



WELCOME FROM THE GOVERNMENT ACTUARY

Welcome to the second edition of GAD's electronic newsletter, **e-News from GAD**.

Thank you to those readers who have given us feedback on the first edition, issued in April. That issue is available on our website www.gad.gov.uk.

Do continue to let me have your feedback by contacting me at:
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TREVOR LLANWARNE GOVERNMENT ACTUARY

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GAD IN THE NEWS

LONGEVITY SWAPS

The Trustees of two of the pension schemes sponsored by Babcock International recently entered into longevity swap arrangements with an investment bank. These are the first longevity swap agreements for a UK pension scheme.

Grant Ballantine from GAD, and Government Actuary Trevor Llanwarne, advised both Boards of Trustees in relation to the swap arrangements.

TREVOR LLANWARNE in Pensions World

Stephanie Hawthorne interviewed Trevor Llanwarne to find out more

about the Government Actuary's Department.

TREVOR LLANWARNE in The Actuary

Adam Jorna asked Trevor Llanwarne about his first year as Government Actuary.

RETIREMENTS

We are sorry to say good-bye to both Andrew Johnston and Andrew Young, who have recently retired. We wish them all the best for the future.

Andrew Johnston worked at GAD for over 30 years. He was Deputy Government Actuary from 2004,

including a spell as Acting Government Actuary. Andrew Young is widely known in the pensions world, both in the UK and abroad. He was author of a 2007 report for DWP on the reform of the Financial Assistance Scheme.

Please contact Stephen Humphrey (020 7211 2646, stephen.humphrey@gad.gov.uk), or George Russell (020 7211 2666, george.russell@gad.gov.uk) with any enquiries about work previously undertaken by either of the two Andrews.

"THERE IS GOOD NEWS AND BAD NEWS."

JULY 2009



ADRIAN GALLOP

DEMOGRAPHY

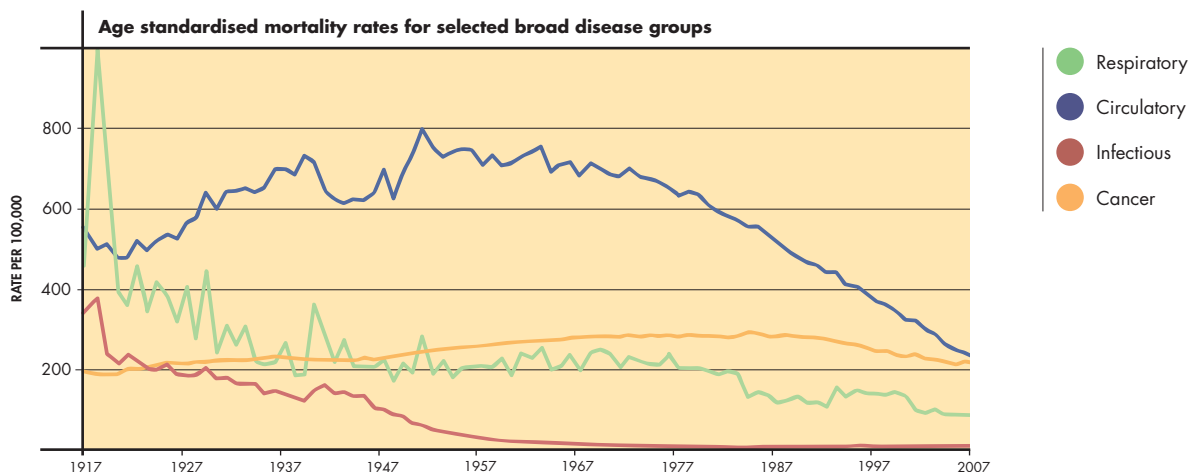
> IMPROVING LIFE EXPECTANCY: WILL CURRENT TRENDS CONTINUE?

There is good news and bad news. The good news is that life expectancy is increasing; the bad news is that the cost of pensions, social security and long-term care for the infirm and elderly are all increasing as a result, far beyond the cost envisaged when current levels of benefit were set many years ago. That is why keeping track of trends in life expectancy is important.

