

The Actuary™

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The magazine of the Institute and Faculty of Actuaries

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data science and
working abroad

TECHNOLOGY

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RISK

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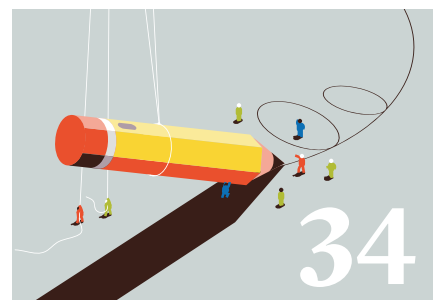


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Expert advice

This edition of the magazine focuses on data science and its applications, which will be a recurring theme for the IFoA.

As an undergraduate in the late 1990s, I was advised against doing a degree in artificial intelligence because it was 'just a fad', which goes to show that even university professors get it wrong sometimes. Their cautious approach has stayed with me and probably contributed to my eventual career choice. As actuaries, we naturally question and aim to provide balanced advice, and I am pleased that philosopher Dr Joel Walmsley has contributed to our coverage of the topic with an article on the ethical use of artificial intelligence (p18).

Broadly speaking, I am very supportive of a more general drive from the profession to support members in keeping their technical skills up to date in all areas. Past initiatives have aimed to improve our ability to communicate effectively, which is undoubtedly very important, but we must have something to say that is worth listening to first. In a world that may claim to have had enough of experts, and where we risk being drowned out by noise, it is even more important for the profession to keep its standards high and support its members in providing impartial, rigorous analysis.

The more eagle-eyed of you may have noticed a new regular section of the magazine, focusing on in-depth topics (p24). If you are a member of a working party or carrying out research and feel you have a more technical article in you, then this is your section of the magazine. It may not get the most Insta hits, but it should demonstrate the quality of our contribution.

As always, this is your magazine, so please do write in with your views.

D Georgescu

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Upfront

JOHN TAYLOR

Forging new paths



The Terminator is coming! At least that's one potential vision of the future, invoked by Boris Johnson at the UN last year while he speculated about artificial intelligence (AI). We can certainly debate how realistic that vision is, and what the possible timescales might be.

Perhaps a more relevant question for the foreword of *The Actuary*, though, is how technology will change the way we work. Some speculate about a future in which automation makes the vast majority of people redundant. Others suggest that the current level of expectation will not be sustained, and that we may even see another 'AI winter' where investment in this technology diminishes.

Analogous concerns have been around for many years. In response to being shown a knitting machine more than 400 years ago, Queen Elizabeth said to the inventor: "Consider thou what the invention could do to my poor subjects. It would assuredly bring them to ruin by depriving them of employment." Such fears have continued through the first, second and third industrial revolutions. In each case, while technological advances did render some human activity redundant, they also enabled new activity: some of Queen Elizabeth's

subjects became designers and operators of knitting machines. More recently, technology has enabled humans to become airline pilots, web designers, systems architects and so on.

It's no surprise, then, that the fourth industrial revolution is prompting similar concerns. While it's tempting to assume history will repeat itself, with new human jobs being created, we need to remember the regulatory warning: 'past performance is not a guide to the future'.

“Every industry is being inundated with data, but most sectors don't have a strong heritage of managing it”

The fact that sufficient new jobs have been created in each previous age doesn't mean that it will necessarily be the case this time. However, there's one feature of this revolution that gives me confidence in the actuarial profession: the ever-growing quantity of data.

Data is proliferating in our core practice areas of insurance and pensions, creating opportunities for actuaries to become involved in new activity. For example, lapse management has historically involved analysing population averages to support

pricing and reserving. Data now allows us to analyse and predict lapse behaviour at an individual level. This, in turn, gives life actuaries the opportunity to get involved in customer relationship management.

Beyond our core practice areas, every industry is being inundated with data, yet most sectors don't have a strong heritage of managing it. They need professionals who excel at applying maths and statistics in a commercial environment. Pioneering actuaries are responding by helping

supermarkets, telecommunications companies and internet companies to realise the value in their data.

While technology will lead to the automation of some actuarial tasks, it is already enabling many opportunities. I believe that this trend will continue, but only if we as individuals and as a profession make it happen. Creatively applying our core actuarial skills using the latest techniques will ensure we remain valuable to clients, employers and wider society. I look forward to seeing how our members forge a brave new path in the digital world.



