Fractal future
What can we learn from Mandelbrot’s legacy?

Plus:
Modelling the future
Solvency II risk margin

Inside: Perils of piracy • ESG correlation • SONIA versus LIBOR • GI claims payments • Latest jobs
A year-end account

As 2010 draws to a close, we are featuring the themes of general insurance, risk management and modelling in this edition. Thank you to the many contributors from the GIRO conference that have provided us with bumper material, some of which is available exclusively on our website www.the-actuary.org.uk

It has been a busy year for the profession and public alike. The Profession concluded the merger of the Faculty and Institute, named Jane Curtis president-elect of the Actuarial Profession, and launched the CERA risk management qualification, while in March, the International Association of Actuaries hosted a well-attended conference in Cape Town.

On our own turf, SIAS turned the grand age of 100. The editorial team bade a fond farewell to Jean Eu, Matt Fewster and Finn Clawson and welcomed Richard Elliott, Sonal Shah and James Monk. The UK formed a coalition government and recently announced its plans for the spending review. In Europe, Belgium took over the presidency of the Council of the European Union from Spain and Greek sovereign debt was downgraded.

Further afield, the year started with a devastating earthquake in Haiti, garnering impressive international aid effort and sympathy. Later in the year, natural disasters abounded with significant earthquakes in Chile, Indonesia and China, and monsoon rains in Pakistan. More recently, an innovative rescue effort for the trapped miners in Chile gave the world something to smile about. And let us not forget about Eyjafjallajökull, which threw international flight traffic into chaos.

The Deepwater Horizon oil spill in the Gulf of Mexico, the largest accidental marine oil spill in the history of the petroleum industry, continues to have impact. Perhaps aptly, the 2010 United Nations Climate Change Conference will be held in Cancún, Mexico this month. In keeping with the environmental initiatives, The Actuary will be kicking off 2011 with a green electronic-only issue published on 13 January. For more information, see page 15.

It has been an eventful year all round, one that I am sure will only get better for the successful actuarial exam candidates to be announced before Christmas.

I wish you all a joyous festive season.

Marjorie Ngwenya
Editor
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- Adam Jorna predicts the demise of the UK coalition and the future of man
  Visit www.the-actuary.org.uk/875206

WRITERS OF THE MONTH

Sarah MacDonnell and Anthony Cloughton are the editorial team’s joint choice for December for their articles on PPOs, and receive book tokens courtesy of:

www.the-actuary.org.uk
Letters to the editor
In which actuaries discuss accounts, applications and advice

Letter of the month

Pension disclosures
The article from the Nottingham scholars in the November 2010 edition of The Actuary caught my attention. They recommend additional disclosures in company accounts to help readers understand pension risks.

I agree that additional information would be helpful but wonder if they have gone far enough. As a reader of accounts, I would like to know how different assumptions might lead to different disclosures, and also what is actually going to happen if the assumptions used are not borne out by actual experience. Will the experience lead to higher cash contributions or to banking covenants being breached? Will it impair the ability of the company to borrow money, to invest or to pay dividends?

Such insights would be very useful especially if accompanied by some sort of probability estimate. As a passenger on the Titanic might have remarked: “When we hit the iceberg, we’re not that interested in all those precise estimates about wind-speeds, engine performance and tidal patterns: we’re interested in how many lifeboats there are.”

Michael J Harrison
8 November 2010

The writer of the letter of the month receives a £25 Amazon voucher.

Tier 1 (General) visa — October quota now reached

I write to inform you of a new development in UK immigration affecting professionals such as actuaries. The UK Border Agency has announced that the monthly quota for Tier 1 General visas for October has now been reached. This is the first time that this has happened since a new temporary quota was introduced from July. It affects all applications for Tier 1 General visas submitted from outside the UK. It does not yet affect Tier 1 General applications submitted within the UK.

Applications can continue to be submitted as normal, however, no new Tier 1 General visas can be issued until 1 November. This may lead to a knock-on effect from month to month until the new annual quota is set from next April. We would urgently advise all applicants interested in applying for the Tier 1 General visa to look at doing so promptly before the processing times for such applications are increased. Although the quota currently only affects applicants outside the UK, we would advise applicants in the UK to look at applying as soon as possible, in case any new quota is introduced.

Tim McMahon
22 October 2010

CPD for retired actuaries

The new rules on CPD require actuaries who undertake more than a very few hours’ paid work a year in any capacity, other than on the stage or as manual labourers, to complete CPD. I have a choice. Submit or resign. I have chosen to resign.

Sadly, no amount of CPD can make up for an inadequate foundation in a particular subject. Despite the best efforts to educate a new generation as to the real world of investment by experts such as Robert Clark, Richard Fitzherbert and the late Jack Plymen, much of the profession’s teaching of investment is still based on such discredited assumptions as arbitrage-free markets. Even Sharpe’s Capital Asset Pricing Model is still in the syllabus, despite its total debunking by, among others, the profession’s David Wilkie.

Because the profession confuses investment with financial economics it has failed to provide adequate basic education in investment, and where actuaries were once considered among the experts in the field, a younger generation of actuaries no longer commands that respect. I have left the profession with mixed feelings. I am still an actuary and will admit to being one despite my feeling of shame because of its ignorance of the principles of investment and its subservience to the cult of market-consistent values. I welcome comments at sosgreen@onetel.com

S. J. Green
29 October 2010

Endowment mis-selling — advice sought

I was interested in an article I read recently in the December 2009 issue of The Actuary, concerning the alleged mis-selling of endowment policies. Anthony Pepper contends that actuaries were fully aware, at the time, of the risk that these financial products carried. He maintains that the Financial Ombudsman Service (FOS) still underestimates the degree of known risk attached to these products.

I am currently disputing the verdict of an adjudicator of the FOS as to the suitability of an endowment policy sold to me some years ago: October 1987. His definition of suitability rests on the assumption that the endowment was perceived as being a low-risk financial product when it was sold to me.

I would be grateful for your advice in assessing the main contention of Mr Pepper’s article. He maintains that actuaries were well aware that these were not low-risk products. Do you agree or disagree with him? I invite your comments at michell523@btinternet.com

Bob Michell
26 October 2010

The editorial team welcomes readers’ letters but reserves the right to edit them for publication. Please e-mail actuaryletters@incisivemedia.com. The deadline for receiving letters for the February issue is 11 January 2011.
Ronnie Bowie looks at how the profession can move forward and face the challenges on the global stage

A brave new world

The Institute and Faculty of Actuaries’ current mission is expressed as follows:

‘To support our members throughout their careers so they have the skills, attributes and knowledge appropriate for the evolving needs of the UK financial sector primarily as quantitative risk professionals.’ This mission statement dates from 2005 and was born out of a strategy debate following the Morris Review.

Those involved in the strategy debate at the time say that the primary driver behind the review and subsequently agreed mission statement was a need to restore confidence in the profession, a confidence that had been badly shaken (inside and outside the profession) by the events surrounding Equitable Life.

The strategic mission therefore emphasised support for our members in preference to emphasising our quasi-regulatory role or our role globally as an education provider.

Today the Profession enjoys much greater public confidence and self-confidence. Five years ago we were consistently criticised for an unworldliness in the commercial application of our work and for our business communication. Today we are perceived to have improved in these areas, but with more still to do. Our competence and integrity remain very highly regarded. While we must avoid arrogance and complacency, there is nothing wrong in being proud of our craft and our contribution to making the financial world a safer place.

We have a much better platform than five years ago. Confidence in, and the reputation of the profession, depends upon the actions of individual actuaries. Nonetheless, the professional body can set a context and a sense of direction. Feedback from external stakeholders suggests that the Profession has not been very successful in setting that context nor direction, nor at making our collective voice heard.

Council is therefore reviewing our strategy and how we articulate it. Given the progress we have made in the last five years, Council will consider whether a more ambitious and stretching mission would be appropriate. Indeed, the challenge may be to avoid overreaching ourselves. We would welcome your views; in particular, in my presidential address I stated that we would welcome your views on the following specific points.

The letters ‘UK’ in the mission may not properly reflect the global nature of our body — 40% of members outside the UK — nor of the global economy in which we work. So does our mission need to change to reflect that reality, recognising that in most territories there is a local association with whom we will wish to work? How should we articulate our global role?

We have ambitions to be perceived as highly skilled risk professionals. Should we restrict our initial focus to ‘quantitative risk professionals’ or aim more broadly?

However far we aspire to broaden our reach, it is likely that we will need to be much more energetic in promoting the ‘Associate’ qualification as the ‘fully qualified actuary’. To what extent should we seek to position AIA/AFA as a foundation-level qualification around which we have an array of other subsequent qualifications, not just our own fellowship and CERA qualification but MBA, CFA and others that might be more relevant to the business area in which the actuary intends to work?

We have an absolute imperative to deliver what our members need in a way that reflects the wide range of those needs. At the moment we have three working objectives:

■ World-class member support
■ Building public confidence
■ Extending our reputation.

What changes, if any, need to be made to these?

Finally, and crucially, what is it that defines what the actuary brings to relevant business situations? In the October edition I put forward my own view that there are no individual features that distinguish us but rather it is the combination of features and an ability to understand and manage uncertainty that sets us apart. Do you agree?

What particular features or combinations would you emphasise?

These are by no means the only questions that Council is wrestling with. Given the range and depth of the questions, and given that we want the answers to help form a strategy that draws us forward for the next decade, we will not rush the process. Your views therefore will be taken fully into account and I look forward to hearing from you.
A fractal view of risk

Before the onset of the current liquidity crisis, Benoit Mandelbrot, who died in October, was probably most famous for fractal geometry. His name will forever be associated with the colourful posters based on the Mandelbrot set, although the mathematics behind the artwork will be of little interest to non-mathematicians.

However, for many years he warned that the principles underlying these psychedelic posters also provided a better model for market returns than the theories based on the normal distribution. In particular, he believed that investors basing their decisions on the normal distribution did not understand the magnitude of the risks they were running.

These ideas were set out in Mandelbrot’s book The (Mis)Behaviour of Markets, reviewed in the October 2009 edition of The Actuary. However, although this book was reviewed by this magazine in the middle of the current financial crisis, it had been published some time earlier in 2005, by which time Mandelbrot had been expressing his reservations with modern finance theory for nearly half a century.

At the heart of Mandelbrot’s argument was his view that returns were fractal in nature. This means that the broad structure of returns looks similar no matter what timescale is considered. The patterns seen in returns over a few minutes of trading could appear identical to those witnessed over many years, suggesting that if prices can dip sharply for an afternoon, they can do the same for a decade. This gives mathematical form to Keynes’ statement that markets can remain irrational longer than you can remain solvent.

The distribution of fractal returns follows a power law — the probability of observing a return of 2x is 1/2^n times the probability of observing a return of x. Such ‘power law’ distributions have much fatter tails than the normal distribution, the level of fatness increasing with n. This means that extreme positive or negative returns are much more likely under the assumption of fractal returns than under the normal distribution.

Mandelbrot’s fractal model appears to fit observed market behaviour well, certainly better than modern portfolio theory. Attempts have been made to bring models based on the normal distribution into line with observations. However, Mandelbrot regarded many of the solutions — such as generalised autoregressive conditional heteroscedasticity (GARCH) models for varying volatility — as attempts to shore up a framework that was fundamentally unsound. His view was that fractals offer a simpler model that explains reality better. So why are fractal models not used more widely? Well, for one thing they are not well suited to indicate whether one strategy might be better or worse than another given a particular set of liabilities. It can also be difficult to calibrate fractal models when particular risk measures are required for statutory purposes. Be that as it may, even if fractal models are not used, accepting that the fractal view of the world is even partly valid suggests that certain steps should be taken.

The level of uncertainty implied by fractal models means that it is important to avoid trying to describe risk in terms of a single number such as the standard deviation. Taken in isolation, such measures can give the misleading impression that the true underlying level of risk is known; it is, in fact, unknowable. This is not to say that such measures are useless — although the standard deviation is a poor measure of the frequency or size of extreme events — but it is important to consider a range of information. This information should then be used to inform decisions rather than being regarded as ‘the answer’.

It is also important to consider as long a history as possible when analysing possible future events. While the nature of a market might change considerably over time, the nature of markets in general has been the same for millennia.

Abandoning the models with which we are familiar might be a step too far — there is a limit to the uses to which fractal models can be put. Nevertheless, they do offer additional insights into the risks present in portfolios, and as such the possibility that returns might be fractal should be borne in mind when investment decisions are being made.

Paul Sweeting is professor of actuarial science at the University of Kent
CERA is the new global chartered enterprise risk actuary qualification, and the new website will provide news and information about the qualification and the benefits it can offer to actuaries and their employers.

Aimed at those who already hold the qualification, actuaries and students with an interest in the qualification as well as employers and actuarial associations who are not currently part of the CERA treaty, the website will be a key tool in promoting the work of CERA actuaries.

For actuaries and students interested in the CERA qualification, the website includes information about qualification routes, with details about the syllabus and links to actuarial associations that offer the CERA qualification or are expected to do so in the future.

The website also features information aimed at employers and consultants that promotes the skills and knowledge of CERA actuaries and has an interactive map to allow people to locate participating CERA associations. An additional ‘meet a CERA’ section allows people to view profiles of individual CERA actuaries, their backgrounds and the work that they specialise in.