INTERPRETING PAST TRENDS

For many years, analysis of mortality rates has been a routine part of actuarial work. The analysis has been coldly statistical, with historic trends a prominent feature. The chart shows past trends of death rates of males by cause of death (the trends for females are similar). Over the course of the 20th century the incidence of death from infection has reduced to almost zero, and deaths from cardio-vascular disease or respiratory disease are on marked downward trends, while the trend in cancer deaths has apparently been rising until about 20 years ago. What's going on?

Male mortality by major cause, England and Wales 1917-2007



The chart shows the past. The improvements in public hygiene and lifestyle during that period are well known, not to mention medical advances. The diagram confirms their impact. But these developments have been so significant that they have masked improvements in cancer survival rates. It only looks as if cancer survival is unchanged because those who have avoided infection, or problems with their heart or lungs, have eventually succumbed to cancer. Once you look at it this way, it's clear that the trends in death rates from each cause must be related.

WHY THE BIG FUSS?

The big fuss is not about the past - analysis with hindsight is easy. The big fuss is about the future because predicting the future trends of improvement is extremely tricky. See that spike on the chart in 1918. That was the 'Spanish flu' pandemic. Who's to say there might not be another spike just off to the right of the chart.

PROJECTING FUTURE IMPROVEMENTS

A logical start is to extrapolate past trends, despite some shortcomings in this approach:

- > To be reliable, there needs to be an implicit assumption that the rate of improvement in life expectancy from past lifestyle changes and medical advances will be maintained. But who can say what that should be? On the one hand, medical advances might accelerate. On the other hand, the rate of improvement in life expectancy might slow down, perhaps because of the increasing prevalence of obesity.
- > It would be a brave demographer who would rely on an extrapolation more than 20 years in the future. Unfortunately, projections of pension and Social Security costs must inevitably look way beyond that.
- > Future trends will depend on the future make-up the population, including for example, the impact of migration. Simply relying on the past make-up of the population will miss this important effect.

THE WAY FORWARD

It may be a tricky problem, but it is not insurmountable. There are some ways of approaching it which might limit future damage:

- > The relevant bodies (the Actuarial Profession, and the Office of National Statistics) continue to build on their established practice of progressive trend analysis, delving deeper when and where merited. If a trend is spotted, at least the nature of the problem dictates that there will be a time lag before the financial effect is felt. Early warning systems are good practice.
- > There is regular dialogue between those analysts whose concern is to:
 - Analyse the make-up of the population (Office of National Statistics)
 - Study the incidence of illnesses across the population (epidemiologists)
 - Project likely long term costs (actuaries).

Each group is interested in understanding how the various factors (such as lifestyle and medical treatment) might affect life expectancy.

When it comes to long-term economic planning, this is a problem with very many unknowns. There is no immediate, once and for all, solution. If there were, someone would have solved it already. The best that can be done is to learn from history as far as possible, keep a close track on the trends, and lay plans for the future. With that in mind, GAD continues to work closely with Office of National Statistics.

***"IT MAY BE A TRICKY PROBLEM,
BUT IT IS NOT INSURMOUNTABLE."***

WE'VE GOT A FUND, SO WE'RE OK
..... BUT ARE WE REALLY OK?

eNews
FROM GAD

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MARTIN LUNNON

DEMOGRAPHY

04

> WE'VE GOT A FUND, SO WE'RE OK BUT ARE WE REALLY OK?

Martin Lunnon looks at how countries finance their social security programmes

Most countries have social security to pay benefits to individuals unable to provide for themselves. One thorny question is how to finance these programmes. This continuing issue faces many countries, from emerging nations to the most developed economies.

There are three options:

Fully funded

A social security fund large enough to meet all liabilities accrued to date; a bit like an occupational pension plan.

Partially funded

A smaller fund covering part of the benefits.

Pay as you go

(PAYG) Contributions each year to cover benefit outgo.

Most countries operate some sort of fund, like the National Insurance Fund in the UK. But unlike occupational pensions, social security is usually only partially funded.

