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Figuring out the French exception

By Mark Heijster

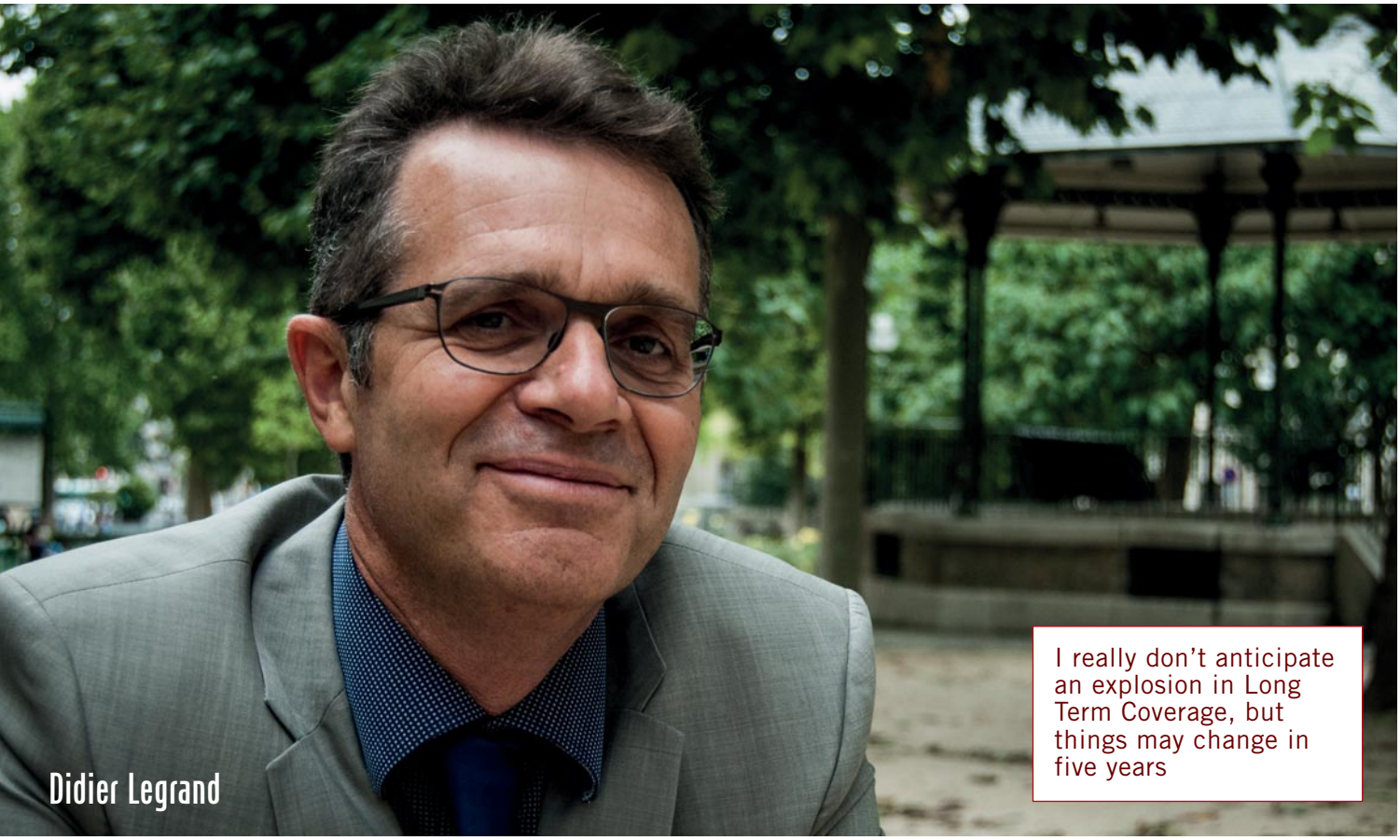
The stats are quite remarkable. The French are exceptionally committed to preparing for the care of the elderly. In fact, France has the highest number of persons insured for this type of care, with, for example, three times more than in the United States. In addition, the stats show a slight increase in that number every year. Despite the steady growth, Long Term Coverage (LTC) is still only a very small part of all activities, according to MutRé CEO Didier Legrand. In the medium term, MutRé is keen to pursue the development of its LTC activities. But what does the future hold? For an answer to this question, we looked to Paris, where the headquarters of MutRé has been located since 1998.

Let's start with the notable proportion of young people who have LTC coverage. How is it that, unlike many other countries, the French have an interest in such insurance?