JOHN TAYLOR

is the president of the Institute and Faculty of Actuaries



CPD

Webinar on CPD scheme proposal

With the consultation on proposals for a new CPD scheme for IFoA members closing on 17 April (see page 12), members who have questions about the proposals are encouraged to sign up to participate in our final webinar.

The webinar will take place on 2 April at 16:00 GMT and will feature a panel of IFoA members and executive staff who will present the proposals and field your questions. You can book through the consultation webpage.

Ben Kemp, IFoA general counsel, said: “After a lot of work looking at different approaches to CPD requirements across different professions, and obtaining members’ feedback, I think we’ve developed a strong proposal for a revised scheme and I look forward to hearing what members make of it.

“We want to refocus IFoA CPD on the benefits it can bring for our members’ careers and we encourage members to take advantage of all kinds of learning opportunities – whoever

the provider, whatever the form – to develop their professional capabilities.

“The proposed new approach is intended to help support IFoA members to remain relevant in the ever-evolving, varied and dynamic sectors in which they work, and to underpin our shared commitment to the quality and professionalism for which they are rightly renowned.”

Under the proposed scheme, all members have the same CPD requirements, except students and ‘non-practising’ members. There will be greater flexibility when it comes to what can be counted towards CPD hours. Recording and evidencing will no longer be required; instead the IFoA will focus on supporting members in their professional development in a reflective practice discussion.

Review the proposals and share your thoughts online before 17 April at bit.ly/31DvMIH



IN BRIEF...

Paper: A Cashless Society in 2019

Cash is under pressure. A tense 2018 led to a tumultuous 2019: Facebook’s announcement of plans to launch its Libra cryptocurrency with a consortium of companies united all regulators against the project. The IFoA’s Cashless Society Working Party has now released *A Cashless Society in 2019: The Cashless World in Motion Review*, which can be found at bit.ly/2SpA1V6). The paper reviews 2019 events and developments from 2018 themes, as well as the risks and issues associated with a cashless society. Its author, Sabrina Rochemont, shares her predictions for 2030 in her blog on the IFoA website – read it at bit.ly/2SJs6Rp

Social impact investment webinar

The IFoA’s Social Impact Investment Working Party is delivering a webinar for actuaries and external stakeholders. Presenters will use their

international experience of this significant, growing market to:

- Clarify confusing terminology
- Describe key trends
- Explore actuaries’ role in this field.

The speakers are: actuary and working party member Kudzai Chigiji; Kurt Morriesen, head of sustainability in Europe for the UN Development Programme; and Shilpi Nanda, an actuary involved in microinsurance and former Impact Insurance Fellow at the International Labour Organisation.

The webinar will take place on Thursday 19 March from 09:00 -10:00, plus time for questions. Please register at bit.ly/2UZKkrc

EDUCATION

IFoA sponsors Enterprising Maths in Scotland

As part of our ongoing school engagement activities with the Scottish Board, we were delighted to sponsor Enterprising Maths in Scotland (EMiS) in November 2019. EMiS targets hundreds of school-age students with a range of regional activities and national school competitions that demonstrate their excellence in maths. The successful teams then take part in the National Final, which this year took place at the Glasgow Science Centre. For the second year running, this year's winning team was from James Gillespie's High School. Iain McLellan from our Scottish Board was on hand to speak with students and hand out the awards. Congratulations to all those students who took part, and a very big thank you to Iain and the Scottish Board Schools and Universities sub-committee for their support.



Institute
and Faculty
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Book
now

Spring Lecture 2020

The Brexit Budget: What next for the UK economy?

25 March, The Assembly Rooms, Edinburgh

Presented by economist Vicky Pryce

Vicky provides an in depth look at the first budget from Boris Johnson's Government and dissects what this could mean for the direction of fiscal policy as the UK navigates its departure from the EU.



Register at www.actuaries.org.uk/springlecture2020



CAMPAIGN

A call for evidence

On January 31, IFoA President John Taylor launched the IFoA's call for evidence on 'The Great Risk Transfer' at a breakfast briefing attended by more than 50 members and industry stakeholders.