PARTIAL FUNDING

Suppose a new social security programme sets out to pay full-rate benefits from day one. It will rarely be fully funded, unless established with a large initial payment from public funds. Partial funding can also arise because:

- > Contributions are set to maintain a fund large enough to pay five years' (say) of future benefits. A smaller fund is enough to provide liquidity or prevent the need for short-term alterations in contribution rates when benefit expenditure goes up or down.
- > An initial aspiration to full funding can change to partial funding in adverse conditions; where benefits cost more than expected, asset returns are poor, or expenses high.
- > On the other hand, partial funding can occur if PAYG contributions are set higher than needed to pay annual benefits over a number of years.

ACTUARIES AND SOCIAL SECURITY ...

Social security actuaries in the UK and elsewhere investigate ways to counter the effects of changing demographics and economic outlook, usually within a partial funding framework.

*"ACTUARIES INVESTIGATE
WAYS TO COUNTER THE
EFFECTS OF CHANGE."*

WE'VE GOT A FUND, SO WE'RE OK
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05

IN A LARGE COUNTRY



The US Social Security Trust Fund is only partially funded. Social security contributions, at rates set in law, have exceeded benefit expenditure in recent years, so a fund has built up, which will continue to grow until the post World War II baby boom retires (around 2016). The fund will then run down, and is projected to run out of money by 2037¹.

A lot of attention is paid to when the fund is projected to run out. However, many events could change this outcome. Comparatively small increases in contributions could make good the position, as could changes to benefits.

IN A SMALL COUNTRY

A small island territory has a partially funded social security programme which is still fairly immature, but the population is living longer and aging, and is also highly sensitive to immigration. Contributions are at just the rate which will pay for benefits earned over an average working lifetime.

As in the first example, expenditure is projected to grow as the population ages and the fund matures, until it exceeds contribution income. Then the fund starts to run down, until it is exhausted. But how to explain this to people? Especially when they are paying adequate contribution rates, and they say: "we've got a fund, so we're OK".



CLARITY OF PRESENTATION IS KEY

One approach for the explanation focuses on benefits earned in the past. Because of partial funding, the fund set aside to pay past service benefits will eventually run out. But there will be future contributions to make up the shortfall, and these could be greatly boosted by future immigration.

An alternative approach considers the whole fund. The liability to pay benefits will grow with the population, and the growth in earnings; the deficit from full funding will grow in line with investment returns; the net fund (liabilities less deficit) will be negative if population and earnings growth fall short of investment returns.

Under both approaches, the partial fund can run out under some scenarios – depending on the balance between demographic expansion and economic growth.

OK, BUT KEEP UNDER REVIEW

Having a fund might feel like 'we're OK'. But what matters is how much is in the fund and the contribution levels. If the fund is not enough to pay for past accruals, future contributions have to subsidise the past as well as pay for the future. Not necessarily a problem. But the lower the funding, the greater the reliance on future contributions, and the more likely they are to have to rise.

The trick is to keep the position under regular actuarial review. That way, there is an early warning system in place in case liquidity is squeezed, or if threats arise to the long term affordability of social security for those who really need it.

¹ <http://www.socialsecurity.gov/OACT/TRSUM/index.html>

*"THERE IS NEVER (OR HARDLY EVER)
A SINGLE ANSWER."*

JULY 2009



COLIN WILSON

INVESTMENT AND RISK

> LESSONS FROM RECENT EVENTS

Colin Wilson looks at how traditional risk modelling fared in the recent extreme economic conditions, and draws three key lessons for the future.

The words 'risk modelling' immediately evoke thoughts of complex mathematics. Fear not - this article takes a look at a set of principles, using the analytical technique of common sense.

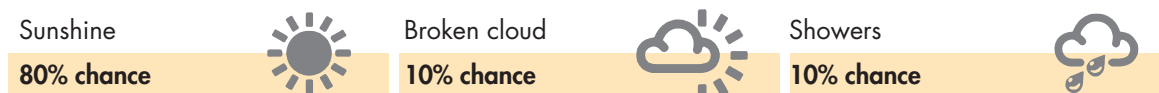
FINANCIAL INSTITUTIONS ...