Dr Trevor Watkins, head of learning at the Actuarial Profession, said: “The launch of the CERA website is a major step forward in the exciting international development of a new, high-quality, risk qualification for actuaries. It is a qualification that will enable actuaries to be equipped to deal effectively with organisation-wide risk issues on an international basis.”

The CERA concept was first developed in the US by the Society of Actuaries, which joined with a group of actuarial associations from leading countries to create the CERA Treaty Board in November 2009.

The actuarial associations currently involved include:

- Institute of Actuaries of Australia
- Canadian Institute of Actuaries
- Institute of Actuaries of France
- German Actuarial Society
- Israel Association of Actuaries
- Institute of Actuaries of Japan
- Mexican Association of Actuaries
- Actuarial Society of the Netherlands
- Actuarial Society of South Africa
- Swedish Society of Actuaries
- Institute and Faculty of Actuaries, UK
- Casualty Actuary Society, US
- Society of Actuaries, US.

The website can be found at www.ceraglobal.org

While the International Actuarial Association (IAA) will be taking the lead on a detailed response to the International Accounting Standards Board’s (IASB’s) Exposure Draft, published at the end of July, the Actuarial Profession intends to comment on issues that may have a disproportionate impact on UK insurers or where the IAA’s response does not sufficiently highlight our concerns.

Probable areas of concern include:

- The intended treatment of the free estate in a with-profits fund needs to be clarified. In one paragraph it is implied that the free estate should be split between a shareholder and policyholder element but this appears to be contradicted elsewhere. Ideally, it would seem desirable to give a three-way split, thereby separately identifying the policyholder and shareholder elements of the free estate along with liabilities to current policyholders.
- While a number of accounting mismatches arising in unit-linked business are addressed in the exposure draft, it is disappointing that the mismatch that currently can arise due to a difference between the deferred tax charge under IAS 12 and tax allowances within a unit fund has been allowed to stand.
- The proposal to require a risk margin calculated by a cost of capital approach to be calibrated to a confidence level is impractical and of very little theoretical benefit. It will require stochastic modelling for many companies that otherwise have no need of this technique.
- A strict interpretation of the rules on contract boundaries will require a major change in systems for, in particular, medical expense insurers for very little practical benefit. The resultant profit from future premiums would be offset by a corresponding increase in the residual margin whose run-off is arbitrary.
Bodily injury claims cost rising faster than previously thought

Increases in the frequency and amount of bodily injury (BI) claims have added at least £100 onto the cost of an average motor policy in the last two years and show no signs of abating.

A report produced by the Actuarial Profession’s third-party working party has concluded that overall BI claims inflation is now running at about 30%, considerably higher than estimates had previously suggested.

The study, which had access to data supplied by companies making up 90% of the UK motor insurance market, shows that a third of the increase is due to the higher number of BI claims, while the majority of the increase can be attributed to the higher average cost of settling claims. The increases come at a time when the overall number of reported accidents has been falling.

David Brown, chair of the working party, said: “Insurers have felt the effect of BI claims inflation in their recent results. Even though premiums have increased, these findings raise questions about whether they have been increased enough.”

The report highlights the involvement of claims management companies, describing how the growth in claims correlates with the growth in the number of such organisations. It contrasts the situation in England with that in countries such as Scotland, Ireland, France and Germany where legislation has restricted the practice of claims farming.

David Brown said: “It remains to be seen what impact the proposals to address compensation culture through reform of such practices as no win/no fee in Lord Justice Jackson’s review will have.”

A potential ticking time bomb for the industry is the effect of BI inflation on the adequacy of companies’ reserves. The report found evidence of a mismatch between the inflation shown on case estimates and that seen on settled claims.

At a regional level, the North-West comes out as the BI claim black spot, followed by the North East and Yorkshire. The London area, however, shows the fastest recent rate of growth.

Pensions pressures highest on young people

The Chancellor has announced in his Comprehensive Spending Review that contributions to public sector pensions will have to rise, but the detail of where the burden will fall has yet to emerge. More notably, he has decided to bring forward the increase in state pension age to 66 for both men and women within a decade. This all means that most people will have to work longer or save more to have the same expectations in retirement.

Saving more will be tough for the young, who are also now facing the pinch prospect of rising tuition fees for their higher education. Personal debt, currently standing at around £1.5 trillion, is likely to rise as students incur greater debts through university. This will only delay the time that a student can contemplate saving for retirement through a pension.

The Actuarial Profession has calculated that debt-strapped students now delaying saving until they are 40 would have to invest 38% of their salary to achieve a pension of just half of their final pay from the age of 66 even if investments earn 4% a year above inflation. If investments only earned 2%, they would need to be investing an impossible 50% of their pay.

Commenting on this, Peter Tompkins of the Profession, said: “These figures are stark and paint a worrying picture for young people. Pensions and retirement age are a very emotive issue; the scenes in France demonstrate this. Our concern is that if the abilities of people to provide adequately for their own future are hampered then attempts to move pensions responsibility to the individual will also suffer.”

Actuarial team takes on quiz professionals

An actuary and a student actuary recently took part in the BBC Four quiz show Only Connect. Tim Jordan and Andrew Smithies, and their friend Michael Howes, faced stiff opposition from a team who later turned out to be quiz professionals.

Tim said: “We were, of course, disappointed that there were no questions on obscure reserving techniques. The other team managed to get maximum points in one round for knowing that Pugachev’s cobra was an aerobatic manoeuvre. I was sure that was an obscure reserving technique. We also might have done a bit better on the music round, but I’m not sure I’m ready to start listening to classical music yet.”

Student actuary Andrew commented: “Only Connect can test you on anything. So the chances of us getting an actuarial question, such as the central moments of a distribution, have got to be beyond the bounds of the 99% confidence interval.”

Their experience of being on the receiving end of Victoria Coren’s acerb wit hasn’t put them off future television appearances and Andrew is due to appear in a forthcoming episode of Mastermind. His specialist subject? The history of the London Underground.

If you’d like to see how the team got on, the show can be viewed on the BBC iPlayer at http://tinyurl.com/2wynz54
Chief executive of the Institute and Faculty of Actuaries announces departure

Caroline Instance has announced that she will be stepping down from her role as chief executive of the Institute and Faculty of Actuaries at the end of February 2011 when she will have been with the Profession for nearly nine years, working alongside 10 presidents of its predecessor bodies the Faculty of Actuaries in Scotland and of the Institute of Actuaries. She was the first person to be appointed by both bodies to oversee their joint operations while also holding the role of director general of the Institute.

To enable the Council of the newly merged body, which is currently reviewing its strategy, to have the time to consider what it might require of the chief executive who will lead the next phase of the Profession’s development Caroline has agreed to be available on a consultancy basis during 2011 to allow the Profession to continue to benefit from her experience and corporate memory. She will be employed until the end of April during which time she will assist the president of the Institute and Faculty of Actuaries, Ronnie Bowie, in representing the UK Actuarial Profession at home and abroad.

Bowie said: “The Institute and Faculty owes Caroline a great debt for her contribution to our development over the last decade. She has worked tirelessly to modernise our professional body and leaves a considerable legacy and a great platform from which we can move forward.”

New qualifiers join the Profession at Staple Inn

Over 130 new qualifiers were welcomed into the Profession at ceremonies at Staple Inn Hall on 28 and 29 October 2010.

The evening ceremony on 28 October also saw prizes awarded to Mike Armitage and Ziqi Zhu. Mike won the Faculty of Actuaries prize for best student and Ziqi won the Worshipful Company of Actuaries prize for attaining the highest mark in the life assurance (SA2) paper. Mike said he was “surprised but happy” to win the Faculty prize, while Ziqi said he was delighted to receive his prize and thanked the Worshipful Company of Actuaries for their support.

President of the Institute and Faculty of Actuaries, Ronnie Bowie, congratulated the new Fellows and spoke of the challenges and opportunities that faced them as they started their careers.

Past presidents come together for Institute and Faculty of Actuaries dinner at Staple Inn Hall

The past presidents’ dinner of the Institute and Faculty of Actuaries was held at Staple Inn on 13 September 2010.

Front row: Duncan Ferguson, Stewart Ritchie, Malcolm Murray, George Gwilt, Stewart Lyon, Jane Curtis;
Middle row: Marshall Field, Paul Thornton, Ronnie Bowie, Nigel Masters, Paul Grace, Michael Pomeroy; Back row: Roger Corley, Tom Ross, John Martin, Chris Daykin

Profession consults on practising certificate regime

The Profession has published a consultation paper on recommended changes to the current practising certificate regime.

The recommendations are being made by the practising certificate regime working party established by the Professional Regulation Executive Committee (PREC) to carry out a review of the current regime of practising certificates for reserved roles.

The consultation period runs until 31 December 2010 and, thereafter, the responses submitted will be used to inform PREC’s decision on implementation of the working party’s recommendations.

Consultation paper: http://tinyurl.com/53claco
Questionnaire: http://tinyurl.com/37tuskx

Child geniuses — the next generation of actuaries spend a day at Staple Inn Hall

As Ronnie Bowie, president of the Institute and Faculty of Actuaries, welcomed new Fellows at a ceremony at Staple Inn Hall on 28 October, the Profession also welcomed 12-year-old Wajih Ahmed and 10-year-old Zohaib Ahmed to Staple Inn.

The boys have both achieved an A* grade in A-level mathematics and both want to be actuaries. Last month, they spent a day with Ronnie and his colleagues at Hymans Robertson as they learned the actuarial ropes while being filmed for a Channel 4 documentary, Child Genius: Five Years On.

Wajih and Zohaib spent the day learning about the history of actuarial science as well as finding out just what it takes to qualify as an actuary.

The brothers’ academic development is treated as a formal project, with their mother being the full-time manager and their father acting as the technical lead. Fiercely competitive, Wajih and Zohaib have a specific study schedule and are rewarded financially based on the hours they spend studying.

On 19 November, Ronnie Bowie, president of the Institute and Faculty of Actuaries, gave his presidential address at a meeting in Staple Inn Hall. If you were unable to attend the meeting, a video of the address can be found at our website www.actuaries.org.uk
Pioneering works of actuarial science newly published in their original format

Steven Haberman, Dean and Professor of Actuarial Science at London’s Cass Business School and co-editor of History of Actuarial Science (1995), has previewed Chance and Assurance, a presentation on DVD of selected manuscripts from the Equitable Life archive that the UK Actuarial Profession acquired in 2006. He writes:

“As many will know, Equitable Life was formed in 1762 and was the world’s first life insurance company to be established on scientific principles. These principles were set out in a body of work that was largely unpublished. This DVD brings together six of these seminal manuscripts in a way that brings them to life and makes them easily accessible. They have been digitally converted and are presented both in virtual book form (with a nice page-turning facility) and as PDFs. The six manuscripts are Thomas Bayes’ notebook plus two each of James Dodson’s and Richard Price’s work and one written by William Morgan. These last three men were among the key figures behind the establishment of the Equitable and hence the development of modern life insurance. The DVD is introduced by a thoughtful note by Angus Macdonald and also includes a paper published in 1950 by the late Maurice Ogborn on eighteenth-century actuarial work, which helps with the background. The six manuscripts are each accompanied by an insightful introduction by an expert on actuarial history, which explains the significance of each item, places each in context and provides a guide to further reading. This is an important and valuable resource and one that I would recommend for anyone interested in the origins of actuarial science and the beginnings of our profession.”

Presentation discs have been offered to the individual and corporate donors who supported the UK Actuarial Profession in its acquisition of the archive. Stuart Shepley (pictured) presented Roger Hayne, immediate past president of the Casualty Actuarial Society, with a copy of the DVD at its recent Annual Meeting in Washington DC in November.

The DVD will be available for sale from 1 December 2010 at £15.00 plus postage from the Profession’s eShop www.actuaries.org.uk/research-and-resources/eshop. Order your copy to see how it all began and own a (virtual) piece of actuarial heritage. For enquiries, email publications@ actuaries.org.uk with a subject line of ‘Chance and Assurance DVD’.

Stuart Shepley (left) presents Roger Hayne, immediate past president of the Casualty Actuarial Society, with a copy of the Chance and Assurance DVD.
Modelling mortality and longevity

Dr Shane Whelan provides an overview of a special supplement to the British Actuarial Journal

Mortality is on the move and actuaries’ advice must not just keep up but stay ahead. Help by the profession has been posted in the last few weeks: a special supplement to the British Actuarial Journal (supplement to Volume 15) on mortality and longevity modelling. The supplement comprises review papers of the most up-to-date research findings together with a critical assessment of modelling and projection methods from leading authorities across the interrelated disciplines of biomedical and health research as well as demography and actuarial science.

The supplement records a selection of papers presented at the conference, Joining Forces on Mortality and Longevity, hosted by the profession in Edinburgh in October 2009. The conference was organised around three inter-related themes: drivers of change in longevity, how successive cohorts differ and why; and the connections between aggregate population mortality and individual risk characteristics. These themes were identified as of particular relevance to informing actuaries’ opinions by the Mortality Research Steering Group, which organised the conference and which, a year before, had presented a Report on Scoping Mortality Research (sessional meeting paper to Institute of Actuaries, September 2008).