Throughout 2020, the IFoA will be running a campaign looking at the various ways that risk is being transferred from institutions to individuals. Whether it's the move from defined benefit to defined contribution pensions, the decline in with-profits funds or customers being priced out of some insurance products, this transfer can be seen across many areas of public policy and actuarial practice. Read about the campaign at bit.ly/2UyX9lo

The first phase of the campaign is about understanding the issue better. We want to hear from you – how do you see this trend manifesting itself in the areas you work in? What impact it is having on consumers? Are there interventions that could help ensure individuals are better equipped to deal with the risks they face? Access our call for evidence at bit.ly/2OvzUVC

DISCIPLINARY TRIBUNAL

Panel Hearing of Mr Ben Loon Vernon Tan

On 10 December 2019 the Disciplinary Tribunal Panel considered a charge of misconduct against Ben Loon Vernon Tan (the respondent). These were proceedings in the absence of the respondent.

The charge against the respondent arose as result of a failure to comply with the CPD schemes in 2016-2017. He was also charged with failing to co-operate with the IFoA. It was alleged that all or any of the charges constituted misconduct in terms of Rule 1.6 of the Disciplinary Scheme.

The panel found all of the factual elements of the charge proved, and that the compliance principle was breached. The panel was satisfied that this was a case of misconduct.

The panel determined that the appropriate and proportionate sanction was a reprimand and a fine of £2,500. A copy of the panel's full determination, including reasons, can be found on the IFoA's website at bit.ly/2GZm7nR



EVENTS AND CONFERENCES

23/03/20

Finance and investment webinar: Applying artificial intelligence to systematic investing

What are the advantages of using artificial intelligence (AI) in investing? What are the differences between traditional quant and AI? This new webinar, part of a series of four webinars leading to the annual Finance and Investment Conference 2020, discusses challenges and the future of AI in the investment sector.

25/03/20

Spring Lecture 2020, Edinburgh – Vicky Pryce

ASSEMBLY ROOMS, 54 GEORGE ST, EDINBURGH
Please join us for our annual Spring Lecture – The Brexit Budget: What next for the UK economy? – presented by Vicky Pryce in Edinburgh. Vicky will provide an in-depth look at the first budget from Boris Johnson's government and dissect what this could mean for the direction of fiscal policy as the UK navigates its departure from the EU.

05/05/20

Finance and Investment Conference 2020

ROYAL COLLEGE OF PHYSICIANS, LONDON
Join us at this year's Finance and Investment Conference in London, focusing on the environmental, social and governance (ESG) space. In many cases, ESG is now an essential part of policy and central to the way stakeholders make decisions for the long term to ensure retention of clients, manage risk better and ensure more economically efficient and sustainable investment returns. With ESG moving centre stage, attending this year's conference is a must.

02-03/06/20

Protection, Health and Care Conference 2020

Join us at this annual two-day conference, aimed at all insurance professionals with a passion for harnessing insurance risk in their organisations.

The conference uses workshops by individuals working at the coalface and 'big name' experts to explore how innovation, technological and medical advances, the political landscape and other market development will impact the protection, health and care markets.

24-25/06/20

IFoA Asia Conference 2020

CCEC NEXUS, KUALA LUMPUR
Join us at the IFoA Asia Conference, which intellectual thought leaders, senior industry players, opinion formers, academics, actuaries and non-actuaries from across Asia and beyond are expected to attend.

This year's landmark conference promises to be an exciting one as the IFoA's first Asian president-elect, Tan Suet Chieh, will use his presidential address to highlight the two key pillars of the IFoA's emerging strategy.

Additionally, we are also delighted to announce that the Honourable Mr Lim Guan Eng, Malaysia's Minister of Finance, will be the guest of honour at this year's conference.

View all of our workshops, seminars, webinars, events, and conferences at www.actuaries.org.uk/event



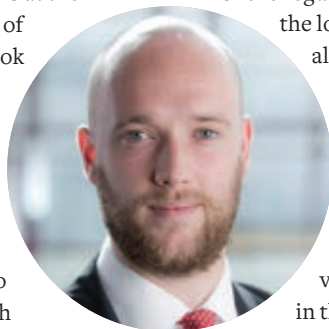
BLOG

The political year ahead

In his latest blog, Henry Thompson, the IFoA's new head of public affairs, takes a look back at some of 2019's highlights for policy and public affairs at the IFoA, and gives a glimpse of some of the projects to look forward to in 2020.

