version of his stages. He recognises that the choices he outlines are not confined to a particular age, just that they are more pressing at certain ages.

Ages	Psychological Crises	Virtue	Significant Relations
Until 2	Basic trust vs. Mistrust	Hope	Mother
2/3	Physical Autonomy vs. Shame and doubt	Will	Father
3-5	Initiative vs. Guilt	Purpose	Family
6-12	Industry vs. Inferiority	Competence	School
13-18	Identity vs. Identity confusion	Fidelity	Peer groups and out groups
19-35	Intimacy vs. Isolation	Love	Partners, friends and colleagues:
36-65	Generativity vs. Stagnation	Care	Work and home
Over 65	Integrity vs. Despair	Wisdom	Humankind

The earlier virtues are plainly self-serving and, therefore, more critical for a fulfilled life. The later, and greater, virtues are altruistic in focus, but the argument is that they, too, are necessary for personal maturity. The man whose career creativity (generativity) serves only himself may be feared, but is likely to die unregretted and unhappy.

But these virtues do not necessarily come unaided. As Carr (1993) puts it: "One cannot really understand the value of a given virtue, work of art or religious ritual until one has had the opportunity to test experientially its potential to deepen or enrich one's life - and this takes time and effort. ... understanding and acquiring moral and other values is not a matter of neutral intellectual reflection in the context of disengaged enquiry or debate but a matter precisely of engaged practical initiation and experience under the sound and reasonable guidance of those with the wisdom of experience themselves."

We need the guidance and the collegiality of the profession to grow.

I have dealt with these issues at greater length in Asher (1998b).

13 Challenge 10: Personal

The final challenge is the personal one, and brings us back to the question in section 2.2: what do I want to be remembered for?

Drucker (1990) quotes St Augustine's suggestion that asking the question is the beginning of adulthood. Drucker goes on to say that the person who thinks he can answer the question at 25, has not understood it. He who cannot answer it at 50 has wasted his life. Writing this paper as I approach my fiftieth, I can say I do want to be remembered for having said what is in it.

Over to you ...

Acknowledgement

Thanks are due particularly to Piet de Jong for his invitation to give the first version of this at a Macquarie University seminar, and to subsequently commit it to writing.

References

Apps, P. and Rees, R. (2003) Life Cycle Time Allocation and Saving in an Imperfect Capital Market. *Working Paper, Sydney Law School*

Asher, A. (1994) Managing the financial costs of housing, *Journal of Actuarial Practice*, 2.1: 125-144

Asher, A. (1998a) Effective and Ethical Institutional Investment, *British Actuarial Journal* 4: 969-1027

Asher, A. (1998b) The Education and Continuing Professional Development of Actuaries, *Transactions of the Actuarial Society of South Africa* XII.1:1-37

Asher, A. (2001) Research and the Public Interest, and South African Panel Study in Income Dynamics *Two short papers presented to the annual convention of the Actuarial Society of South Africa.*
(<http://www.assa.org.za>)

Asher, A. (2003a) "Meeting Consumers' Needs" Chapter 5 in *Understanding Actuarial Management: the Actuarial Control Cycle*, ed Clare Bellis, John Shepherd & Richard Lyon, Institute of Actuaries of Australia, Sydney 71-108

Asher, A. (2003b) Smoothing Investment Returns *UNSW Centre for Pensions and Superannuation annual colloquium* (<http://www.cps.unsw.edu.au/>)

Asher, A. (2004a) Unfinished Accounting Issues in Financial Institutions: Modelling Fair Value and Prudence, *Unpublished*

Asher, A. (2004b) Short-changed: conflicted superstructures, *UNSW Centre for Pensions and Superannuation annual colloquium*

Auerbach, A.J. and Kotlikoff, L. (1991a) How Rational Is the Purchase of Life Insurance? *NBER working paper w3063*

Auerbach, A.J. and Kotlikoff, L. (1991b) Life Insurance Inadequacy - Evidence From a Sample of Older Widows, *NBER Working Paper No. w3765*

Australian Institute of Health and Welfare, 1996, *Health Expenditure Bulletin*, no. 12, December, Australian Institute of Health and Welfare, GPO Box 570, Canberra ACT 2601

Barr, N. (2001) *The Welfare State as Piggy Bank - Information, Risk, Uncertainty, and the Role of the State* Oxford University Press