There are 11 papers in the issue together with a discursive editorial. Diana Kuh and colleagues open with a comprehensive Review of Life Time Risk Factors for Mortality. Their paper marshals research on such factors as environment, lifestyle, body size, physical ability and cognitive function to show how each alters the mortality experience of individuals, not just when currently exposed to such factors but at times long after exposure — with linkages reported between elevated mortality late in life and early life experiences.

The importance of individual risk characteristics in mortality disposes one to seek cohort influences in population mortality trends. Carol Jagger et al take up this theme in their paper, Cohort Differences in Mortality and Morbidity. They review the papers presented at the conference on the cohort theme and, in addition, give an overview of research that suggests that the increases in life expectancies witnessed in recent decades are largely increases in healthy life expectancies.

Next follows papers that provide evidence for the cohort effect at aggregate population levels. David Forfar reminds us of the statistical evidence in the populations of Scotland as well as England and Wales and shows the consequences of incorporating a cohort effect in mortality projections.

Alison O’Connell and Kim Dunstan report finding evidence that the UK ‘golden generation’ has brought along their mortality improvement as emigrants to New Zealand.

Maria Reinert-Azambuja highlights the complex connections that could be posited to exist when early life experiences can impact later life mortality, with her speculative paper suggesting a link between heart disease late in life and exposure to influenza early in life.

Mike Murphy’s paper, The ‘Golden Generations’ in Historical Context, challenges the ‘cohort effect’ and how it is currently modelled. He suggests that the observed ‘cohort effect’ does not reflect changing mortality of the average person in the population but the changing mix of two separate populations within the overall population that have a material mortality differential.

The next paper, by Mariachiara Di Cesare and Mike Murphy, shows that, inter alia, mortality projections by individual cause of death can be improved by using period-based models for those causes of death that are primarily driven by calendar year effects and by employing cohort-based models when the underlying driving factor is primarily related to long-term past exposures that are changing in time.

The last four papers treat different themes. First, Eugene Milne proposes a new mathematical model of ageing and mortality. The model, in the classic tradition of mathematical and actuarial science, is a simple but well-motivated model of individual mortality risk that, he shows, is capable of reproducing mortality curves of human populations and those of other species when heterogeneity of risk within the population is captured by parameter variability.

Second, Gordon Woo and colleagues consider how mortality risk might be modelled on a prospective basis, in a parallel to how catastrophe risk is currently modelled. Eschewing the dominant approach of statistically modelling past mortality data and then trying to project rates into the future, they outline all the factors that affect future rates and attempt to model each factor stochastically, from advances in geroscience to new drug discoveries to changes in personal lifestyles.

Third, Bridget Browne and colleagues address themselves directly to the problem of developing a stochastic model of future mortality variability that might determine the capital required for an annuity portfolio to satisfy the requirements of the regulator. Their proposed model can be bolted on to any deterministic model of future expected mortality rates. They recommend, with supporting rationale, an absolute minimum level of volatility. This paper is of significant practical importance to actuaries developing such models.

Stephen Richards provides the final paper, in which he considers some issues that arise for actuaries in applying some of the insights gained from presentations at the conference.

Dr Shane Whelan is a lecturer at University College Dublin, a council member of the Society of Actuaries in Ireland, and a fellow of the Institute and Faculty of Actuaries.

Dr Shane Whelan
The Actuary — forthcoming issue themes and features

The Actuary welcomes features contributions from members or contacts in and around the profession. Below is a list of themes for the next few months along with the deadline for submission. If you would like to contribute, please contact Tracey Brown at features@the-actuary.org.uk with suggestions.

For a full list of 2011 issue themes, visit www.the-actuary.org.uk/875190. The January edition of The Actuary is only available online as a special ‘green issue’, and will include features covering environmental matters (see box, right).

January 2011 — online special edition
Published 13 January 2011,
editorial deadline 26 November 2010
advertising deadline 21 December 2010
■ Environment
■ Energy
■ Careers

To ensure you receive this special edition, sign up for our email alerts at www.the-actuary.org.uk/emailsignup

February 2011
Published 27 January 2011,
editorial deadline 15 December 2010,
advertising deadline 11 January 2010
■ Careers and soft skills
■ Solvency II
■ Pensions

March 2011
Published 24 February 2011,
editorial deadline 10 January 2011,
advertising deadline 8 February 2010
■ Investment
■ Modelling and software
■ Pensions

April 2011
Published 31 March 2011,
editorial deadline 11 Feb 2011,
advertising deadline 15 March 2010
■ Education and research
■ Life
■ Careers and networking

May 2011
Published 28 April 2011,
editorial deadline 18 March 2011,
advertising deadline 12 April 2010
■ Regulation and standards
■ Health and care
■ Banking and financial services

June 2011
Published 26 May 2011,
editorial deadline 15 April 2011,
advertising deadline 10 May 2010
■ Solvency II
■ Risk management
■ Careers and training


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www.cass.city.ac.uk/masters
BAS issues Pensions and Insurance Standards

Pensions Standard to come into force on 1 April, with Insurance Standard announced for 1 October

The Board for Actuarial Standards has now issued its first technical standards on pensions and insurance respectively. This follows the Reporting, Data and Modelling generic standards which came out in the last year or so.

The Pensions Standard, which emerged in October, comes into force on 1 April. A major part of the standard relates to explaining clearly what assumptions or bases are in use and why, so that lay readers can understand the actuary’s approach. It is an evolution of existing Guidance Note standards, although there are some new aspects of the standard, such as the prescription of adjustments in one parameter being proxies for another (for example, 0.25% off the discount rate to allow for improving mortality). Explaining to clients the reason for any changes between reports (whether formal valuations or not) is given emphasis in the standard.

The Insurance Standard has a longer lead-in time until 1 October 2011. It covers all types of insurance (though medical defence doesn’t quite make the bill as ‘insurance’). Its aim is also to ensure that information is comprehensible and that risks are properly addressed for the benefit of the users. So, clear actuarial information on the sufficiency of premiums to meet risks is required but it is then up to the users commercially to decide to what extent (if any) business is to be written at a profit.

Finally, BAS has decided not to tinker with TM1, the standard for money purchase pension illustrations. It will be updating the mortality bases therein, but the changes to be put forward will not come into effect until April 2012. Notably, BAS echoes what the FSA has been cautioning regarding over-optimistic projection bases. Whereas the FSA uses the three projection rates of 9%, 7% and 5% per annum (but warns that lower rates should be used if the investments cannot achieve those), now BAS is warning that the simple 7% per annum rate should also be lowered if the invested fund cannot match that.

Auto-enrolment for all

The coalition government has decided that there should be no small business exemption from the new rules coming into force by 2016 which will require all employees to be enrolled into a pension scheme, including the option of the National Employment Savings Trust (NEST).

Following a review, a number of small changes to the original Labour proposals are now proposed, including allowing 9% of basic pay to be an acceptable form of pension saving, rather than having to make adjustments for bonuses or overtime using a total pay contribution level of 8%. There is the prospect that the ceiling on contribution levels might be removed in 2017, allowing an unlimited level of saving into NEST for those with higher earnings.

Insurance industry sees yet another merger for 2010

In a busy year for professional firm mergers, the latest merger, announced just at the time of going to press, is the acquisition of EMB, the specialist non-life actuarial consultancy, by Towers Watson, the recently cemented merger of Towers Perrin (including Tillinghast) and Watson Wyatt. Founded in 1993 as the pioneering non-life consulting firm English Wright and Brockman, and merging with Peter Matthews’ firm in 1998, EMB now has over 300 employees and revenues exceeding £40 million per annum.

George Osborne responds to Lord Hutton’s review

Following Lord Hutton of Furness’s review of public sector pensions, as reported in the November edition of The Actuary, the government has announced that it is looking at increasing contributions by employees (the higher-paid in particular) but not those in the armed services. It has also announced public consultation on the discount rate that is used to calculate employer contributions, which is likely to lead to lower discount rates and higher departmental cashflow into pensions, at a time of already-stretched budgets. Further news on likely changes will come with the Budget on 23 March.

Radio silence

Radios and televisions were absent from the usual round of political comment in early November, as BBC staff supported a National Union of Journalists strike called on the issue of pensions. More accustomed as we are to these actions in France than in the UK, this one seemed from the interruption of programmes to be well supported. It revolves around replacing final salary benefits with a choice of career average or defined contribution benefits. A number of other unions have achieved approval to the proposals in workforce ballots, leaving the NUJ now on its own in the protest. Is this a sign of division to come as other pension changes are proposed in areas of the government-controlled public sector?

Are motor insurance premiums too high?

Of course they are, if you are a motorist, especially a young driver faced with high premiums for the first few years. But a serious thought from Towers Watson is that their research suggests that insurers are willingly passing on higher premiums to motorists to pay for the significant level of fraud in the current claims experience. Towers Watson recommends a much larger emphasis by insurers on their claims handling techniques in a market which they expect to be unprofitable for the next five years.
From the world of general insurance

Asbestos and environmental developments
On 4 October, following weeks of heavy rain, a torrent of red toxic sludge — containing mercury and arsenic among other toxic materials — escaped from a reservoir at an aluminium plant at Ajka, south-west of Budapest in Hungary. At least nine people died, with 120 injured, most of them suffering from chemical burns. At least seven towns and villages in the area were affected by the escape (believed to amount to around a million cubic metres), with at least one of them flooded to a depth of two metres, causing substantial damage to infrastructure, homes and vehicles. Hundreds, possibly thousands of residents had to be evacuated. The sludge reached the River Danube three days later, but was diluted substantially once it did so. It is thought that the clean-up operation could take 18 months and cost “hundreds of millions of Euros”.

The plant owners, who are not thought to have any insurance against costs arising from the EU environmental liability directive (ELD), have rejected claims that they should have taken more precautions. There was some concern that other similar incidents could arise across Eastern Europe, as in the region there are hundreds of reservoirs of toxic waste contained by relatively old and rudimentary dams. There is a body of opinion that provisions should be put in place to prevent companies going bankrupt over ELD claims — this would be to avoid the cost falling on taxpayers, via their governments. However, this view is far from unanimous.

On 8 October, the UK Court of Appeal published its judgment on the multiple test case litigation known as the ‘employers’ liability policy trigger litigation’ — almost a year after hearing the evidence. The majority decision for policies that respond to injury or disease ‘sustained’ during the policy period was that they should not pay out unless the employee’s mesothelioma tumour started to grow within the period — this usually happens about five years before symptoms appear. The judgment overturns the High Court decision on the issue and effectively states that the insurance industry’s historic practice of paying by reference to the employee’s exposure to asbestos was wrong. This absolves certain insurers in solvent run-off (such as Excess Insurance and Municipal Mutual) from paying on most mesothelioma claims — some injured parties may go uncompensated as a result. However, for certain other wordings, the court found in favour of an exposure basis. Leave to appeal to the Supreme Court has been granted, and the Unite trade union has taken up this opportunity. In view of the complicated nature of the judgment, it is recommended that those principally affected should read the full text of the court’s decision.

Solvency II
A survey by PwC has found that over half of Europe’s insurers have yet to start preparations for the implementation of Solvency II. Nevertheless, the majority expect to be fully prepared by 2013 when it begins. According to the survey, the main challenges to a successful implementation were seen as the own risk and solvency capital assessment (ORSA) and the validation of internal models. The companies surveyed expect to commit an average of 10 staff to Solvency II projects, at a cost of €8m. A quarter of this would be spent on IT work.

UK personal motor insurance
A survey of UK insurers by Towers Watson suggested that the UK personal motor market is set to remain unprofitable until at least 2015. It found that the next five years of forecast poor performance is driven by a 30% annual increase in the cost of fraudulent claims and an overreliance on pricing in an increasingly competitive sector. Third-party bodily injury claims have almost doubled in 10 years as a result of an increasing number of claimants per claim and a more aggressive claims management industry, despite a dramatic fall in the number of accidents over the same period. Towers Watson said that FSA returns show an industry loss ratio of 100% and a combined ratio in excess of 120% for 2009 driven by an estimated 30,000 fraudulent accident claims for the same year. The research indicates that just over £80 per policy now goes to pay for fraudulent claims, both hard and soft fraud.

Large losses
Super Typhoon Megi, Philippines and Taiwan — 18-22 October
This was the most intense cyclone to make landfall in Asia for several years, with a minimum pressure of 885 millibars. It hit the island of Luzon in the Philippines as a Category 5 storm, with winds of up to 155mph. It is feared that 200,000 metric tons of rice could have been destroyed by the passage of Megi, but this is almost completely uninsured. Torrential rain and flash flooding led to at least 31 deaths, an estimated 200,000 people made homeless and extensive damage to infrastructure, especially power supplies. Due to the low insurance penetration, insured losses were estimated at only US$150m. In Taiwan, extreme rainfall (37 inches fell in 24 hours in one area) led to flash flooding and landslides — these caused at least 33 deaths, including those of 19 Chinese tourists on a bus. No insured loss estimate for Taiwan is to hand.