Highlights include a busy start to 2020, with the Pension Schemes Bill being debated in parliament. This contains new measures to put savers on a better path towards a comfortable retirement. The IFoA also launched 'The Great Risk Transfer' campaign, which explores how financial risks have moved from institutions to consumers across areas of financial services, public policy and actuarial work.

In the coming months, there will be a strong focus on engaging with the



government to help shape the outcome of the Kingman Review and seek the best possible outcome for the regulation of actuaries in the long term. The IFoA will also continue to make the case to the government about the importance of finding a sustainable funding solution for social care, further demonstrating the value of actuaries' work in the public interest.

The IFoA's Public Affairs function has the important task of amplifying members' collective voice, as well as demonstrating how the profession contributes to the important issues of our time. Take a look at what you can expect from the team during the coming year at bit.ly/2w6ywCH

ADJUDICATION PANEL

Mr Jack Wicks, student

On 30 October 2019 the Adjudication Panel considered an allegation of misconduct against Mr Jack Wicks (the respondent). It was alleged that the respondent drove a motor vehicle after consuming so much alcohol that the proportion of it in his breath exceeded the prescribed limit, contrary to section 5(1)(a) of the Road Traffic Act 1988 and Schedule 2 to the Road Traffic Offenders Act 1988. It was also alleged that his actions were in breach of the principle of compliance in the Actuaries' Code and constituted misconduct in terms of Rule 4.2 of the Disciplinary and Capacity for Membership Schemes of the Institute and Faculty of Actuaries (Effective 1 February 2018) (the Scheme).

The panel found evidence to support the allegations, noting in particular Rule 4.10a of the scheme that the fact that a member has by a court of competent jurisdiction in the UK been convicted of a criminal offence shall for the purposes of the Disciplinary Scheme be treated as conclusive evidence of the findings upon which the conviction is based. In the circumstances, the panel determined that the facts disclosed a *prima facie* case of misconduct.

In considering sanction, the panel took into account all relevant information and was satisfied that the appropriate and proportionate sanction in this case was a reprimand and £1,000 fine.

A copy of the panel's full determination, including reasons for its decision, can be found on the IFoA's website at bit.ly/2GZm7nR



Institute and Faculty of Actuaries

Registration is now open for this year's annual conference that will focus on the rapidly growing environmental, social and governance (ESG) space.

Finance and Investment Conference

5 May, Royal College of Physicians, London

2020

View the full program and register at: www.actuaries.org.uk/FinanceandInvestment2020

TAKING THE REINS

The IFoA's new
chief executive
Stephen Mann
sets out his
vision for the
organisation

Tell us a little about your career to date.

It's been varied and interesting! I started out as a lawyer working in the City in corporate and financial services areas, before moving in-house to join Norwich Union to work on its demutualisation. I was fortunate, in many ways, to be involved in a number of other initiatives and regulatory issues that helped me broaden my experience quickly and contribute more widely. Over time, I ended up doing less legal work and stepped away from it completely when I became the UK director responsible for strategy. By the time I left what had by then become Aviva, I had ended up being change and IT director and chair of Aviva's with-profits committee, and was responsible for establishing the UK retail investment business.

Before joining the IFoA, I spent nearly 10 years as CEO of the Police Mutual Group, which is the UK's largest affinity mutual working for the police and armed forces in the UK. After a career largely working for shareholder-owned businesses, I had built a good appreciation of the importance of having a clear proposition for members, and of demonstrating how the business was run in their interests.

I have also moved around a bit, starting in London, moving to Norwich and then up to York, where my family are now settled.

What excites you most about becoming the CEO of the IFoA?

All professions are subject to transformational pressures from a range of sources, whether financial, social or digital. I strongly believe that actuaries are well placed to provide fact and data-based insight and thought leadership across a range of areas, and that this is becoming more important at a time when many of the big issues of the day seem to be swayed by opinion and personality, rather than reasoned argument.

During my career, I

have worked extensively with actuaries and seen first-hand the importance of what the profession does; I have subsequently developed a deep respect for it. I was keen to play a role in securing its long-term influence in addressing some of the major challenges facing our society. This really excites me, coupled with the fact that there is a lot of progressive thinking already under way, both in terms of what actuaries need to be thinking about now, and how the IFoA needs to lead the profession.

What are your immediate priorities as you get under way?