'I don't entirely agree with your optimism. It is true that LTC is an important market, but it is far from a priority for the French. If young people, civil servants for example, insure themselves, it is because the LTC component that is included in private insurance arrangements is obligatory. At forty, one really has very little appetite for LTC insurance. Most people only get interested when they are nearly 65. To want insurance against a particular risk, one must be familiar with that risk. Many young people do not have that awareness. It is different when there is someone close who needs help. It is true that the percentage of people with LTC coverage is higher than in other countries, but ultimately, it is only a limited group.'

But it seems you have managed to reach that group.

'This has to do with the fact that France has always been innovative and has developed new products in the field of personal insurance. At one point there was an offer for LTC coverage which was very complete. A total of 5 million people are covered right now, which is not bad. >



I really don't anticipate an explosion in Long Term Coverage, but things may change in five years

However, within that group there are many people who are insured for a very low amount, between 150 and 300 euros per month, while the need might be five times greater. So it is significant, but it's not huge, and the group of insured will not get any bigger in the short term. I do not foresee an explosion in the number of elderly dependent who are insured in the medium term. Only after five years there will be the possibility of a substantial increase in demand.'

Actuaries should not work alone

You just mentioned the obligatory nature of the LTC component within a private coverage arrangement. What has been the role of the French state in this?
'The state takes all kinds of measures to prepare its increasingly aging population. Obligatory coverage for LTC, similar to car insurance, which pays out only when needed, has been proposed. But that plan finally fell through. Today, the government is trying to strengthen the APA (*Association Pour l'Autonomie*). This is an allowance that is paid out starting from the moment people have reached the point where they are dependent on care. It is an amount of between 300 and 800 euros, depending on your income. Furthermore, the state is trying to encourage people to adapt their homes so they can continue living at home. In addition, for ten years now the state has been implementing various tax incentives to get people covered for LTC.'

So, apart from this, the role of the state is rather restricted?
'Yes, that is right. At some point a kind of cooperation between the government and the insurance industry needs to be established. It is in the government's interest to take decisions which allow older people to continue living at home and thereby reduce the costs of health care. Tax incentives can help people to adapt their homes. The insurance industry is the only one that is able to develop products for the long term. That is in the domain of the actuarial profession. Over time collaboration between government and private insurance companies is required, and for that political determination is needed.'

What does this development mean for the profession of the actuary?
'There is much work ahead as LTC includes some complex risks. We are working with three key metrics. First of all we would like to know how many people in a certain age group need care. This percentage tends to decrease, with fewer people becoming dependent on care. A second metric is that of the life expectancy of people dependent on care. For how long a period will their need for care last? A final metric refers to those who do not depend on care. It is the combination of these three factors which will enable us to evaluate risk.

The challenge for the actuarial profession is to look fifty years ahead, taking into account various developments, such as new treatments for Alzheimer's disease, affecting these three metrics. If researchers succeed in preventing Alzheimer's, fewer people will be dependent on care. On the other hand LTC costs will increase when medication is available which will extend the life of Alzheimer's patients. We will have to evaluate these complex parameters. This can best be done with a team of researchers, doctors and demographers. Actuaries should not work alone.'

MutRé
The largest reinsurer for the French health care system was established in 1998 and realized a turnover of 367 million euros last year. Most of the sales (52%) are products related to health care in general. Products related to LTC coverage only provide 15% of the total sales.

FUNDED PRIVATE LONG TERM CARE INSURANCE: 30 YEARS OF POSITIVE EXPERIENCE


Roland Weber


Wiltrud Pekarek

By Roland Weber and Wiltrud Pekarek

More than 10 years before the introduction of statutory long term care insurance on 1 January 1995 the private health insurance industry had been offering private insurance cover against the risk of needing long term care in the form of a daily care allowance and tariffs to cover care costs. Contributions had already been appropriately calculated using the funding principle. In the model terms and conditions for private long term care insurance approved by the German financial regulator in 1984, the definition of nursing care that still applies to this day was created. This is based on the assessment of being in need of nursing care in line with the need for assistance with activities for daily living (ADLs), with individual activities being allocated points. The severity of the nursing case depends on the degree of nursing care needed, which is measured by the number of points awarded.

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Unlike when the pricing and rating used in subsidized supplementary long term care insurance was being calculated, health insurance actuaries had no publicly available head claims cost statistics they could consult when calculating the first long term care insurance tariffs in the 1980s. There were very few statistics concerning the risk of needing long term care. The main source for actuarial assessment of the risk of needing long term care, from which the underlying calculations were derived, was a 1978 Socialdata study. At the time, it was the only comprehensive study on the number of nursing cases living at home and the situation they faced. Information on the number of people needing in-patient nursing care was based on the national statistics for "recipients of nursing care assistance" and the estimates based on them used by the Working Group of the Federal Government and the Länder.