Tsunami, Indonesia — 25 October
This was three metres high and was caused by a magnitude 7.5 earthquake, with its epicentre about 50 miles west of South Pagai in the Mentawai Islands off the south coast of Sumatra. At least 17 villages on the islands are understood to have been completely wiped out by the waves, which penetrated up to 600 metres inland, and the death toll has risen to around 350, with a similar number still missing a week after the event. A tsunami warning was given, but then withdrawn almost immediately — it is believed that the equipment underlying the warning system had been vandalised. It is unlikely that insurance losses of any great magnitude will arise in this remote area.

FOR MORE GENERAL INSURANCE NEWS
More news on the following items can be found on the website:
- Fall-out from the global financial crisis
- Asbestos and environmental developments
- Solvency II
- Other regulatory and legal developments
- Lloyd’s
- Marine developments
- UK personal motor insurance
- UK home insurance
- Flooding
- Munich Re
- Tesco and Fortis
- Climate change
- Large losses

Visit www.the-actuary.org.uk/875208
Global challenges for the actuarial profession
Staple Inn,
High Holborn,
London
5:30pm for 6pm start

Paul Thornton, the current president of the International Actuarial Association (IAA), will give a presentation describing the work done by the IAA in responding to recent global challenges, such as the global financial crisis and developments with international accounting standards. He will outline the work being done with supranational organisations such as the International Association of Insurance Supervisors, International Accounting Standards Board and International Organisation of Pension Supervisors, and the relationships with the IMF, World Bank, OECD and other key bodies, as well as the activities of IAA Working Groups on mortality, micro-insurance and population issues.

The presentation will show how the day-to-day work of actuaries in the UK is more heavily influenced by the international agenda than many appreciate.

Call for papers
We are now looking for papers to be presented at our programme meetings in 2011. We particularly would like to include papers that will be of interest to younger members, and that are likely to stimulate a lively discussion.

We also encourage younger members of the profession to consider writing a paper and presenting their ideas to a friendly audience. Please contact programme@sias.org.uk for more information.

Update from AGM
The new SIAS committee for 2010/2011 was approved at the SIAS AGM on Tuesday 2 November. The newly approved committee members are as follows:
- Will Bennett — Honorary Secretary
- James Williamson — Honorary Treasurer
- Richard Purcell — The Actuary Convenor
- Sarah Darwin — Programme Convenor
- Mark Dainty — Social Convenor
- Iain Ritchie — Marketing Convenor
- Georgios Bakoloukas — The Actuary sub-committee
- Alvin Kissoon — Social sub-committee
- Rishwinder Grewal — Marketing sub-committee
- Divyaa Mohan — Social sub-committee
- Taha Ahmad — Programme sub-committee

For details of events, visit www.sias.org.uk
A successful conclusion to the Twins Project

Worshipful Company of Actuaries’ Charitable Trust helped raise £60,000 to fund the three-year programme

One of the aims of the Worshipful Company of Actuaries’ and its Charitable Trust is to support education. The Company’s involvement in the Twins Project started as far back as 2002 when Alan Fishman identified the opportunity to sponsor a research student at the St Thomas’ Hospital Twins Unit. Jamie Singer (pictured) was put forward as a potential candidate for this project.

The main challenge for the Company was to raise the £60,000 required to support the three-year study programme, which would be under the supervision of professor Tim Spector and his senior colleagues in the Twins Unit. A generous offer of support from the family trust operated by a member of the Court of the Company and financial support from members of the livery company secured the funding to last for the full three years.

I acted as liaison between the Company and Jamie, essentially to monitor his progress, to provide personal encouragement and to give regular reports to the Court. I also arranged for successive Masters to meet professor Spector and Jamie as the project progressed.

Howard Waters, a member of the actuarial science teaching staff at Heriot-Watt University, was responsible for reviewing the academic aspects of Jamie’s proposed research programme to ensure that they lived up to the expectations of the Company.

A striking feature of Jamie’s time at St Thomas’ was the tremendous support he received from his supervisors within the Twins Unit and Robert Plomin, the world-renowned expert in twins research. Over the course of his three years of study he had three papers published, so that most of the results that would form the core of his doctoral thesis were formally documented in these publications.

At the end of 2005 the research phase finished, along with our financial commitment to St Thomas’ Hospital. A viva examination followed in early spring 2008 at which Jamie was given the news that the thesis was ‘almost there’ and would require only relatively minor revisions for it to be formally accepted by the examination panel.

The main difficulty with this final hurdle was that he was given an 18-month timeframe to complete these amendments, rather than being forced to make the necessary changes while he still had some study momentum. A very busy time at work and preparing for his first marathon, in London 2008 for charity conspired to delay progress on the thesis, which was not finalised until early 2009. After that final push, however, he finally heard on 1 March 2009 that the award of his PhD had been confirmed, just over six years since he embarked on the programme of research and study at St Thomas’ Hospital.

I was honoured to be asked to attend the graduation ceremony at Southwark Cathedral in the second half of 2009. It was a splendid occasion and a fitting end to Jamie’s sustained and impressive effort.

Looking back, it has been a real privilege being involved in this novel initiative by the Company. I hope that the success of our sponsorship of the Twins Project will convince the Company and the Charitable Trust that the ‘and more’ aspect of ‘money and more’ in our charitable work is just as important as writing the cheque.

If you would like to read the thesis, a copy with a special manuscript dedication to the Company is in the library at Staple Inn.

By Philip Jowett

Whizz-kid actuaries of the future

Brothers Wajih (12) and Zohaib (10) Ahmed, who were Actuaries of the Future in the June 2009 edition of The Actuary, have recently featured in the Channel 4 programme Child Genius: 5 Years On.

Wajih and Ahmed hold A* grades in A-level mathematics and aspire to qualify as actuaries in their early 20s after completing economics degrees by the age of 17.

In the programme, they spend a day at Hymans Robertson’s London offices, gaining an insight into actuaries’ day-to-day work and experience of presenting results of their work in the boardroom. At home, they proudly display letters of congratulations for exam success from former prime minister Gordon Brown, prime minister David Cameron and deputy prime minister Nick Clegg, and are seen reading The Actuary.

The boys’ father insists that their intellect is a result of starting to learn numbers early, coupled with a rigorous study schedule. With IQ scores of 154 (very superior intelligence) and 142 (superior intelligence) for Wajih and Zohaib respectively, there is no doubt that these future actuaries are extraordinary.

By Kelvin Chamunorwa

Births

George Tchagwa (MetLife) and wife Theresa are delighted to announce the birth of their first born daughter Gina Anashe. Gina was born on 14 October in South Africa.

Deaths


Greg McFarlane died on 13 October 2010, aged 26. He became a student of the Faculty in 2006.
Worshipful Company’s carol service and supper

The Worshipful Company of Actuaries will be holding its annual Christmas carol event at St Lawrence Jewry, on Gresham Street in London. The event has proved to be popular in recent years and this year it is a family carol service on 13 December 2010 starting at 6.15pm. There will be familiar carols and readings and the Company is particularly keen to see members of the profession attend with their families.

The event is open to all, not only Livery members and no tickets are required, although there will be a charity collection. After the service there will be a separate event, a supper at the Armourers’ Hall, and details of this are on the Company website www.actuariescompany.co.uk

Please make a note in your diaries — the more, the merrier!

By Michael Tripp

Hymans’ Martin Potter raises £10k for charity

Hymans Robertson partner, Martin Potter, recently returned to work following a 20ft fall during this year’s Lowe Alpine Mountain Marathon in June. He was rescued by the charity Arrochar Mountain Rescue Team based in Strathclyde who treated him and winched him off the mountain. Martin suffered some extensive injuries (fractured pelvis and skull among them) and had a period off work. Fortunately, he is now well on the road to recovery.

As a thank you for their fantastic efforts, Martin and the team at Hymans’ Edinburgh office have raised £10,000 for the charity.

The Lowe Alpine Mountain Marathon is a two-day mountain orienteering competition held in a high-mountain region of the Scottish highlands each year. It involves an overnight camp at a remote location and over 1,000 competitors took part this year. Teams run in pairs and carry lightweight camping equipment, clothes and food to sustain themselves for 36 hours. There are six courses ranging from Elite to Novice depending on ability and fitness. This year the race area was in Glen Fyne covering the Arrochar Alps.

By David Chambers

Hymans’ Martin Potter (right) with a member of the Arrochar Mountain Rescue Team

Old Mutual dinner leads to special dates in the actuarial calendar

The Old Mutual Actuarial Society (OMAS) recently held its annual dinner — a glittering event held at Meloncino Restaurant at the V and A Waterfront in Cape Town. The 90 guests comprised a spectrum of OMAS members, from first-years to respected senior actuaries, who were treated to a three-course dinner.

OMAS was established in the 1980s to perform the daunting task of organising the social lives of the actuaries and actuarial students of Old Mutual, and it hosts a number of events throughout the year. Popular events include a general knowledge quiz, beach volleyball, pubs of the month and a ladies’ breakfast, as well as more academic endeavours.

The OMAS committee enforced a dress code for the evening and, surprisingly, the actuaries played along. The standard actuarial uniform of chinos and pencil skirts was shed in favour of fedoras, suspenders, feathers and pearls. Hilda Joseph, who was a guest of honour at the dinner, enthused that “it was refreshing to spend a night on the town with my colleagues. Cape Town actuaries definitely know how to live ‘la dolce vita’.”

As part of the dinner, OMAS launched its very own wall calendar, the first of its kind, which features actuarial employees of Old Mutual South Africa.

The objective of the calendar was not only to provide some entertainment for the 150 OMAS members, but also to prove to the world that members of the actuarial profession can be creative and glamorous. Each month’s photograph captures a tongue-in-cheek actuarial theme, combined with a link to the respective month. Abu Addae, for example, ushers in January by weightlifting ActEd files (and abiding by his New Year’s resolution of exercising his option to study). A copy of the much-anticipated calendar was unveiled dramatically using life-size versions of some of the monthly photos.

It is expected that the calendar project will become an annual publication, eventually being used to raise funds for a South African charity. For the moment, though, the actuaries of Old Mutual can be assured that in 2011 they will be breaking stereotypes — one month at a time.

By Pamela Hellig, OMAS 2011 chairperson

New photos not packing all our (black) bags this month

Old Mutual dinner leads to special dates in the actuarial calendar

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What is SONIA, and why are banks using it instead of LIBOR to calculate collateral?
Michael DeWeirdt and Andrew Smith investigate

Before the financial crisis, the banking and insurance industry had almost reached consensus on the appropriate way to value fixed cashflow promises, and the answer was an inter-bank rate called LIBOR. After a period of confusion during the crisis, the banks have settled on a new approach based on a rate called SONIA, which is typically below LIBOR. In this article we describe the rationale for the banks’ change of approach and consider whether the same arguments apply to insurers.

What are LIBOR and SONIA?
Banks with excess cash deposits routinely lend out to banks with excess loan assets at a fixed rate of interest. The agreed rate is a matter for negotiation between the parties, depending on the term of the deposit but also on the perceived creditworthiness of the borrowing bank. LIBOR and SONIA are both inter-bank rates. Table 1 compares the two rates. More information about both rates is available at www.bba.org.uk

What is the cause of the term premium?
LIBOR is typically but not always higher than SONIA, an effect known as the ‘term premium’. Due to the effect of discounting, banks moving from LIBOR to SONIA typically benefit from an increase in assets, which is largely offset by higher liabilities.

Figure 1 compares the two rates over the period 1996-2010. We can see that SONIA was historically much more volatile than LIBOR, but that this has stabilised in recent years.

Banks usually describe the difference between SONIA and LIBOR in terms of ‘committed funding’. The higher rate compensates LIBOR lenders for the inflexibility of a term deposit and reduced capacity to exploit other investment opportunities. The LIBOR borrower correspondingly avoids the inconvenience of daily refinancing and the possibility of increased borrowing costs following a downgrade.

Secondly, SONIA is based on actual transactions while LIBOR is an average of opinions. The opinions may be subject to reporting biases.

Thirdly, six-month LIBOR should also reflect expectations of changes to short-term rates over the six-month period.

Theoretically, these explanations could result in LIBOR being either higher or lower than SONIA. The LIBOR borrower also suffers a loss of flexibility to exploit new funding opportunities. Locking in a rate protects against higher future borrowing costs following a credit downgrade but also removes the possibility of cost-saving following an upgrade. The typical upward slope highlights the current asymmetric situation, where flexibility appears to be of greater value to lenders than borrowers, and prime banks are more concerned about downgrades than upgrades.

Actuaries might express these reasons differently, by analogy to the selection effect in mortality albeit over shorter timescales. Prime banks have benefited from the equivalent of insurance underwriting. For longer terms of deposit, the select effect gradually wears off.

Extending the short curves
Observing rates for terms up to six months is of little use for valuing 10- or 20-year liabilities. To extend the observed curve, most banks make reference to interest rate swap markets.

Interest swaps are a derivative instrument where two parties swap interest rate payments. Typically one party will make payments linked to a short rate such as LIBOR (floating rate) in exchange for receiving fixed interest payments from another party for a defined term that can be as long as 50 years, but is more typically 30 years or less. There is no need for either party to participate in deposits, either with...
each other or third parties, because the swap payments are calculated with reference to the published LIBOR, or other floating rate. The ‘fixed swap rate’ is the level of regular fixed payments that can be traded in the market for a stream of future LIBOR cashflows. We can think of the swap rate as being a market view of the average future LIBOR over the term of the swap contract.