There's a lot to pick up, and my knowledge of IFoA acronyms is developing rapidly! It has been a good time to join as we are in the midst of refreshing the next phase of the strategy; getting the substance agreed and into next year's corporate plan is a priority. I am also taking advantage of being new in the job to try to set the right tone from the

“An open and curious mindset, which continually seeks to learn and enquire, will enable the actuarial skillset to retain its value”

top – to be clear that the IFoA needs to continue to evolve to support its members and to be open and straightforward in how we go about that. I also want to take the time to listen to colleagues, members and stakeholders and understand what is important to them.

What challenges are you looking forward to getting to grips with?

Every job is different and comes with its own challenges. Ultimately, the IFoA is judged on what it is seen to do for its membership, which is a not a homogeneous group. We have to make sure that IFoA members value what we do and are able to feel proud of the benefit that their membership gives them.

There is a range of great things already happening that have perhaps slipped under the radar, but there is even more that we can, and need to, do here.

I have really appreciated how warm my welcome has been, and also the breadth of ideas and passion that has come from everybody I speak to. A practical challenge will be to make sure that we can harness that passion while still maintaining focus in the areas where the biggest impacts to the profession can be made.

What's your vision for the profession going forwards?

I would like to be able to say that my colleagues and I are able to support the profession to make a positive difference to the world.

We need to recognise that the profession is not static. There are huge changes in the sectors, business models and demand landscape that actuaries are working in, and it is essential that we have the agility to move with this tide. This is across areas that actuaries have traditionally worked in, as well as emerging fields where we find the skillset can add value. While IFoA members are recognised for their technical skills, we also have to recognise that an open and curious mindset, which continually seeks to learn and enquire, will enable the actuarial skillset to retain its value long into the future.

How are you planning to help members achieve their career goals?

By seeking a better understanding of what is important to members at every stage of their career, and by developing a modern and dynamic curriculum with a wider approach to training and support, which recognises the need for that dynamic mindset and best equips those qualifying with us to realise their full and diverse potential. Our job must be to enable actuaries to truly understand the value of their skills, and be best positioned to apply that to whatever organisations or sector their careers take them to.



CPD: **A new** **approach**

Neil Buckley, chair of the IFoA Regulation Board, tells us about the bold proposals for a new IFoA Continuing Professional Development Scheme

Why is the IFoA reviewing the existing Continuing Professional Development (CPD) Scheme?

For some time, there has been discussion among the Regulation Board and the IFoA leadership about the possible benefits of a different approach to CPD.

This is in part because members have frequently told us over the years that the requirement to record and evidence activities can be challenging.

There is a perception that only certain types of activities (usually more formal ones) or IFoA-provided learning can be counted towards CPD hours. As a result, many members have felt restricted in the types of learning opportunities they can take advantage of.

This may discourage members from engaging in learning opportunities on topics away from traditional actuarial practice areas. Of course, this is not in line with the IFoA's objectives, and we want members to feel supported in learning about new areas, as well as maintaining their competence.

How did you go about informing options for a CPD Scheme that addresses these issues?

We looked into the schemes of other professional regulators and actuarial bodies to understand different approaches, and considered the pros and cons. We also piloted an outcomes-focused scheme with some of the organisations accredited under our Quality Assurance Scheme (QAS), which gave us a better understanding of how this approach worked. In short, it requires members to consider what their development needs and objectives are, reflect on the benefits derived from their learning, and determine whether those needs and objectives have been met.

What examples of innovative approaches to CPD did you find?

We came across a number of different approaches to CPD in our research, the most interesting being 'hybrids', where a particular volume of learning was prescribed, but members were asked to think more carefully about the outcomes of their activities and how this would shape their development. In the medical and legal worlds, we noted schemes requiring members to have discussions with peers

about these issues. Regulators in these fields believe that reflecting on learning undertaken with a colleague adds real value.

This chimed with the feedback from our pilot of the outcomes-focused scheme. Some QAS organisations had this discussion as part of an appraisal, while others took a less formal approach. Participating members told us that the discussions were extremely beneficial.

We want all members to have this benefit and decided this was something the IFoA could offer in the shape of 'reflective practice discussions'.

What do we hope for from the proposed approach?

At the heart of the proposed new CPD scheme is a continued responsibility to maintain competence and remain relevant for the job undertaken – building on the principles of the Actuaries Code.