1984: First statistics

Helmut Holländer used the results of these studies to develop, for the first time, nursing care frequencies for single care levels in relation to degrees of nursing care needed. His 1984 work Standardised Head Claims in Long term Care Insurance was used by actuaries as the basis for calculating the first long term nursing care tariffs and for private long term care insurance. In his work, the nursing care frequencies in the single nursing care groups are considered unisex and are cautiously assessed with at least the maximum of the gender-specific figures. When determining head claims, actuaries also had to consider, alongside the objective medical assessment of the need for care, the higher risk due to insurance being taken out in connection with the product tariff design – the excess for nursing care costs or the level of daily nursing care allowance if the care giver is a family member.

The probability-of-decrement approach used to calculate the first long term care tariffs meant it was possible to refer to the usual mortality tables as well as to lapse probabilities derived from expected values in the in-force portfolios of insured persons with supplementary cover.

1995: Introduction of mandatory long term care insurance

Until 1986, 28,000 supplementary long term care policies had been taken out and until 1994, one year before long term care insurance became mandatory, 315,900 private supplementary policies had been underwritten. The number of private long term care policies increased once long term care insurance became mandatory. The model was initially to be the funded model approach already practised in private life and health insurance. However, a purely funded model would have caused high start-up costs because provision has to be built up through funding. During a transitional phase, benefit payments would have had to be absorbed by a tax transfer. As of 1 January 1995, the German Long Term Care Act, with its principle of "long term care insurance following health insurance", entered into force. This meant that insured persons with private health insurance cover were included in private long term care insurance and insured persons in statutory health insurance schemes were included in the social long term care scheme, which is a pay-as-you-go scheme. Both schemes provide the same statutorily-defined benefits but are funded in different ways.

Private long term care insurance: funded model with socio-political additional components

Unlike funded models, the pay-as-you-go model considers neither the fact that the population is ageing - meaning that the number of people in need of nursing care is increasing - nor the fact that the future generation is shrinking as a result of the lower birth rate, meaning that the system will have fewer and fewer people paying contributions to cover the care costs of those in need of care. A 2010 study by the Scientific Institute of the Private Health Insurance Industry (Wissenschaftliches Institut der PKV) concluded that, if constant age-specific probabilities for the demand for care are assumed until 2060, the number of persons in need of care can be expected to increase from two million to around four million. This effect alone will mean that spending on social long term care insurance will almost double. This will be compounded by the fact that demographic change will mean fewer people in gainful employment, whose contributions keep the social systems going. In contrast, the generation of insured persons with private long term care insurance are, by creating ageing reserves, making early and responsible provision for the risk of their needing care later in life.

In private long term care insurance, contributions, together with ageing reserves, are initially determined based on age and gender. These are then converted using an appropriate factor into unisex contributions, meaning that long term care insurance contributions have been unisex from the outset. Moreover, when contributions are calculated, various social components are prescribed by law. To fund these components, such as a contribution ceiling, for example, the contributions have to be supplemented by a pay-as-you-go component paid by those insured persons whose contributions are below the ceiling. This pay-as-you-go component is calculated for the whole private long term care insurance industry because for some insurers it would be insufficient whereas for others it would be too high. For this reason a pooling system was created which ensures that the deficit of an insurer whose pay-as-you-go component is too low is compensated for by the other insurers.

Twenty years of mandatory long term care insurance demonstrate the superiority of the funding model

Meanwhile a comparison of premiums in social and private long term care insurance shows that the funding model in private long term care insurance works. While contributions in social long term care insurance are rising constantly as a consequence of the premium rate and the income threshold for contributions being increased private long term care insurance contributions are decreasing. One reason is that a large part of the pay-as-you-go elements have, over time, been financed by the surpluses generated from the funding model.

Politics has recognized the benefits of the funding model and recently introduced subsidised top-up long term care insurance. Demand for this product is high. Unsubsidised supplementary long term care insurance, too, has witnessed growth: from 1.88 million policies in 2011 to 2.34 million in 2013.

Conclusion

Given the demographic change we are experiencing, the problem of the population needing long term care is set to be one of the greatest socio-political challenges in the decades to come. It appears, too, that the population is becoming increasingly aware of this. However, further information is still necessary. The first step has been taken with the support for the funding model. This model is especially suited to paying for the risk of needing long term nursing care because, even more so than the risk of falling ill, it is age-dependent.