Risk modelling has been applied to financial institutions for years. Banks, Insurance Companies and Pension Funds have many differences, but they have one thing in common – each has assets and liabilities. Those assets and liabilities might have different characteristics, but they are all intrinsically uncertain. Banks don't know when depositors will want their money back, whether borrowers will default, whether collateral is secure, or what future interest rates will be. Insurance Companies and Pension Funds cannot be certain about future demographic trends, economic indicators such as inflation, or investment returns.

These uncertainties make such institutions prime candidates for risk modelling. The results from the models help formulate strategic thinking, by highlighting the uncertain influences likely to do most damage, and by testing the effectiveness of possible protective actions. Rather than dwell on the mathematical detail, important though it is, think of risk modelling as a black box. Feed your assumptions into the black box, and out comes a range of possible outcomes, each with a probability attached to it.

... AND THE WEATHER

Note that there is never (or hardly ever) a single answer. It is rather like a long range weather forecast for the next 5 days. Feed in readings from weather stations at several locations in a given area, and out comes a forecast for a single location within the area, along the lines of:



Nothing is presented as a certainty, but there are three possibilities, some more likely than others. Unavoidably, interpretation of the results and deciding on the best plan for the future requires judgement. Sun block might be a better bet than an umbrella! In summary, the forecast is vital, but it's not the whole picture.

BACK TO FINANCIAL INSTITUTIONS...

In financial risk modelling, the black box is much the same. Data is collected over many years from several sources. There are many possible outcomes, each with a percentage probability. Most of the data often shows a clear trend, and it is easy to be confident about the relative risks of commonplace outcomes. It is a lot harder to attach probabilities to extreme outcomes. A weather forecast for the middle of the weather stations will be more reliable than one for the edge where there is less data. Or we may be in a part of the world where hurricanes are so rare that we cannot deduce the conditions that are likely to lead to one in the future.

" HAVING NO PLAN IS NO GOOD."

JULY 2009

THE ONE IN 200 YEAR EVENT

"The shortcoming recently revealed in financial risk modelling is that discernible trends were identified only from normal times, albeit in some cases from sources with a lot of available and reliable data. But those trends were extrapolated to gauge the likelihood of extreme events, with hardly any supporting data.

In particular, assumptions were made about the likelihood of combinations of different events: eg. snow and gales. The trouble is that recent conditions were so extreme, that even the basic assumptions in the black box became invalid. They were fine in normal conditions, because everyone had analysed many years of relative normality, albeit with occasional ups and downs. But recent events were far from normal. In short, what was considered a 0.5% chance - the "one in 200 year event" - actually happened. No-one had statistical data collated under such extreme conditions, and so the risk models became unreliable.

Key lessons

What can we learn from this?

Key lesson 1

Risk models designed to work in normal conditions cannot be relied upon in more extreme conditions.

Key lesson 2

A one in 200 year event is not the same as "it will never happen".

Key lesson 3

If a one in 200 year event has massive detrimental impact, then completely ignoring it can lead to big trouble. First, you need to structure things to minimise the impact. Then, if a potentially catastrophic one in 200 year event does happen, you need some sort of plan to respond. Having no plan is no good.

If Key lesson number 3 sounds pedantic and impractical, then take a few moments of quiet reflection about air travel – first, all the safety features and checks to minimise the risk of a problem, then what happens at the start of a plane journey. *"In the unlikely event of an emergency [one in a million(?) chance]your life jacket is under your seat, oxygen masks will descend from above, and the exits are being pointed out to you now".* This is the plan. Even though an emergency is extremely unlikely, it is so important that everyone knows the essentials of the plan that the captain personally asks everyone to pay attention. Risk management without an equation in sight.

DIFFERENT LANGUAGE, SAME MESSAGE

In our more familiar actuarial territory of Financial Institutions, we might have to resort to language like Value at Risk and confidence limits. (These are statistical expressions which describe the chance that a random variable will lie in a given range. For example, there is a 95 per cent confidence that the temperature will be less than 35°C today.) Handling the mathematics is a core competence for actuaries. But rest assured that we will never forget the importance of the underlying principles and the three key lessons.

"THE ONE IN 200 YEAR EVENT ACTUALLY HAPPENED"



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