However, we hope the new scheme will give members the ability to take advantage of all kinds of learning opportunities – from books, journals and online videos to workshops provided by an employer or even another professional body. We also hope members will explore new areas and widen the scope of their expertise, allowing

them to add more value for their employer.

We hope that the reflective practice discussions will allow members to better consider their needs and outcomes, and that, going forward, CPD will be more meaningful for members, rather than being perceived to be a 'tick box' compliance exercise.

The proposals are for a scheme that is much simpler and more transparent. There would be a single CPD requirement for all members, except students and those that meet the criteria for 'non-practising' status.

For our members employed at QAS organisations, the outcomes-focused CPD scheme will become a permanent optional part of the QAS Handbook.

Review the proposals and share your thoughts online before 17 April at www.actuaries.org.uk/cpd-scheme-review-2020

If you have questions around the proposals for a new IFoA CPD scheme, register now to participate in our consultation webinar on 2 April, 16:00 GMT at bit.ly/38qrsii

“We hope the new scheme will give members licence to take advantage of all kinds of learning opportunities”

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INSIDE

People person

Steve Hales, CEO of Bermuda Resolution Re, on embracing the future and putting people first

Crystal clear

As artificial intelligence becomes more widespread, we need to think about how transparent its workings are, says Joel Walmsley

In the vaults

Helyette Geman and Henry CW Price consider the workings and yields of bitcoin futures

SWIMming lessons

Silvana Pesenti, Alberto Bettini, Pietro Millosovich and Andreas Tsanakas share their alternative approach to sensitivity analysis

Buried treasure

Over-regulation of data in Europe could prevent insurance innovation, cautions Frank Schiller

Shooting the breeze

Theodore Holtom and Anthony Brooms discuss how new technology and machine learning could lessen risk within wind-sensitive industries



Having held senior positions in consulting and with European insurers, Steve Hales was unveiled as CEO of Bermuda Resolution Re in October of last year. He has lived and worked outside the UK for more than 20 years, spending 15 years in Madrid, Spain before moving to Trieste, Italy nearly seven years ago.

I caught up with him by telephone, and started by asking how he got to where he is today.

Hales studied philosophy, politics and economics at the University of Oxford, where he was tutored by Sir Derek Morris – who went on to lead the government-sponsored review into the actuarial profession in the UK, known as the Morris Review. Asked what attracted a humanities student to the profession, Hales tells me that it offered a good combination of job satisfaction and quality of life. Maintaining this balance is still important to him, as he juggles a job and a family that are based in two different continents; his keys to a successful work-life balance are managing his time and making sure he focuses 100% on whatever he is doing at any particular moment. “It can be as mundane as mobile phone discipline and as exciting as spending a few days skiing with family and friends in the Dolomites before heading off to spend the week in Bermuda with the team. Crucially, though, when I am at home, I am with the family. I do not play golf.”

Spending time living and working abroad, experiencing different cultures, is something he would recommend to any young actuary. “It opens your mind in ways you cannot predict,” he says, adding that it has been “fun, surprising, refreshing, sometimes frustrating. One of the key things it does is make you think about the impression you make on other people.”

The human touch

Something that shines through in Hales’s answers is his focus on people. He is unequivocal about the most important lesson he has learned: “No matter how much we talk about technology, algorithms, interest rates and solvency rules, it all comes down to people. That is what motivates me in my work.” He describes his proudest professional achievement as “seeing members of my team go on to be successful in other areas. For me, the sign of a good manager is letting go of your superstars and helping them to develop their own careers.” He is very structured in his management approach, getting satisfaction from maintaining to-do lists and ticking tasks off.

Another lesson Hales has learned is that it is easy to confuse perceived wisdom with ‘the truth’. “I have studied and learned several things in my life, both academically and professionally, only to realise later that they were just plain wrong. I guess that comes from studying humanities and working in the financial sector: I have spent my life surrounded by constructs invented by humans, not Mother Nature.”

We talk about how the actuarial profession has changed since he started his career – in particular the diminishing

Steve Hales
talks to
Dan Georgescu
about working
abroad, data
science, and
the importance
of putting
people front
and centre

PEOPLE

mystique around it. “Knowledge has moved on and the lines between different financial disciplines have blurred,” Hales says. He thinks this is a consequence of the opening up of society and the financial services industry through technology, regulatory change and consumer attitudes, and does not believe it is necessarily a bad thing. “If people do not understand what you do, they will not appreciate it.”