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OVERVIEW OF HEALTH INSURANCE SYSTEM IN UK

This article was provided by the Health and Care Board, Institute and Faculty of Actuaries

The majority of healthcare in the United Kingdom is provided by the tax-funded National Health Service (NHS). The services are generally free at the time of use. Around 10 per cent of the UK population have PMI (private medical insurance) which supplements or provides a private alternative to some benefits otherwise available under the NHS. It is concentrated with the top four insurers (BUPA, AXA PPP, Aviva and Pru Health) covering 85% of the market.

PMI generally covers the costs of specialist treatment and acute surgery; chronic conditions are not covered. Individuals with PMI also benefit in full from and pay for the NHS through general taxation and social security contributions. PMI is not tax deductible.

PMI policies vary from full cover to limited cover, from the packaged family plan to specialist cover. There are both corporate plans for employers and personal plans. Most business written is on a moratorium basis where all pre-existing medical conditions and conditions related to them are excluded from benefit.

The challenge medical insurers face is seeking to keep their cover affordable in light of ever-increasing cost pressure from the introduction of new (and often expensive) treatments, which policyholders, naturally, expect to access, should the need ever arise.

How is the long term care insurance organized in the UK?

In the UK there is only a modest long term care insurance market (around 10,000 policies a year). Only immediate needs annuities (and variations thereof, including deferred annuities) are sold. Immediate needs annuities work by the insurer taking a single premium at the time an individual goes into care, and guaranteeing to meet the future care costs for that individual, sometimes with starting payments deferred for between 1 and 5 years. Typical single premiums might be in the region of £100,000, lower for deferred policies.

In the past there were various forms of LTC insurance in the UK, which included pre-funded products, immediate needs annuities and investment bonds. Poor pricing in the 1990s may have led to significant rate increases and to insurers dropping their pre-funded products. Reinsurance capacity also reduced as reinsurers withdrew from the market due to poor sales. Demand for insurance products is also low, partly due to the incorrect perception that the State will provide and a lack of clarity as to what the State does actually provide.

Where do you see the strengths and weaknesses of the long term care insurance?

The real strength of the only current available product, immediate needs annuities, is that the product is available at the point of need and customers understand it. The two main weaknesses are the demand consumers make instead for other types of pre funded products and uncertainty (especially with respect to State benefits) for insurers in creating alternative products. Increased consumer awareness and demand may be brought about by UK Social Care reforms and the Government push for improved guidance on pension options at retirement.

The main issue insurers have in product creation is being able to correctly price and hold future reserves for the obligation they have to pay the consumer. This in part depends on the claim definition (or trigger) and the terms of payment. Lessons have been learned from products developed in the 1990s which were poorly priced – partly because of lack of data and partly because they underestimated improvements in longevity.

Associated with this is the potential challenge for the insurer if the trigger for a claim differs from the public criteria of "substantial needs". There is the risk of confusion and loss of trust for the public where the State benefit system does not dovetail with insurance products. These issues need to be overcome for further development of LTC protection insurance or disability linked annuity products.

Recent Develop

By Peter Banthorpe

Dementia is a poorly understood disease with no known cure. It is a condition that can lead to a profound loss of function and independence and so generates a substantial need for care. Across the world, insurance products exist to provide financially for this care through long term care or Critical Illness policies. In some countries, insurance specifically for dementia exists. More indirectly, changes in the life expectancy of people with, or at risk of, dementia will impact the pricing of longevity insurances. This article examines some of the recent developments in dementia research.

Dementia is most notably a disease of old age, so as populations worldwide continue to age, the burden of disease will grow exponentially. Recent developments have served to thrust the global challenges from dementia into the spotlight. The 2012 report, *Dementia, a public Health Priority*, jointly authored by the World Health Organization and Alzheimer's Disease International, aimed to raise awareness of dementia and to advocate for action. The G8 group of nations took note and attended a dementia summit in December 2013, from which emerged a number of important initiatives, some of which are discussed later.

Recent Incidence Trends

To price insurance contracts incidence rates are needed. Unfortunately, a review of the literature reveals a lack of high-quality incidence rate information, with most studies concentrating on estimating the prevalence of dementia in a country.

Understanding trends in dementia is complicated because dementia is a description of symptoms arising from certain diseases and conditions, each with different risk factors. The most common cause is Alzheimer's disease, the causes of which are not fully understood, but increasing age and genetic factors are the most well-established. The second-most common cause is vascular dementia, which has similar risk factors to cardiovascular disease.