There are similarly defined swaps relative to SONIA, but these have traded only very recently, with very few trades for terms beyond two years until 2008. Figure 2 shows historic differences between 10-year swap rates, comparing the effect of settlement against SONIA, three-month LIBOR and six-month LIBOR.

Why have banks moved to SONIA from LIBOR?
The trade in derivatives is now usually subject to collateralisation. For example, in the context of an option, the buyer pays a premium to the seller but at the same time the seller posts back the cash as collateral. The collateral position is updated daily, so it is inconvenient to commit to term deposits. When the spreads between LIBOR and SONIA were predictable and small, and collateralisation was less widespread, banks usually valued their positions with reference to six-month LIBOR. This was never theoretically the perfect solution but had the practical advantage of a liquid swaps market to which discount curves could be calibrated. During the financial crisis, banks faced a widening and volatile shortfall between the rates actually earned on collateral and the assumed LIBOR. As SONIA swaps became more widely traded, these provided a natural mechanism for banks to realign the return on collateral with the assumptions underlying their pricing models. However, liquidity can come and go. At the time of writing, SONIA swaps are liquid out to terms of two years with some activity out to 10 years. LIBOR swaps, in contrast, are liquid to 30 years with less frequently traded prices observed to 50 years.

Calibration options for insurance liabilities
All of this presents actuaries with new dilemmas in liability valuation and interest rate risk management. The reasons for changing bank practice do not relate directly to insurers’ liabilities. Insurers do not usually post cash collateral against promises to policyholders. However, the degree of credit risk embedded in LIBOR is now much more visible. There will continue to be questions over whether this spread should be allowed to reduce insurers’ stated liabilities.

Earlier this year, the CFO/CRO forum published a paper on risk-free rates, proposing a downward adjustment of 0.1% to six-month LIBOR rates to reflect the credit risk, intended to reflect an average spread over the cycle. In contrast, under current market conditions where 10-year swap spreads are close to 0.5%, an insurer moving from LIBOR to SONIA faces an increase of more than 5% in a stated 10-year liability. Given the limited liquidity of SONIA swaps, especially at longer terms, there is an understandable industry preference for LIBOR-based valuation.

Rather than focusing on deductions from LIBOR, insurers have shown more interest in possible additions, particularly in relation to illiquidity premiums. Nevertheless, it does seem odd that, following the financial crisis, banks conclude that LIBOR discount rates were too high while insurers conclude that the same rates are too low. We can expect further changes as insights from the two industries are shared.

We are grateful for useful comments from members of the derivatives working party but opinions and any errors are those of the authors alone.

SONIA is based on actual transactions while LIBOR is an average of opinions, which may be subject to reporting biases

As SONIA swaps became more widely traded, these provided a natural mechanism for banks to realign the return on collateral with the assumptions underlying their pricing models. However,
A workable model

Martin Sher and Craig Reynolds explore cluster modelling and how it can be used in model compression

In almost all stochastic period-by-period projections, some form of model compression is required to create a smaller number of model points in order to reduce run-times. These points, when projected through the model, ‘replicate’ the results that would be achieved if the full policy file was projected. As such, model compression can be considered a form of portfolio replication using insurance rather than financial instruments. This article explores cluster modelling as a new model compression approach and compares it to classic mapping techniques and other statistical approaches.

Classic mapping techniques
The standard method for model compression is to create an ‘average’ model point for a group of policies using policy characteristics, such as plan code, issue month, quinquennial ages, policy sizes, premium modes and so on. While commonly used, this approach rarely yields a compression in a ratio of much more than 10:1 without several drawbacks, among them:

- The actuarial modeller needs to know something about each minor plan in order to map it into a major plan
- Rules for mapping are subjective and can be hard to automate
- Mapping rules need to be refreshed and enhanced as new plans are created or other characteristics of the in-force block change
- Traditional model validation techniques (which often focus on actual versus model values of opening reserves, premiums, cash values and policies in-force) do not necessarily confirm that a model will work well across multiple scenarios. Even for a single scenario, a tight opening balance-sheet validation does not guarantee a good fit of income projections
- Rules are particularly hard to derive and apply for certain product types, notably multi-life policies or policies with guarantees that may have non-homogeneous values of ‘in-the-moneyness’ or historical behaviour
- The approach can create ‘artificial’ policies with potentially inappropriate relationships between policy fields (for example, premiums vs sum assureds vs age and so on).

An alternative approach, which works well when there are large pools of homogeneous policies, is to randomly select policies (for instance 1 in 100) and assume that each selected policy represents, for example, 100 similar policies. This approach is easy to implement, models ‘proper’ policies, includes less potential for in-the-moneyness or historical behaviour to be lost and can use statistical techniques to determine the number of model points to be selected for a given confidence interval. Stratified random sampling and other more sophisticated sampling approaches can be used to further refine the selection process.

Based on cluster analysis techniques used in social sciences, cluster modelling enables users to efficiently model millions of policies into just a few thousand, or even a few hundred, model points.

Cluster modelling
Based on cluster analysis techniques often used in social sciences and other applications, cluster modelling enables users to efficiently model millions of policies into just a few thousand, or even a few hundred, model points. It automatically assigns all policies from a seriatim in-force file to one of a small user-selected number of representative model points. Conceptually, it computes the distance of each policy from every other policy, defining the importance of each as the product of its size and the distance to its nearest neighbour. It then assigns the least important policy to its nearest neighbour and grosses up the amount of in-force for that neighbour.

Description of the technique
The following are defined for each policy:

- An arbitrary number of location variables. A location variable is one whose value a user would like reproduced closely. Some location variables can be statistically known items (for instance, starting reserves per unit), while others can be obtained from projection results from a small number of calibration scenarios (typically one to three), such as:
  - Reserves, cash value, account value or premium per unit as of the projection date or some future date on one or more calibration scenarios
  - Present value of claims per unit
  - Sum of the premiums paid in the first five years of the projection per unit
  - First-year liability cashflow per unit
  - Present value of profit (PVP) per unit.

- A size variable to represent the importance of a given policy. This ensures that large policies are not mapped away as readily as small policies, all other things being equal. For example, the size variable would typically be represented by the face amount for life insurance or account value for deferred annuities.
- A segment. The program will not map across segment boundaries. Segments
might be plan code, issue year or any other dimension of interest. Segments can decrease calculation time, offer a strategy to prevent policies from one area of business being mapped into another or be used to further distinguish location variables.

The calculation proceeds as follows:

1. The distance between any two policies is calculated using an \( n \)-dimensional sum-of-squares approach, as if the \( n \) location variables defined a location in \( n \)-dimensional space. As an example, with three location variables (Var1, Var2, and Var3), the distance between policy 1 and policy 2 could be measured as:

\[
\sqrt{(Var_{11} - Var_{12})^2 + (Var_{21} - Var_{22})^2 + (Var_{31} - Var_{32})^2}
\]

2. In this definition, the location variables must be appropriately scaled. Each of the location variables is normalised by dividing each one by the size-weighted standard deviation of the associated variable.

3. The importance of each policy is defined by the cluster modelling process as the size multiplied by the distance to the nearest policy.

4. At each step, the process finds the policy with the lowest importance and maps it to its nearest neighbour (the destination policy), adjusting the size — and hence the importance — of the destination policy in the process. This step is repeated until the model has the desired number of model points.

5. At this point, only the user-specified target number of clusters remains. In the next step, the program finds the most representative policy in each cluster, which is the policy in each cluster that is closest to the average location (centroid) of all cells in the cluster.

Cluster modelling scenarios

With appropriate changes in location variables, cluster modelling can be used for compressing asset models as well as cluster scenarios. For this purpose, all we need to do is define a set of location variables. Such variables might include:

- Equity index wealth ratios at times 0, 1, 2, 3, 5, 10, 15, 20 and 30 for one or more equity indices
- Interest or inflation accumulation factors at selected terms to maturity and projection points
- Model results for a very highly compressed model run across all scenarios.

Advantages of cluster modelling

In summary, there are a number of advantages of cluster modelling:

- It applies to any product type and can be extended to include assets in addition to liabilities
- It achieves far better compression ratios for a given model-to-actual fit
- It is easily automated with minimal up-front effort
- It can be maintained and applied in similar ways at later valuation dates
- It allows customisation to place different priorities on different measures of model fit
- It applies to seriatim in-force or to compressed model points to create even more compressed model points
- It allows easy adjustment to the number of model points to produce more or less model granularity, depending on the application
- It allows easy on-the-fly analysis of model fit for differing levels of model granularity, without re-running a model.
When worlds collide
Dr Matthew Lightwood explores the question of correlation across economies when implementing an economic scenario generator

Correlation between simulated variables is a major theme under Solvency II and important in capturing the risks associated with multi-asset class investments. It could be argued that the simultaneous movement of investment returns and differing economic conditions is the most important factor in accurately assessing and managing the market risk an insurance firm faces. From a modelling perspective, the ability to properly capture the correlation with the implicit coupling of variables both within and across economies creates a significant technological challenge when implementing a realistic economic scenario generator (ESG).

These challenges must be overcome, because properly capturing the diversification and concentration effects among assets will inevitably lead to a more reliable calculation of risk and solvency capital requirements.

Measuring correlation
Unlike bond yields or stock prices, which have an absolute value, correlation is not directly observable in the market place. Trying to determine an appropriate target or desired value for the correlation of two financial or economic variables is difficult. This is because the measured value from market data may fluctuate considerably depending on the time window used (for instance, one year, 10 years or 100 years), the frequency of data used (daily, weekly or monthly) or the historical period under consideration. Take, as an example, the correlation between the GBP/USD and EURUSD foreign exchange rates over the last 10 years shown in Table 1.

One might naively expect quite stable values, however, the measured values range from 0.402 to 0.922 depending on the time horizon or frequency of data used. Individuals may have a personal preference for one value over another, but from an objective standpoint would need to defend that view. Which value, then, is to be believed or used as a basis for building an ESG or validating its behaviour? In reality it is more practical to make general statements when forming acceptance criteria. For the FX rates discussed above, statements might include:

- Correlation should on average be positive and in the range 0.4 to 1.
- Scope should exist for paths to be simulated, which capture a wide range of correlations.
- Correlation along a single simulated path should be dynamic, encompassing periods of both high and low correlation.

ESG considerations
Enabling correlated behaviour between different components of a model within an ESG is as much a technological challenge as a theoretical one. Indeed, the CRO Forum in its December 2009 paper Calibration recommendation for the correlations in the Solvency II standard formula acknowledged “the calibration of dependencies of risk factors is among the most difficult tasks when setting up a capital model”.

The standard methods employed by leading ESG developers include:
1. Direct functional relationships among the economic models
2. Correlation of the independent random processes associated with the models.

The former is usually introduced through a cascade structure where each economic model forms an interconnected network. In a cascade structure, scenario generation is governed by a well-defined sequence, in which variables at the top of the structure can only influence those below. This approach has two desirable effects. Firstly, it renders estimation practicable and, secondly, it introduces joint behaviour between model components. The exact sequence of the variables is to some extent arbitrary, however, interest rates are often used as a starting position and, since one may need to calculate discounted cashflows through the life of a simulation, it is an obvious choice for practical reasons.

In practice the latter involves applying the Cholesky decomposition of a covariance matrix to the vector of independent random processes driving the stochastic processes. While the estimation of the covariance matrix requires careful consideration, this approach has significant advantages, since the mean correlation can be controlled to some extent while allowing for simulated paths that exhibit a range of different correlation values.

Tail correlation measurement and analysis
The economic crisis of 2008 led to an increased focus on the behaviour of ESGs in the tails of the distribution, especially correlation in the downside tail. The conventional wisdom is that for most asset classes, correlation increased as market conditions deteriorated. As such, one may believe that ESG-simulated results should exhibit similar behaviour.
Unfortunately, the lack of data on economic crises means that establishing solid conclusions about the values of tail correlations is difficult, and the CRO Forum acknowledges that this is “in a way a subjective task”. One can still study general historical patterns, however, and use these to form some acceptance criteria for the correlation exhibited by an ESG.

In their 2004 paper, Forecasting International Equity Correlations, Eth, Harvey and Viskanta noted the correlations of G-7 equity markets with United States equity markets was significantly higher when markets are falling than when markets are rising, even when such market drawdowns are relatively moderate. Looking at market data it is possible to measure this effect. Figure 1 shows the correlation of S&P 500 equity index returns with the FTSE 100, EUROSTOXX 50, TSX 60 and Nikkei 225 as a function of percentile of the S&P 500 return distribution, with lower percentiles representing negative returns. The values shown are the Spearman’s rank correlation coefficients within quintiles of the S&P 500 distribution. For all the economies studied an effect can be seen, with significantly higher correlation in the downside tail than in the bulk of the distribution. For the FTSE 100, the correlation is also significantly higher in the right-hand tail of the distribution indicating that the economic cycles of the United States and United Kingdom are to some extent harmonised.