Brown, S. J., Gallagher, D. R., Steenbeek, O. W. and Swan, P. L. (2004) Double or Nothing: Patterns of Equity Fund Holdings and Transactions <http://ssrn.com/abstract=555423>

- Becker, G. S. (1983) *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* 2nd edition, University of Chicago Press, Chicago
- Blake, D. and Timmermann, A. (2004) *Performance Persistence in Mutual Funds: An independent assessment of the studies prepared by Charles River Associated for the Investment Management Association Financial Services Authority*, London
- Carr, D. (1993) *Moral Values and the Teacher: Beyond the Paternal and the Permissive* *Journal of the Philosophy of Education* 27 (2): 193-207
- Davidoff, T., Brown, J R. and Diamond, P A (2003) *Annuities and Individual Welfare* *NBER Working Paper w9714*
- Davis, E. P. and Li, C. (2002) *Demographics and Financial Asset Prices in the Major Industrial Economies* *Brunel University research paper*
- Dimson, E., Marsh, P. and Staunton, M. (2004) 'Irrational optimism', *Financial Analysts Journal* 60.1: 15-25
- Drucker, P. F. (1977) *Management* Pan, London
- Drucker, P. F. (1990) *Managing the Non profit Organization: Practices and Principles* Harper Collins, New York
- Dweczyk, M. D. (1992) *Housing: the Actuary's Last Big Frontier* *Transactions of the 24th International Congress of Actuaries* 5: 53-74
- Erikson, E. (1982) *The Life Cycle Completed*. Norton, New York
- Ferson, W.E., Sarkissian, S. & Simin, T.T. (2002) *Spurious Regressions in Financial Economics* *NBER Working Paper No. w9143*
- Friedman, M. and Kuznets, S. (1945), *Income from Individual Professional Practice*, *National Bureau for Economic Research*
- Grossman, S. J. & Stiglitz, J. E. (1980) *On the Impossibility of Informationally Efficient Markets* *The American Economic Review*, Vol. 70.3: 393-408
- Gurenko, E.N. (2004) *Catastrophe Risk and Reinsurance: a Country Risk Management Perspective* Risk Books
- Hadjimatheou, G. (1987) *Consumer Economics after Keynes: Theory and Evidence of the Consumption Function* Wheatsheaf Books, Brighton
- Holzmann, R. & Stiglitz, J. E. ed (2001) *New Ideas About Old Age Security* The World Bank, Washington

- Levitt, T. (1975) Marketing Myopia. *Harvard Business Review* Sept-Oct
- Lucas, J. R. (1980) *On Justice* Clarendon Press, Oxford
- Mulligan, C.B and Xavier Sala-i-Martin (1999) Gerontocracy, Retirement, and Social Security *NBER working paper w7117*
- Modigliani, F. (1986). Life Cycle, Individual Thrift and the Wealth of Nations. *The American Economic Review*, June, 297-313
- Oleson, M. (2004) Exploring the relationship between money attitudes and Maslow's hierarchy of needs. *International Journal of Consumer Studies*, 28.1 83-92
- Pender, H. (2004) *Public policy, complexity and rulebase technology* The Australian Institute working paper.
- Polachek, S. W. and Siebert, W. S. (1993) *The Economics of Earnings* Cambridge University Press
- Shiller, R. J. (2003) *The New Financial Order: Risk in the 21st Century* Princeton University Press
- Siegel, J. J. and Thaler, R. H. (1997) The Equity Premium Puzzle *Journal of Economic Perspectives* 11.1, 191-200
- Trowbridge, C. L. (1989) *Fundamentals of Actuarial Science* Actuarial Education and Research Fund
- Wadsworth, M., Findlater, A. & Boardman, T. (2001) *Reinventing Annuities* Staple Inn Actuarial Society, London
- Wallis, C. and Dell, K (2004) What Makes Teens Tick, *Time Magazine*, May 10
- Welch, I. (2000) Views of Financial Economists on the Equity Premium and on Professional Controversies *Journal of Business* 73.4: 501-37
- Wolf, A. (2004) Professional engineering bodies have been pretty much alone in insisting that there are such things as absolute requirements for competence *Times Higher Education Supplement* Issue 1631:17