A recent review of the dementia epidemic in the *New England Journal of Medicine* found the trend in incidence of dementias in high-income countries seems to be broadly neutral to favourable based on a number of recent reports[1]. This view is supported by a range of other studies, including one published in August based on Australian data[2]. The reasons proposed for these favourable trends vary by study. This perhaps reflects the lack of understanding of the disease process. Commonly cited reasons for improving trends include:

- Increasing educational levels;
- Increased intellectual stimulation throughout life, due to changes in employment patterns or, as awareness grows, perhaps deliberately to prevent onset of dementia;
- Reduction in vascular risk factors, particularly affecting vascular dementias;
- Healthier lifestyles, including exercise.

One particular initiative announced in connection with the G8 summit was the creation of the UK Dementias Research Platform. This £16m public-private partnership will utilise two key strategies in modern research, data from large prospective cohort studies and widespread academic collaboration, to provide an improved understanding of the dementia disease process by setting the brain in the context of the whole body[3]. This, alongside similar initiatives, should allow us to develop a better understanding of risk factor associations.

In the context of risk factors we can note the potential association with the obesity epidemic sweeping the developed world and how this could adversely impact dementia trends. Obesity has not been clearly linked with Alzheimer's disease but a link with vascular dementia is more plausible, so some impact may be observed. Overall dementia incidence may not increase as a result of the obesity epidemic, as other risk factors

ments in Dementia Research

may continue to develop favourably. Indeed, a paper on the Rotterdam Study in 2012[4] showed that even in the presence of deteriorating Vascular Risk factors (increasing obesity and hypertension) dementia incidence rates likely fell between 1990 and 2005.

Future Dementia Treatments

To quote Margaret Chan, Director General of the World Health Organization, "In terms of a cure, or even treatments that can modify the disorder or slow its progression, we are empty-handed"[5]. In this context the search for treatments is clearly very important.

A global target date of 2025 was set at the G8 summit as a key milestone for developing a cure or treatments for dementia. This was also the date set previously by the U.S. Government's National Plan to Address Alzheimer's Disease as being the target year by which Alzheimer's disease could be effectively treated. It is recognised that achieving these aims by 2025 is an extremely ambitious goal.

The scope of the challenge is apparent when one considers:

- Only three dementia drugs, out of more than 100 tested since 1998, made it to market[6];
- Two recent phase 3 trials of drugs designed to clear or reduce Amyloid plaques, which have been proposed as being a cause of Alzheimer's disease, were halted after they showed little or no promise in treating symptomatic patients.

Following the failure of the anti-amyloid drugs to treat symptomatic patients one line of research is to test the effect of these and other drugs on high-risk patients before they develop symptoms – i.e., researching prevention rather than cure. A key benefit of these trials will be provide evidence as to whether Amyloid plaques do indeed cause Alzheimer's or, as many suggest, are themselves a symptom of the disease process that causes Alzheimer's disease.

Research is ongoing in many other areas, including methods to help manage symptoms, but overall funding for research in the area of dementia has historically been relatively limited. For example, in 2007/08 the UK Government provided nearly eight times as much funding for cancer research as they did for dementia research[7]. To help increase the amount of dementia research, a number of additional substantial funding pledges were made in connection with the G8 dementia summit.

Implications for the Insurance Industry

For critical illness and long term care products, the definition of dementia that triggers a claim would normally be aligned to severe forms of dementia and focused on the level of cognitive impairment. This is a necessary precaution as, at present, diagnosis of dementias is an inexact science and the perception is that dementias remain under-diagnosed in the community. The requirement for severe cognitive impairment should protect these products from adverse trends when the anticipated increase in diagnosis occurs.

Scientific breakthroughs will in time yield treatments and interventions that will:

- delay the onset of dementias until later in life, and
- arrest the progression of dementia and so delay the onset of more-severe cognitive impairments.

In this way critical illness and long term care products may in time benefit from beneficial trends as both outcomes will reduce the number of dementias reaching the required severity levels.

Increased focus on dementia should lead to increasing demand for insurance to protect against the costs of suffering from dementia. While an increase in demand would be welcomed, the increased focus on dementia could also bring potential issues. For example, clients may see an increase in declined claims if they claim earlier in the disease process, before the disease has progressed to the required degree of severity for payment.

For longevity insurance, delays in dementia progression will likely result in life expectancy increases providing another driver for continued mortality improvements.

The UK Actuarial Profession is keeping abreast of new developments in dementia research through its Mortality Research Steering Group which has hosted a workshop on Dementia Research in November 2012[8].

Conclusion

As we have discussed above, dementia is now recognised as a major global challenge. That recognition has brought with it more research funds and an increased focus. Increased funds, allied with co-ordinated global collaboration between brilliant scientists, may yet deliver the ambitious targets set. However, recent progress on cure and prevention has been slow, and to meet those targets will require some rapid breakthroughs in an area that is poorly understood.