Facing the future

Nonetheless, it is clear that actuaries will need to further adapt if they are to meet the challenges of a changing world. Hales believes that they should, for example, “proactively embrace the data science school of thought”. He managed a team of data scientists for a time while working for Generali in Trieste, and came to greatly appreciate the ways they applied the scientific method to problems.

How did an actuary in a traditional life role come to lead a data science department? Hales says he was undaunted by the challenge and pitched the role to his organisation as one of “taking a step back and thinking more widely”. His job was to “connect the dots” between what scientists can do and what



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the business needs, as well as to ensure that those in traditional actuarial roles embraced new developments, recognising that actuaries operate where insurance problems meet statistical and mathematical developments. “You could argue that actuaries were the first data scientists, but now they need to get ahead of the curve again,” he says. He believes that, in a fast-changing world, actuaries cannot stand still – so it is vital that new subjects such as the IFOA Certificate in Data Science are included on the syllabus.

Similarly, Hales says, actuaries need to get out of their comfort zone on climate change issues, which will affect our business on all levels: risk, investments, product and service opportunities. Should it be the next thing added to the syllabus?

Direction as CEO

I ask Hales about the course he will be steering as CEO of Bermuda Resolution Re. Building on his experience, the intention is to build a 21st-century reinsurer with a strong technology base, making appropriate use of developments in data science to automate mundane tasks and enable actuaries to focus on analysis and explaining insights. This could potentially include distributed ledger-style solutions, which can provide a fast and accurate record of data that has been shared with cedants. Reinsurers necessarily exchange a lot of data and it is important to make the most of available technology to speed up checks and processing time, as well as build a suitable platform to allow machine learning techniques to mine the data for emerging trends.

What is so attractive about the Bermudian operating environment? “Regulations need to ensure solvency in the sector so that customers can trust their insurer to be there for them when things go wrong, while also attracting fresh capital to allow the sector to grow. All of this in an environment of negative interest rates, accelerating technological advances and changing customer dynamics, both in terms of behaviours and demographics.

“Any system is going to be a compromise. My feeling is that the Solvency II principles are about right, but the level playing field principles have been implemented locally in different ways. Each regulator has its own concern and approach. This makes it difficult to speak about a ‘European market’ and limits what can be done at scale. And the treatment of sovereign debt distorts views on asset liability management, but does show the importance of the sector to the ongoing management of European economies.”

“No matter how much we talk about technology, algorithms, interest rates and solvency rules, it all comes down to people”

The advantages of the Bermudian regulatory regime lie in its pragmatism, with links to both the European and US regimes; this allows for consolidation of balance sheets without requiring restatement. Hales’s ambition is to build a technology-powered reinsurer that is able to reinsure life legacy books in mature markets across the world.

A changing political landscape

Finally, I ask Hales about the challenges posed by the changing political landscape – specifically Brexit. He is pragmatic about the outlook: “However it turns out, I would expect Brexit to complicate things when it comes to dealings between the UK and Europe; it’s just a question of how and by how much. At a professional level it does not cause too many complications, as we are not reinsuring between the UK and EU. At a personal level, I guess it will make it more difficult if we decide at some point to move back to Europe, or if the children want to work or study in Europe. But let’s see what happens before we make any judgments. As long as I can eat jamón ibérico and drink prosecco, the rest is manageable.”



ENDGAME EVOLUTION

By **Frankie Borrell**, head of client solutions, Pension Risk Transfer at Legal & General.

Endgame planning will likely come into sharper focus for many defined benefit (DB) pension scheme trustees this year, driven by improving funding levels and The Pensions Regulator's planned consultations on a clearer framework for setting a long-term funding target (LTFT).

Indeed, the regulator's 2019 annual funding statement states that trustees and their corporate sponsors should not only agree a LTFT but also be prepared to evidence that their short-term investment and funding strategies are aligned with it.

For any given DB pension scheme, the journey to the LTFT or even the LTFT itself will depend on many factors. The strength of the employer covenant, scheme funding level and maturity are key factors.