This kind of analysis is useful from the perspective of economic scenario generation because it provides many clues as to the general behaviour that one might wish to produce within a simulation. Great caution, however, must be exercised when comparing such data to simulated model output as it is neither reasonable nor logical to expect a model to ‘fit’ to such data for the reasons discussed above. It is more reasonable to make general statements such as “correlation should increase in the left-hand tail of the returns distribution”.

To demonstrate this, the results obtained from the Stochastic Volatility Jump Diffusion (SVJ) model, where the independent Brownian motions are correlated using the method described, are also shown in Figure 1 for comparison. It can be seen that this model, when robustly estimated, is capable of reproducing the main characteristics of the market including tail correlation.

**Conclusion**

Correlation is an important issue both for risk management practitioners and builders of quantitative models. Forming an opinion about correlation from the historical data is, however, difficult and no absolute ‘truth’ exists, because calculated values depend on a wide range of factors. When analysing correlation, a great deal of qualitative judgment must be used in deciding whether a model adequately captures the dynamics of the market. Correlation analysis is, to a great extent, a question of interpretation, which can only be based on an understanding of the limitations of correlation as a measure. Useful analyses can, however, be performed and used to make informed decisions about the robustness, efficacy and applicability of an ESG with respect to the correlation question. Enabling a more sophisticated approach to correlation is necessary where differing levels of correlation are exhibited in different parts of the distribution and where correlation fluctuates with key economic drivers. The alternative, static correlation across all simulated paths and at all points in time, may underestimate correlation in the tails or overestimate it in the bulk of the distribution, or as the CRO Forum notes “may encourage companies to offset/neutralise risk for one specific scenario, but dramatically increase the risk associated to a reverse scenario”.

**Table 1 — Correlation between the GBP/USD and EUR/USD foreign exchange rates over the last 10 years**

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Data frequency</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>0.798</td>
<td>0.402</td>
<td>0.826</td>
</tr>
<tr>
<td>Weekly</td>
<td>0.922</td>
<td>0.508</td>
<td>0.824</td>
</tr>
<tr>
<td>Monthly</td>
<td>0.599</td>
<td>0.822</td>
<td>0.776</td>
</tr>
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**Figure 1 — Spearman’s rank correlation coefficient as a function of the percentile of the return distribution for the S&P 500 vs selected equity indices compared to Stochastic Volatility Jump Diffusion (SVJ) model with correlated Brownian motions**

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December 2010 29
Solvency II is putting the spotlight on capital modelling and creating both opportunities and challenges for actuaries. There is significant growth in adoption of partial or full internal models as re/insurers seek a more representative capital assessment than the standard formula. But there is also an increase in complexity as companies undertaking internal modelling need to ensure their models can satisfy pillars 1 and 2 of Solvency II as well as existing and emerging accounting standards. In addition, they must ensure that these models are actually used in making key decisions about the business.

ReMetrica version 5.0, Aon Benfield’s Dynamic Financial Analysis platform for capital modelling, has evolved in response to the regulation with a comprehensive set of Solvency II enhancements. In use by over 160 firms worldwide and with 10 years of development, ReMetrica provides extensive capabilities for modelling the full balance sheet of re/insurance companies, and includes detailed models of all key risks. The newly released version 5.0 provides an extensive set of new components suitable for both calculating the Solvency Capital Requirement and broader risk management purposes under Pillar 2.

Tackling one-year and ultimate views of risk
A key complexity for general insurance capital models under Solvency II is the need to produce both one-year and ultimate views of risk. Solvency II requires risks to be considered on a one-year time horizon, whereas insurers prefer to model the total risk emerging in run-off when making risk management decisions.

One potential modelling approach to this issue is to project the balance sheet one year into the future and run it twice: once on parameters reflecting one year insurance volatilities and once on those reflecting the ultimate volatility to run-off. However, although this approach may satisfy the requirements of Solvency II, it ignores recent innovations in multi-year modelling that have emerged from second generation ICA models.

ReMetrica 5.0 offers a much neater solution to capturing both ultimate and one-year insurance risk. It allows the user to specify a distribution for the ultimate losses and a stochastic recognition pattern that determines how the ultimate level of risk is attributed to each development year.

Fair value accounting
In addition, ReMetrica 5.0 includes components designed to provide the fair value accounting output required under both Solvency II and IFRS 4 Phase II. These are important advances in capital modelling that together allow a single internal model to satisfy pillars 1 and 2 of Solvency II and other reporting requirements.

The Use Test: Embedding capital models into the decision-making process
Underpinning approaches to capital modelling under Solvency II is the challenge of the Use Test; to prove to regulators that capital models used to report on the company are actually applied by senior management in making business decisions. In this way firms are encouraged to generate the maximum value from internal models by looking beyond regulatory capital to identify how capital modelling can better inform their business decisions.

This ethos is reflected in the design of ReMetrica which is aimed at providing a statistical framework for practical decision making. As a result, it is used to support decisions across a wide range of disciplines, from capital adequacy to asset allocation, pricing, reinsurance optimisation and business planning.

The true prize for a successful Solvency II implementation is to transform risk management into a powerful business planning tool that empowers firms to optimise their utilisation of capital and thereby maximise profitability. The evolution of ReMetrica as an internal modelling platform and the new Solvency II functionality gives the opportunity for actuaries to turn the proposed regulation into a positive move for their business.

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Key objectives of a Solvency II internal model

<table>
<thead>
<tr>
<th>Assessing regulatory capital</th>
<th>A one-year projection of the Solvency II balance sheet into the future to satisfy Pillar 1 of Solvency II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projecting the balance sheet</td>
<td>The use of a single model to produce calculations and report on multiple accounting or regulatory basis, for example GAAP and fair value output for Solvency II</td>
</tr>
<tr>
<td>Modelling the ultimate risk associated with one or more years of new business</td>
<td>Ultimate risk is the view of risk consistent with today’s ICA model and will remain an important perspective for effective risk management. It can be used for determining the firm’s economic capital requirements using robust insurance models consistent with industry practice in pricing and reserving methods</td>
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Aon Benfield

Assessing regulatory capital

Projecting the balance sheet

Modelling the ultimate risk associated with one or more years of new business

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A little goes a long way
Sarah MacDonnell looks at the benefits to claimants of periodical payment orders in contrast to lump sum payments

Structured settlements, or periodical payment orders (PPOs), are not a new phenomenon. While over the years there have been episodes of consternation in the insurance industry over their emergence, they never seemed to materialise in any great number and the industry only ever saw a handful settling each year. Over the past 18 months or so, however, we have witnessed a significant increase in the number of PPOs being settled in the courts. This article looks at what a PPO is and discusses what may have caused the increase in their numbers.

What is a PPO?
If someone is seriously injured in a car accident, for example, then they will make a claim on the insurance of the responsible party in order to be financially compensated. This compensation can either be in the form of a single lump sum or, alternatively, as a series of regular payments over the remainder of the claimant’s lifetime. This latter form of compensation of regular payments is known as a structured settlement, or PPO.

These payments are typically made either once or twice a year and are linked to an inflation index that is agreed at the time of settlement. They can apply to any future pecuniary loss elements but, to date, they have been seen to primarily apply to the future cost of care element. A lump sum can be made alongside the regular payments; for example, the future care costs may be covered by a PPO, whereas the loss of earnings element could be in the form of a lump sum.

There can be a provision for step changes in the regular payment amount to be written into a PPO. These are known as stepped PPOs and will apply at fixed points in time to situations where a specific change in circumstance has already been foreseen at the time of settlement. For example, there could be a provision for a one-off increase in payments to be made in the case of a claimant whose parents are the primary carers. This would allow for the time when the parents cannot deliver the same standard of care and additional care costs will need to be incurred.

Similarly there can be a provision for variability orders, whereby the case can return to court in specific circumstances, such as a deterioration in the claimant’s medical condition, say. For both the stepped and variability orders, the terms under which the increase in payments will be triggered have to be defined clearly at the time of the settlement. A deterioration in the claimant’s medical condition that had not been foreseen and specifically allowed for as a variability order at the time of settlement would not result in an increase in the regular payment amount.

Where some of the cost of care is borne by the local authority, insurers may need to offer a guarantee in the PPO to cover costs in the event that the local authority payments are reduced or withdrawn in the future.

Lump sums versus PPOs — the claimant’s perspective
Even though claimants have historically tended to prefer a settlement in the form of a lump sum, it is widely argued that it is in the claimant’s best interest to receive compensation in the form of regular payments instead. The primary reason for this (other than the possibility that a claimant may choose to spend most of the money up front) is that a PPO takes away most of the risks that are inherent in a lump sum, such as mortality, inflation, investment and credit risk.

Compensation can either be in the form of a single lump sum or, alternatively, as a series of regular payments over the remainder of the claimant’s lifetime

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For example, should the claimant live longer than was anticipated at the time of the settlement, there is the potential for the funds from a lump sum to run out, whereas, by definition, a PPO will continue to pay out for the remainder of the claimant’s lifetime.

Changes in the economic environment can also affect the value of a lump sum; for example, if inflation proves to be higher than was expected at the time of settlement then the value of the lump sum will be eroded. Similarly, if investment returns are lower than anticipated at the time of the award then there is a risk that the lump sum will not be sufficient to cover the claimant’s costs. Though, conversely, they would not be able to benefit from good returns if investment markets perform better than expected or if they had opted to invest in potentially higher-yielding (though more risky) investments such as equities.

**So how many are there?**

The Profession’s working party on PPOs has undertaken an industry survey of the UK motor market, which estimates that there are currently around 60 PPOs a year settling (excluding PPOs settled in respect of the NHS and the Motor Insurers’ Bureau (MIB). Figure 1 shows the number of PPOs settled in each quarter between 2005 and 2009.

So far, the majority of PPOs have come from the motor insurance market. PPOs do also emerge from employers’ liability and general liability covers but, to date, these have been much less frequent.

**Why has the number of PPOs increased?**

The Courts Act 2003, which was implemented in 2005, allowed the courts to impose a PPO award for the first time, irrespective of the wishes of the insurer or the claimant. Historically, claimants have tended to opt for a lump sum settlement even though it is argued that this is not in their best interest. Initially, this legislation did not seem to have a material impact on the number of PPOs being awarded.

The index used to inflate annual payments was originally automatically linked to RPI. However, in 2006 a court case was brought in the form of *Thompstone v Tameside and Glossop Acute Services NHS Trust*, which questioned this assumption and suggested that the payments for future cost of care would be better linked to wage inflation. The court agreed and the annual inflation increase was linked to the Annual Survey of Hours and Earnings (ASHE). The case was appealed and a number of other cases were put on hold pending the outcome. In 2008 the Court of Appeal upheld the ruling and since then the majority of PPOs have had inflation linked to ASHE (as shown in Figure 1 by the colour coding of the bars).

On top of that, it is likely that the investment market crash of 2008 will have also contributed to the relative attractiveness of PPOs for claimants. Lump sums are calculated by the courts with reference to Ogden tables. The Ogden tables implicitly allow for a real discount rate, which is set by the Lord Chancellor. It was last changed in 2001 and currently stands at 2.5% per annum. This contrasts with current real yields on index-linked gilts of less than 1% per annum.
A step into the unknown
Anthony Claughton explores the potential impact of periodical payment orders for the insurance sector

Periodical payment orders (PPOs) are funny things. In a sense they are a very simple change. Future payments that traditionally are converted into a single lump sum and paid by the insurer will instead be paid out over time. With deterministic assumptions, the annuity formula learned in actuarial and finance exams will calculate the gross cost. Yet that small change has significant ramifications for both the insurance industry and the general public.

The issue for the insurance industry is one of uncertainty. Unfortunately, uncertainty has a cost. Although we do not know exactly how PPOs will play out, we do know some things. They will increase the time that claims take to settle and the cost to manage the claims, and consequently the reserves will increase. Variation orders and guarantees will mean costs can increase in the future unexpectedly with little warning. Insurers’ future payments will be sensitive to economic factors and will be highly correlated — so we can be certain that things will be less certain.

As a result insurers will need to hold greater capital, a cost that will feed into prices. The size and materiality of any increase will be difficult to quantify with the dearth of experience to date. The price implications will depend on the assumptions made by insurance companies on many other issues as well, not just capital costs — assumptions such as the real discount rate, how an impaired life population will behave, PPO desirability and reinsurer behaviour.

These are key decisions where actuaries and businesses will need to make a call, ones that may have a significant impact on the prices charged today and the profitability that eventually results from written business. That we won’t know which insurers are under/overpricing on PPOs for many years is something that will surely give the regulators a few uncomfortable moments.

There is also a great deal of uncertainty about the impact on the purchase of reinsurance. For direct insurers the value of reinsurance will reduce. First, the standard market reinsurance clauses allow the retention to increase with wage inflation over time. PPOs, with their slower payments than lump sums, result in a higher net cost to insurers. Second, Solvency II will force credit risk to be considered, which PPOs increase. From the reinsurer’s point of view, the beneficial impact of the indexation clause may be offset by the uncertainty impacts discussed above, which have a geared-up impact for reinsurers as the bulk of their exposure is to large claims.

How this will affect the insurers’ and reinsurers’ dance at renewal is unknown, but it is sure to add some new steps.