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1 – New Insights into the Dementia Epidemic. Larson et al. N Engl J Med 2013; 369:2275-2277

2 – The Influence of smoking, sedentary lifestyle and obesity on cognitive impairment-free life expectancy. Anstey et al. International Journal of Epidemiology, 2014, 1–10

3 – New approach to accelerate dementias research. MRC News 19 Jun 2014. Accessed 21 August 2014.

4 – Is dementia incidence declining? Schrijvers et al, Neurology® 2012;78:1456–1463

5 – Transcript of Address to the G8 Dementia Summit, 11 December 2013. http://www.who.int/dg/speeches/2013/g8-dementia-summit/en/ Accessed 21 August 2014

6 – The Lancet, Volume 383, Issue 9936, Page 2185, 28 June 2014. Accessed 21 August 2014

7 – Answer to Parliamentary Question 241507, 16 December 2008. Recorded in Daily Hansard – Written Answers

8 – The Actuarial Profession Mortality Seminar Series: Dementia Research - Where Are We and What Are The Gaps? 28 November 2012.

LEARNING TO LOVE

By Jeroen Breen

"In a world that constantly throws big, unexpected events our way, we must learn to benefit from disorder." (Nassim Nicholas Taleb)

This was the headline of the *Wall Street Journal* in November 2012 and as far as that is concerned today's world has not changed at all. Our environment is changing at an exponential rate. Matters which were regarded as certainties previously, are now uncertain. Risks of which we had no knowledge yesterday, are significant today. The development of big data ensures that we will know even more. However, what are we going to do with all that data? How are we going to use this knowledge in our models? Will we still require models in the future?

In this rapidly changing world there is a considerable need for professionals who know what correlations are, who understand what causality means, who appreciate how risks can be quantified, who are able to calculate what population ageing implies, who grasp the impact of solidarity and who know what volatility means. Actuaries meet this profile very well. In fact, this is the profile of an actuary. An actuary is an outstanding example of a risk professional. Actuaries need not be circumspect in admitting to this and may certainly claim this title.

If we consider population ageing, the actuarial profession is confronted with challenging and exciting developments. How will the future be financed? How much solidarity will we have for each other? In many countries, a good pension system is supported by two and sometimes three tiers; in many cases, this is still based on the Defined Benefit system, but the Defined Contribution system is certainly on the increase. However, what happens if, as an elderly person, you have additional expenses at any particular moment, for instance in relation to additional healthcare or other forms of care, because this is no longer financed from an insurance product? Is it possible in such cases to make use of part of your pension? It would be a good idea if the financing of our future were regarded in an integral fashion. In many countries, the elderly are the most wealthy group. However, this wealth is often tied up in real estate or pension systems and is not immediately available, when

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necessary. In the Netherlands, the themes of pension and housing are slowly but surely being linked. In any event, they are the topic of discussion. There are countries, such as the Scandinavian countries, where these three themes are already more integrated. In some countries, long-term healthcare products have been marketed successfully, while in many other countries it has not been possible to launch such products. This depends strongly on the political and economic climate of the respective country and the way in which – in this case – healthcare and curative healthcare are configured.

In the various European countries, many actuaries are involved in these developments. The issues are not identical in all countries, so that a single European model will not be feasible; volatility in the various methods of implementation will therefore remain. Of course, this does not mean that we cannot learn from each other; many issues are essentially not unique. Actuaries are united locally in local professional associations and within the European context actuaries are members of the Actuarial Association of Europe (AAE), the European umbrella organisation of actuaries. Through this membership, it is therefore very easy to take a look at what is happening in neighbouring countries, since some wheels need not be reinvented.

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What if there was a cure for cancer?

Improving the quantification of longevity risk using scenarios

By Jeroen Gielen and Anja de Waegenaere

Over the past decades, the life expectancy of people in the developed world has increased significantly. Although living longer can be a positive achievement for society, it brings challenges to fund retirement benefits, in particular for insurance companies and pension funds. Increases in life expectancy have therefore resulted in an increased attention among academics, policymakers and industry researchers, leading to the development of different models to quantify longevity risk. Particular attention is devoted to the determination of the solvency buffer, which is the amount of capital that pension funds or insurers need to hold in addition to the best-estimate value of their liabilities. In this article we compare different methods to determine the solvency buffer for longevity risk, and provide a technique to challenge the results of these methods.