For the general public this may all feed into higher motor insurance prices. But that is not the only way they are affected. The NHS is settling many claims as PPOs, is not the only way they are affected. The NHS is settling many claims as PPOs, which have a geared-up impact for reinsurers as the bulk of their exposure is to large claims. Earlier this year the NHS had 800 active PPOs on its books. The exact nature of these claims has not been reported, but if they have a profile similar to those settled in the motor market then the reserves could exceed £1.5bn. With different assumptions it is possible this could be even more.

At a time when the UK is grappling with how to reduce its future obligations, it is uncertain how aware the government and the public is that it is building up new obligations via the NHS. Pushing payments into the future can be beneficial for government organisations, but planning needs to be done to make sure there are no unpleasant surprises.

I should make it clear that PPOs can be very good for claimants. There are many scenarios where it makes a great deal of sense to pass risks that are significant for the claimant onto insurers where they are less material and can be pooled. At a time of depressed investment markets, many may view a fixed-income stream as higher value.

At the recent GIRO conference, a presentation was given summarising key findings from the 150-page paper produced on PPOs by a working party. It was titled ‘PPOs — be afraid. Very afraid’. Although the title was slightly tongue-in-cheek, hopefully this article will help actuaries realise, they do need to know what they are, how they could be affected and have a plan to deal with PPOs’ pricing, reserving and capital implications.
All at sea
Yves Colomb, Darren Farr, Peter Hinton and Neil Hilary look at the risks of piracy and the costs inflicted on the insurance industry

Pirates are the highwaymen of the seas, spotting — with little apparent planning — a potential victim on its travels, moving in swiftly, attacking, overcoming and disappearing with prey or treasure on board as rapidly as they had arrived. Pirates have been doing this for thousands of years, despite the best efforts of navies and world powers.

There have been a number of high-profile cases recently and, with the costs to intercontinental shipping rising, a team of actuaries came together to investigate.

Over the centuries, some facts have changed little. Pirates need:
- Safe havens on land — the government acquiesces in piracy or is unable to suppress it
- Support services on land — an impoverished population with no alternative source of income can come in handy
- A ready supply of attackable vessels — they come in all shapes and sizes
- Access to weaponry
- A market for the onward sale of vessels or cargo.

Currently, these features are most noteworthy in Somalia. Somali pirates are preying on ships off the Horn of Africa. All ships travelling between the Mediterranean Sea and the Indian Ocean through Suez, Egypt, are exposed, as well as ships hundreds of miles offshore in the Indian Ocean. However, piracy is a global problem and there are many other hot spots, such as the Malacca Straits and Nigeria.

The marine piracy working party presented a paper to the 2010 GIRO convention, which traced the evolution of this maritime crime from the earliest times to the modern day. In particular it discusses Somali pirates and estimated the costs they impose on the shipping industry.

While actuaries commonly gorged on an overabundance of statistics (life or motor insurance), the group immediately faced the difficulty of obtaining base statistics in trying to assess the cost of piracy. Perhaps more than in any other insurance, underwriters have very good reasons for not releasing frequency and severity statistics for the world’s prying eyes. Shipowners have little incentive to publicise the fact that they have been attacked and it is in no-one’s interests to publicise amounts paid in ransom or the value of stolen goods. Also, reporting the near misses may affect the owner’s insurance premiums. Exposure data is not readily available. What is available requires judicious extrapolation.

Using a ‘safe corridor’ in the Red Sea, patrolled by international forces, reduces the likelihood of a successful attack.

Risk identification and management were uppermost in the working party’s thinking. It is important both to avoid incidents and to minimise their impact when they do occur. There is clear evidence that planning and taking prompt action when an incident occurs reduces losses. There have been a number of cases where this has frustrated pirates. For instance, the use of safe rooms has enabled ships to be recaptured from pirates and using a ‘safe corridor’ in the Red Sea, patrolled by international forces, reduces the likelihood of a successful attack.

As an emerging issue, we have tried to understand the risk and the factors that drive it, sought risk management solutions and derived some initial costs from statistics.

Because of its topicality, the ability to use transits of the Suez Canal as a proxy for exposure and, by way of illustration, the paper estimated the costs relating to kidnap and ransom (K&R) by Somali pirates. Using judgment rather than strict financial modelling, the working party projected that in 2010 an ‘average claim cost’ (ransom and ancillary expenses) of around $9m, with a hit rate of about 2.2% combined with a ‘success’ rate of 29% combining to produce a ‘claims frequency’ of approximately six per mile.

The estimate of the K&R cost per vessel came to about $60,000; this is in line with other analyses of the same insurance cost.

The group explored an alternative: that of sailing around the Cape of Good Hope and found that, despite the increasing risk around the Horn of Africa, there was still economic advantage to be gained from the Suez passage with adequate insurance, as the Cape sailing might cost an additional $0.7m.

The lack of data and other issues place considerable uncertainty around the cost of mitigation. We are now better placed to comment on this uncertainty. But perhaps one lesson that history has taught us is that piracy in general can only be solved by land-based solutions, in particular finding work opportunities for those in coastal communities and ensuring a stable government is in place.

Yves Colomb is a property and casualty consultant for Towers Watson; Darren Farr is a pricing analyst at Munich Re Underwriting Ltd for the Watkins Syndicate; Peter Hinton is a general insurance actuary working in the Prudential Insurance Policy Department at the Financial Services Authority; Neil Hilary is the UK Profession’s staff actuary specialist in general insurance.
Taking a risk

Gareth Haslip looks at the complexities underlying the calculation of the risk margin under Solvency II and compares different methods

Under Solvency II, the fair value of non-hedgeable liabilities is decomposed into the best estimate of the liabilities (BEL) and the risk margin (RM). One significant complexity in the Solvency II framework can be attributed to the intertwined relationship between the solvency capital requirement (SCR) and the risk margin. The SCR in respect of reserve risk is defined as the amount of capital required to support the increase in the sum of the BEL and RM following a one-in-200-year event over the next year, as illustrated in Figure 1. The RM is defined as the capital cost of holding the SCR over the lifetime of the liabilities, leading to circularity in the relationship between the SCR and the RM. While it is possible to explicitly compute the RM, where the SCR allows for both the potential movement in both the BEL and RM, the mathematics involved is complex and is only practical for simplified actuarial models that may not be appropriate for use in an internal model.

A key simplification that is suggested by the wording of QIS5 in SCR 1.3 is that under the standard formula: “To avoid circularity in the calculation, any reference to technical provisions within the calculations for the individual SCR modules is to be understood to exclude the risk margin.” While an internal model can in theory incorporate this additional level of precision, it may be reasonable to argue it can be excluded on the grounds of proportionality. Note that for the purposes of this article, we will only consider the effect of reserve uncertainty in the calculation of the SCR and assume that unavoidable market risk associated with the liability benchmark portfolio is nil. In addition, we do not consider the impact of unincurred obligations, which can also make significant contributions to the RM.

One particular challenge is to determine whether risk margin simplifications will be material in the context of an organisation’s overall risk exposures

Defining the SCR

Under the convention of excluding the movement of the RM in the SCR calculation, the initial SCR is calculated by computing the 99.5 th percentile of the change in BEL over the first year of simulation, which can be observed directly from Monte Carlo simulation. That is, $\text{SCR}(0) = \text{VaR}_{99.5\%} \left[ \text{BEL}(1) - \text{BEL}(0) \right]$. However, quantifying the SCR in future years is more difficult and path-dependent in nature: for example, the SCR that applies in the second year is dependent on the movement in reserves over the first year. That is, the SCR for future years is only known conditional on the path of the BEL up to that year and looking across all trials of the simulation: the unconditioned SCR is a random variable.

The RM is calculated along each path of the Monte Carlo simulation and its distribution can be seen across all trials. The RM required under Solvency II is given by the mean of the distribution of risk margins under each path or alternatively can be computed as the discounted value of future mean SCRs multiplied by the cost of capital, as illustrated by Figure 2.

The key difficulty here is that in order to determine the SCR at future times along a particular path, it is necessary to carry out an embedded Monte Carlo simulation, conditioned upon the information up to that point in time. This concept is illustrated in Figure 3. Performing this type of nested Monte Carlo simulation is a slow process and requires $m^2 \times n$ simulations in order to compute the RM, where $m$ is the number of trials and $n$ is the length of the run-off payment pattern. For example, using 10,000 trials across five years will require a total of 500 million simulations, which is impractical.

An alternative to Monte Carlo simulation is to utilise distributional theory for the underlying statistical model of reserve uncertainty, which transforms the problem into one of integration across all possible paths. This is more efficient computationally, but the mathematics is involved and requires relatively simple reserving models to preserve tractability.

Simplifications

There are clearly many technical complexities in computing the risk margin ‘exactly’ (even after making the simplification to avoid circularity in the
A SCR definition. Several simplifications are suggested in QIS5 TP 5.32:
1) Make a full calculation of all future SCRs
   without using simplifications
2) Approximate the individual risks or sub-risks within some or all modules and
   sub-modules to be used for the calculation of future SCRs
3) Approximate the whole SCR for each future year, eg. by using a
   proportional approach
4) Estimate all future SCRs ‘at once’, eg. by using an approximation based on
   the duration approach
5) Approximate the risk margin by calculating it as a percentage of the
   best estimate.

Further details on how each of these methods can be applied in practice are given
in the QIS5 technical specifications. In the case study below we compare the exact
method, 1, with methods 3 and 4 to give an indication of the pros and cons of each level
of simplification.

Case study
For the case study, we assume that our liabilities consist of a best estimate
undiscounted reserve of 1,000 at time 0 which for two notional classes of business
will be paid out according to the schedule in Table 1.

We assume that there is no uncertainty around the payment times or payment
proportions and there is no unexpired risk or expenses. There are many different
approaches to model the evolution of the reserves over time. We will apply a
simple methodology of assuming that the outstanding claims reserve at the end of each year is subject to uncertainty through a scaling factor drawn from a log-normal distribution. That is, the best estimate of the liabilities will evolve according to the following relationship:

\[ \text{BEL}(t) = [\text{BEL}(t-1) - \text{claims paid}(0,t)] \times \text{scaling factor}(t) + \text{claims paid}(0,t) \]  

(2)

where the scaling factor log-normal distribution with mean 1 and the coefficient of variation specified in Table 2. Note that the coefficient of variation is increasing over time, which is a common characteristic of liability classes.

If desired, correlation between years can be allowed for through a linear correlation matrix that is applied to the scaling factors using a Gaussian copula. For the case study, the correlation assumptions are shown in Table 3.

Result

The computed future SCR and resulting RM are shown in Table 4, alongside the results achieved using the Proportional Method and the Duration Method (assuming 6% cost of capital and a 2% discount rate).

It can be seen that in both cases the Duration Method understates the risk margin and the Proportional Method provides a reasonable approximation, although it is extremely sensitive to the term structure of volatility\(^2\). This suggests that the Proportional Method could be adapted to use weights linked to both the estimated term structure of volatility and the proportion of reserves outstanding to provide a better approximation of the future SCR. It is interesting to note that Method 5

(Percentage of Best Estimate) is more conservative, assigning a risk margin in the range of approximately 7-10% for the classes considered in the case study.

The risk margin remains one of the more demanding aspects of Solvency II and, due to the intractable nature of the calculations involved, one particular challenge is to determine whether risk margin simplifications will be material in the context of an organisation’s overall risk exposures. While many internal models will not project the liabilities beyond the one-year time horizon, when applying approximations to the risk margin, it is important to understand how the ultimate reserve volatility is apportioned over the lifetime of the liabilities.

\(^1\) See Risk Assessment, Gareth Haslip, The Actuary, December 2008

\(^2\) In the previous article (published in November 2008), examples are given where the Proportional Method does not provide a satisfactory approximation to the risk margin using the payment pattern as weights.
Coen brothers show True Grit

‘The Dude’ takes on the role of Rooster Cogburn in new film version of 1968 Charles Portis novel

Ask any fan of the Coen brothers to name their best movie and you’re unlikely to receive The Ladykillers as an answer, their 2004 remake of the 1955 Ealing comedy. While Tom Hanks’s central performance drew some plaudits, the film itself had a lukewarm critical reception and was widely thought inferior to the original. Nevertheless, six years and a Best Picture Oscar later, the Coens are ostensibly revamping another old favourite, True Grit, a 1969 Western starring John Wayne.

The difference this time is that the original True Grit is based on a novel. The Coens are claiming that their film will be a more faithful adaptation of the book rather than a remake.

The novel tells the story of 14-year-old Mattie Ross and her mission to avenge the murder of her father who was shot dead by his hired hand Tom Chaney. Mattie, now in her late-sixties, narrates the novel, interspersing the tale with homespun wisdom and Biblical references. Though at one point she invites the reader to look up several New Testament quotations, her wrath strikes a distinctly Old Testament note. When she consults the Sheriff about hiring a Marshal to track down Chaney, he recommends L.T. Quinn, an honest man who ‘brings his prisoners in alive’. Mattie opts instead for Reuben ‘Rooster’ Cogburn after hearing that he is “a pitiless man” who “loves to pull a cork”.