The solvency buffer is meant to reduce the likelihood of insolvency in case mortality decreases more than expected. Well-known is the Solvency II standard formula ('SII-SF'), which defines the solvency capital requirement (SCR) for longevity risk as the increase in the net liability upon a 20% decrease of the mortality rates for all ages in all future years. An alternative is the Value-at-risk trend method ('VaR-method'). Under this method, a stochastic forecast model is used to generate a large number of scenarios for the development of mortality during one year. Each scenario leads to new best-estimate projections for future mortality, and a corresponding new best-estimate value of the liabilities. The solvency buffer is then determined as the amount of capital needed to ensure that insolvency over a one year horizon occurs in at most X% of the generated scenarios, where X is determined by the applicable regulatory regime [1].

The VaR-method requires a stochastic mortality forecast model. Most stochastic mortality forecast models are based on extrapolations of past trends in all-cause mortality improvements. This has two main disadvantages. First, the method is a 'black box' in the sense that it yields no information as to what causes the decrease in mortality rates. Second, an implicit underlying assumption is that trends observed in the past will continue in the future. This implies that major technological breakthroughs are typically not accounted for.

To challenge this standard approach, we propose a model in which future mortality rates are predicted under specific scenarios. A scenario is defined as a decrease in mortality of a specific death cause, for this paper cancer. We determine new mortality projections for these scenarios and the corresponding change in life expectancy, and we compare the capital requirement to remain solvent after the occurrence of the scenario with the SCR of traditional longevity models.

Mortality scenarios

According to the World Health Organisation (WHO), the list of top 10 death causes for high income countries contains only disease related death causes [2]. Being one of the predominant death causes in The Netherlands, scenarios on cancer related mortality are investigated here, although the method can be applied to any disease for which mortality numbers are available. We defined three different scenarios, where the severity of each scenario was determined by the strength of the reduction in the one year mortality numbers caused by cancer: 100% (a cure for cancer: full elimination of cancer as death cause), 50% or 20%. The recent history of HIV shows that similar scenarios have occurred in the past decades: in the mid-1990s a therapy became available to suppress HIV replication, leading to a reduction in HIV-mortality in the US by more than 60% [3].

With such mortality scenarios, we challenged the results of traditional longevity models: we compared the SCR of the SII standard formula and the VaR-method with the capital required to withstand the scenarios. The latter is calculated in three steps:

1) we adjusted the historical mortality numbers based on the scenarios,
2) we generated new mortality tables with the Lee Carter (LC) method based on the adjusted data[1],
3) with these tables we calculated the 'new' life expectancy and the corresponding liability, for a fictitious portfolio with annuities.

Life expectancy and SCR

The impact of a scenario on the mortality rates is twofold: current mortality rates decrease because a death cause is (partially) eliminated, and the trend of the forecasted future mortality rates changes. We visualize the impact of the scenarios by showing the effect on the life expectancy as a function of age for Dutch men. We display the difference between best-estimate life expectancy based on the scenario of reduced cancer mortality and best-estimate life expectancy based on unadjusted mortality data, referred to as the BE table. A positive value means that the life expectancy according to the scenario table is higher than the life expectancy according to the BE table.

Figure 1 shows the difference in life expectancy for the three scenarios for men. All three scenarios cause an increase in life expectancy: the mortality rates for the scenario are lower than the original mortality rates. The difference is between 0 and 4 years, depending on age and scenario severity. The S-shape of the curves is caused by the different impact of the scenarios for the different ages, which is beyond the scope of this article.

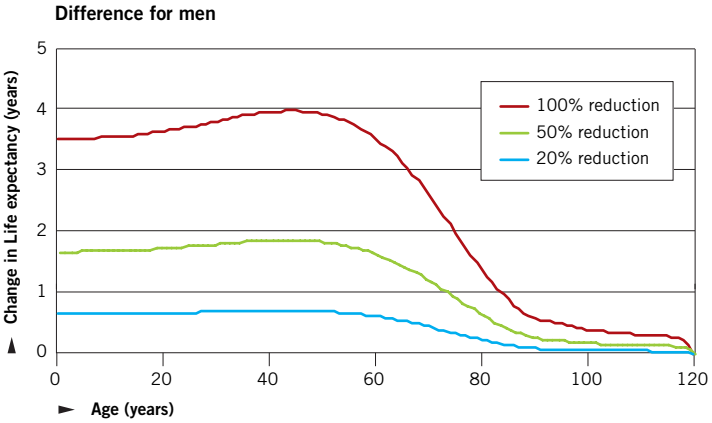

Figure 1 The change in life expectancy for Dutch men caused by the scenarios. A positive value means that the best-estimate life expectancy is lower than the life expectancy under the scenario situation. The graph for women has a similar shape, with a maximum reduction of 3.5 years compared to 4 years for men.