John Wayne won a Best Actor Oscar for his portrayal of Rooster Cogburn; the latest recipient of that award, Jeff Bridges, takes the role in the new film, reuniting with the Coens for the first time since The Big Lebowski. He is joined by another Oscar-winner, Matt Damon, together with Josh Brolin and 13-year-old Hailee Steinfeld, who plays Mattie Ross. The Coens’ treatment of this last character promises to be the most interesting aspect of their version. Ethan Coen has already lamented the fact that the original film loses much of the comedy inherent in the novel’s deadpan narration, and has hinted that the new film will seek to more fully incorporate Mattie’s point of view.

A rich source of comedy in the book is Mattie’s continual struggle to get her seniors to take her, and her mission, seriously. The visual aspect of this struggle was mitigated somewhat in the 1969 film by virtue of Mattie being played by a 21-year-old actress, Kim Darby. The Coens’ casting of the much younger Steinfeld will hopefully restore part of the comedic energy to some of the key scenes of the novel.

What else can we expect from the new movie? Well, as with any Coen brothers film, expect superb attention to detail. There is a wonderful shot in the underrated The Man Who Wasn’t There where the ash on Ed Crane’s cigarette has grown to an improbable length, perfectly reflecting the stillness of the character. And who will ever forget that haircut in No Country For Old Men?

With long-term Coen collaborator Roger Deakins once more assuming cinematographic duties, the film is guaranteed to look fantastic. The novel roams over dramatic scenery and builds to an extraordinary climax, providing plenty of quality material for the eight-time Academy Award nominee.

True Grit is released in the UK on 14 January 2011. Make a resolution to see it.

Seriously, you’ve never read… The Catcher in the Rye?

This month, Yasmeen Husain from KPMG gives her thoughts on J.D. Salinger’s classic 1951 novel.

Did it live up to its reputation?

My expectations for the novel came from its associations in the media with the shooting of John Lennon, the attempted assassination of Ronald Reagan, a quote by the serial killer Ted Bundy and the movie Conspiracy Theory. I therefore thought it might have content that would push anyone who read it to the verge of insanity. Thankfully, it turned out to be an excellent book. The teenage narrator, Holden Caulfield, tells about the events that take place after he gets expelled from his prep school. Caulfield has an amazing capacity to lie, often gratuitously, and displays a great self-awareness in regard to his many bizarre and irrational thoughts. The story conveys his sense of alienation and his frustration with an environment that he describes as ‘phoney’. Much of Caulfield’s interior monologue assumes a rather cynical hue, though he does make some sharp observations about human relationships.

Why read it?

To remember what it was like to be a teenager. Also, to explode the myth about the psychological side effects of reading the book — it won’t turn you into an assassin (I hope).

Who would you recommend it to?

One and all.
Can you briefly summarise your actuarial career thus far, including at which stage in the exams you switched sectors?
I started my career out of university in a pensions consultancy doing fairly typical valuation work. After two years I made the switch into an investment bank, joining a pension advisory group, where I was designing and marketing hedging solutions for pension schemes, as well as getting involved in pension-related M&A advisory work. At the stage I moved I only had one exam left (my fellowship paper).

How did you find interviewing for a job role you hadn’t done before?
The interview process was like nothing I had experienced elsewhere. I ended up having eight interviews (which can be at the low end for a bank), including getting grilled on technical questions. So it was a bit of a culture shock, but an interesting experience.

What exams knowledge have you found useful in your new sector?
I found the basic financial training the insurance section, as actuarial students there tend to develop through a series of work function rotations.

Can you briefly summarise your actuarial career thus far, including at which stage in the exams you switched sectors?
I have worked for one year in the life insurance industry and have also worked for a few months within the pension consultancy business.

Why did you decide to switch?
I wanted to move into an environment where I would work in a wider role and develop personally from engaging with the entire scope of the sector from the outset. This doesn’t happen within the life actuarial exams give incredibly useful generally in my day-to-day work, but the most relevant have probably been the derivative papers.

How easy has the transition been?
I found the change of working environment to be pretty huge with a very steep learning curve. You certainly have to work a lot harder and need to be a lot more self-reliant as well as developing a more commercial mindset. The most useful thing I have found from my previous job was a solid understanding of liabilities and cashflows combined with the general knowledge I gained of the pensions world.

What would you say to students considering switching between sectors?
You face a lot of competition to get into a bank, and not just from other actuaries, so my advice is to be as fully prepared as you possibly can, not only in standard actuarial topics, but also on the markets and how banks work.

Why did you decide to switch?
I had become pretty bored with my pensions consultancy job and was looking for something that would challenge me more and provide me with more responsibility. An investment bank seemed like a good place to get this type of career and luckily I managed to achieve it before the economy turned south.

How did you find interviewing for a job role you hadn’t done before?
The interview process was like nothing I had experienced elsewhere. I ended up having eight interviews (which can be at the low end for a bank), including getting grilled on technical questions. So it was a bit of a culture shock, but an interesting experience.

What exams knowledge have you found useful in your new sector?
I found the basic financial training the insurance section, as actuarial students there tend to develop through a series of work function rotations.

How easy has the transition been?
Due to the wide variety of work in pension consultancy, there is little repetition so it is necessary to get a full understanding of the work the first time as it may be a while before a similar piece of work arises. I developed a very good understanding of Microsoft Excel functions and programming code, and this has enabled me to gain more responsibility in a shorter period of time.

What would you say to students considering switching between sectors?
Think about what you want from a career and where you could best use your natural talents. If you would prefer more client interaction and more variety then maybe pensions would suit you.
Book review round-up

A stocking-filler selection of *The Actuary’s* must-have books on the financial world

**Wall Street Revalued**
Economist Andrew Smithers proffers his theory that assets can, indeed, ought to be valued to prevent another financial market crisis.

*Wall Street Revalued* is published by John Wiley & Sons. RRP £16.99

**The Quants**
The Quants tells the story of maths geniuses as they created a money-trading machine that almost destroyed the financial market.

*The Quants* is published by Random House. RRP £12.99

**Obliquity**
John Kay pitches an original concept about unintended consequences, relating it to all aspects of day-to-day life. Fascinating.

*Obliquity* is published by Profile Books. RRP £10.99

**No One Would Listen**
In this in-depth look at what caused the global financial meltdown, the author meets those whose warnings were ignored.

*No One Would Listen* exposes the story of how Markopolos cracked Bernie Madoff’s Ponzi scheme. An enthralling read.

*No One Would Listen* is published by John Wiley & Sons. RRP £18.99

**The (Mis)behaviour of Markets**
Mandelbrot’s book on fractal geometry offers new material on the recent credit crisis that affected the world.

*The (Mis)behaviour of Markets* is published by Profile Business. RRP £9.99

**A Simples Life**
A mock autobiography charting the TV meerkat’s founding of comparethemarket. com as well as his ancestor’s journey.

*A Simples Life* is published by Ebury Press. RRP £9.99

**Obliquity** is published by Profile Books.
**No One Would Listen** is published by John Wiley & Sons.
**The (Mis)behaviour of Markets** is published by Profile Business.
**The Big Short: Inside The Doomsday Machine** is published by Penguin UK/Allen Lane, RRP £25

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**Actuary of the future**

Roxanne Thompson

**Employer and area of work**
Aon Hewitt, Pensions Consulting.

**Date entered Profession**
June 2008.

**Describe yourself in three words**
Driven, loyal, talkative.

**Tell us your formula for success**
Expect more from yourself than others do.

**What’s your best attribute?**
My willingness to always have a go at new things.

**And your worst habit?**
Not suffering fools gladly.

**Alternative career?**
Geophysicist. I enjoy science and travelling — it seems like a good career to combine the two.

**Tell us something unusual about yourself**
I decided at 18 to visit a new country and try a new activity every year of my life — I’ve kept to it so far!

**What is most likely to irritate you about others?**
People who sit in the quiet coach on trains but refuse to be quiet!

**What three items would you take to a desert island?**
MP3 player, surfboard and a friend.

**Is the glass half full or half empty?**
It depends on what’s in it.

**What is the greatest risk you have ever taken?**
Backpacking around Brazil on my own when I was 19.

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**WHO WOULD YOU LIKE TO SEE FEATURED HERE?**
If you would like to nominate someone for Actuary of the Future, please e-mail AOTF@the-actuary.org.uk
December prize puzzle  Strip club

Christmas Dinner for the trustees of the European Economic Area
Enigmatic Obfuscation And Egregious Acronyms Authority (EEAOAEAA) is never a straightforward affair. This year, rather than the traditional cracker riddles (which are, of course, excruciatingly convoluted at the best of times), the 11 trustees have each found a piece of paper with a five-letter message written on them, as shown below. Can you work out what the meaning behind these messages is?

Terms and conditions
The winner will be drawn at random from the correct entries received and the winner’s name will be announced in the next edition. Please note that the puzzles editor’s decision is final and no correspondence will be entered into. We reserve the right to feature the winner’s name and a photo (if supplied) in *The Actuary*. Your details will not be passed to any third party in connection with this draw.

Puzzle 465  Bullseye!
For every angle, there exists a line that divides the angle into two equal parts. This line is known as the angle bisector.
In a triangle, there are three such lines. Consider a triangle ABC with internal angles \(a, b, c\) opposite them. Can you show that the three angle bisectors of a triangle meet at a point — without having to draw any further straight lines?

Puzzle 466  Thinking outside the boxes
My son has 12 presents sitting under the Christmas tree in boxes of different sizes, and at the moment the boxes are of more interest to him than the contents. He loves to stack the boxes into towers, with each tower formed of one or more progressively smaller boxes. How many different ways are there for him to do this?

MORE PUZZLES ONLINE
To access the puzzles archive or to play daily interactive Sudoku, visit [www.the-actuary.org.uk/puzzles](http://www.the-actuary.org.uk/puzzles). The puzzles editor is pleased to receive ideas for new puzzles from readers at puzzles@the-actuary.org.uk
Bridge challenge 10

Solutions for November 2010

Puzzle 464 solution

Tale of the century

1910. Halley’s comet flyby
1911. British MPs vote to receive a salary
1912. Barnsley win the FA Cup
1913. Woodrow Wilson becomes US President
1914. Gavrilo Princip assassinates Franz Ferdinand
1915. German U-Boat sinks the RMS Lusitania
1916. The Easter Rising in Ireland
1917. Mata Hari arrested and shot for spying
1918. Spanish Flu becomes pandemic
1919. The League of Nations founded
1920. National Football League formed
1921. Marie Stopes opens the first birth control clinic in London
1922. Howard Carter enters Pharaoh Tutankhamun’s tomb
1923. End of the Irish civil war
1924. Summer Olympics celebrated in Paris
1925. Margaret Roberts born in Grantham
1926. British General Strike
1927. First solo non-stop trans-Atlantic flight
1928. Alexander Fleming discovers penicillin
1929. St. Valentine’s Day Massacre
1930. Clyde Tombaugh discovers Pluto
1931. William Shatner and Leonard Nimoy born
1932. Cockcroft and Walton split the atom
1933. King Kong, starring Fay Wray, premieres
1934. Adolf Hitler becomes Führer of Germany
1935. Parker Brothers releases the board game Monopoly.
1936. The Jarrow March to the houses of Parliament
1937. Neville Chamberlain becomes Prime Minister
1938. The War of the Worlds US radio broadcast causes panic
1939. Spanish Civil War ends: Franco assumes power
1940. John Lennon born
1941. Japanese assault on Pearl Harbour
1942. Casablanca premieres
1943. Battle of Kursk
1944. The Stauffenberg plot
1945. The Yalta Conference
1946. Hungary experiences highest ever recorded inflation
1947. British coal mines nationalised
1948. Gandhi assassinated

1949. Nineteen Eighty-Four published
1950. Korean War begins
1951. King George VI opens London’s Royal Festival Hall
1952. First hydrogen bomb detonation
1953. Doomsday clock reaches two minutes to midnight
1954. Alan Turing dies
1955. Rosa Parks is arrested for refusing to give up her seat
1956. Elvis Presley enters the US music charts for the first time
1957. Sputnik 1 launched
1958. The UK’s first motorway opens to traffic
1959. First Barbie doll sold
1960. The ‘year of Africa’

November prize puzzle solution

Fab four

The four missing letters were ‘SIAS’.

November prize winner

Congratulations to this month’s winner, Derek Pugh of Friends Provident.

Bridge challenge 11

A useful beginners’ guide to playing bridge can be found at

www.ebu.co.uk/education/learning/default.htm. Please send any comments you have to Tom Bratcher at puzzles@the-actuary.org.uk

You are South, Playing Rubber bridge in 4 Hearts

Ace, King and Jack. The idea is that, holding eight cards in a suit with no loss when the partnership holds the King will drop the Queen. However, the difference in probabilities is very slight; often other factors will come into consideration.

You have 10 tricks on top, six hearts, two diamonds, one club and one spade. However, West opened 3♠ and will normally have seven spades for this bid, Dummy ♦QJ has four, you have two. This leaves East with a void — the pitfall! If you play ♠A at trick 1, East will ruff it, leaving you with only nine tricks.

However, you can’t go wrong if you play low on ♠K, ♠Q and ♠J, ruffing in hand and drawing trumps, after which you can cross to ♦K and discard a club loser on ♠A.
Please send news of moves, promotions, retirements and appointments to peoplemoves@the-actuary.org.uk

Change of address
Please remember to update your details on the Profession’s website at www.actuaries.org.uk/members/transactions

December 2010

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