To quantify the impact of the scenarios on the capital requirement, we have created a fictitious portfolio containing pension annuities[2]. Table 1 shows the resulting SCR for longevity risk (expressed as a percentage of the BE liability) using the Solvency II SF, the VaR-method, and using the scenarios for cancer mortality reduction.

Method	SCR (% of BE liabilities)
Solvency II SF	4.6%
VaR-method	1.7%
Scenario A: Cancer (100%)	7.9%
Scenario B: Cancer (50%)	4.0%
Scenario C: Cancer (20%)	1.6%

Table 1 Capital requirements following from the different methods: the Solvency II standard formula (SII-SF), the VaR method, and the scenarios.

The different models give a broad range of SCR values. Although the SII-SF does not fully capture a cure for cancer (the most severe scenario), it gives a relatively high SCR compared to the VaR-method. To identify whether the prudence of the SII-SF causes the SCR to be too high, or whether the VaR-method underestimates the actual risk, both methods can be challenged with the scenarios. This shows that only the scenario with the lowest severity (20% reduction in mortality) leads to a comparable result as the VaR-method, the other scenarios imply a larger SCR. There can be a discussion on the 'correct' scenario severity, but at least the scenarios open the 'black box' and provide insight into the potential risk.

Conclusion

We have used scenario analysis to challenge traditional longevity risk models. The scenarios imply a significantly larger capital requirement than the traditional Value-at-Risk trend method, and show that the Solvency II standard formula does not fully capture a cure for cancer. Scenario analysis for longevity risk can bridge the gap between the mathematics of a model and expert opinion, leading to a better understanding of longevity risk. Therefore, scenarios analysis can be a valuable complementary technique to the existing longevity models.

[1] - Richards, S.J., Currie, I.D., Ritchie, G.P.; A Value-at-risk framework for longevity trend risk; The actuarial profession discussion paper; 2012.

[2] - http://who.int/mediacentre/factsheets/fs310/en/

[3] - Torian, L., Chem, M., Rhodes, P., Hall, H.I, Chen, M..; HIV Surveillance---United States, 1981--2008; Morbidity and Mortality Weekly Report (MMWR); 60; 2011.

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1 – Overall mortality data was used from the Human Mortality Database of the period 1970-2009. Disease specific data was taken from the World Health Organisation (WHO).

2 – The portfolio contained both men and women between age 20 and 65. The number of policyholders per age is a discrete approximation of a normal distribution with mean=45 and sigma=12, with equal numbers for men and women. Accrued benefits were estimated based on a linear relationship between age and salary, a career average defined benefit plan, and a starting age of 20 years. The portfolio contained old age pension and spouse pension.

European agenda

2014

1-3 October	Helsinki	**AAE Committee Meetings** http://actuary.eu/forthcoming-events/
3 October	Helsinki	**AAE General Assembly** http://actuary.eu/forthcoming-events/
27-28 October	Zurich	**EAA Seminar on Discount Rates in Financial Reporting: A Practical Guide** http://www.actuarial-academy.com/index.php?page=seminars
13-14 October	Budapest	**Model Validation under Solvency II** http://www.actuarial-academy.com/index.php?page=seminars
4-5 November	Amsterdam	**Market Valuation Methods for Life Insurance** http://www.actuarial-academy.com/index.php?page=seminars
17-18 November	Zagreb	**Solvency II in a Nutshell** http://www.actuarial-academy.com/index.php?page=seminars
24-25 November	Prague	**An Introduction to Economic Scenario Generators and their Validation** http://www.actuarial-academy.com/index.php?page=seminars
1-3 December	Strasbourg	**EAA Forum** **Solvency II – What´s Next?** http://www.actuarial-academy.com/index.php?page=seminars

2015

Spring	follows	**Solvency II for Non-Life Actuaries** http://www.actuarial-academy.com/index.php?page=seminars
Spring	follows	**Non-Life Pricing: Practical Implementation of Modern Techniques** http://www.actuarial-academy.com/index.php?page=seminars
7-10 June	Oslo	**Joint IAALS & PBSS Colloquium** http://www.actuaries.org/oslo2015/
23-27 August	Sydney	**ASTIN and AFIR/ERM Colloquium** http://www.actuaries.org/sydney2015/

2018

4-8 June	Berlin	**International Congress of Actuaries** http://www.ica2018.org/

colophon

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In April 2015 the theme will be Reinsurance. Any suggestions or ideas can be e-mailed to contact@the-european-actuary.org