As the regulatory landscape evolves, so have the de-risking tools and solutions available to trustees, to help them better secure and protect their members' benefits. Both established providers and new entrants are rising to the challenge of providing greater access and choice for the £1.9 trn of DB pension liabilities remaining in the UK.

The buyout market: From strength to strength

The transfer of all or part of a pension scheme's liabilities to an insurer has been a tried and tested staple of the endgame management toolkit for more than 30 years. Recent demand has been unprecedented, with ever more trustees attracted to the security that a bulk annuity delivers.

Insurers have increased their capacity significantly. Across 2019, it's estimated that more than £40bn of liabilities were entrusted to UK insurers via the use of buy-ins or buyouts¹. This is a staggering 325% increase on the volume just two years prior. Employee benefit consultants and other advisors who work with pension schemes on buy-ins and buyouts estimate that this level of demand will continue for at least the next ten years.

Investment and governance solutions

From an investment perspective, de-risking has evolved from hedging interest rate and inflation risk to the use of holistic, cashflow-matched investment strategies. This refined approach to managing risk involves aligning income and principal receipts to meet cash outgo. Historically associated with insurers, we've seen adoption of this low-risk approach among cashflow-negative pension schemes nearly double from 2018 into 2019².

Solutions aimed at enhancing governance frameworks appear to be a further natural by-product of the growing need for a joined-up approach to managing pension related risks. Nearly one in five pension schemes have now adopted a fiduciary management framework for their investments³. We have also observed the advent of more efficient multi-employer occupational schemes, known as DB master trusts, and professional trustees.

Insurance-led innovation

Keen to widen their remit, insurers have shown themselves open to innovation: one example is an Assured Payment Policy (APP), which allows a pension scheme to lock down investment risk by providing protection against changes in asset yields, interest rates and inflation.

APPs and the more established use of longevity insurance contracts effectively mean that a pension scheme can be more selective in the choice and timing of the risks to insure along its journey. The AIB Group UK Pension Scheme was the first to make use of an APP in its de-risking journey, completing a transaction with Legal & General at the end of last year.

The elephant in the room: Sponsor insolvency

Of course, even the best run pension scheme, with effective de-risking solutions in place, can find itself in an unenviable place upon the insolvency of its sponsor: a PPF+ buyout, or entry into the PPF.

The recent debate around pension consolidation vehicles – such as Clara Pensions or the Pensions Superfund – has focused on the challenge of making risk transfer more accessible. This challenge is particularly pertinent for a pension scheme which cannot yet afford a buyout and where there is a weak sponsor covenant, meaning that the risks associated with achieving and then maintaining the LTFT are too high.

Insured Self-Sufficiency (ISS) is another example of a new combined investment and insurance de-risking solution that can also protect against sponsor insolvency risk. The main contrast between ISS and the consolidator options is that ISS enhances, rather than replaces, the sponsor covenant. The two central building blocks include a low-risk, cashflow-matched investment strategy and insurance in the form of a capital buffer to protect against adverse asset or liability experience.

Looking ahead

The endgame debate is set to continue as we see commercial consolidators, insurers, investment managers and consultants develop and refine solutions. There is more choice than ever before, and if a greater number of DB members receive their benefit promises in full as a result, then this focus should be welcomed as great news for the pensions industry.

¹ Hymans Robertson (2020), *Risk Transfer Report 2020*

² Mercer (2019), *European Asset Allocation Survey 2019*

³ KPMG (2019), *2019 UK Fiduciary Management Survey*

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The ethical use of artificial intelligence will rely upon the workings of that technology becoming more transparent, says **Joel Walmsley**

CRYSTAL CLEAR

The last few years have seen a number of calls for ‘transparency’ around the workings of the latest artificial intelligence systems. In 2019, the European Commission’s High-Level Expert Group on AI published a report, *Guidelines for Trustworthy AI* (bit.ly/2O184Am), that proposes transparency as a central ethical and legal requirement, while the EU’s General Data Protection Regulation (GDPR) guidelines stipulate that when a person is subject to an automated decision, they have the right to an explanation of

the judgment, as well as the right to challenge it: no more hiding behind ‘computer says no’. Why is transparency suddenly a concern, though? Is it achievable? And if not, what alternatives are available?

Machine learning

It’s useful to contrast contemporary machine learning systems with classical programming and what the philosopher John Haugeland called ‘good old-fashioned AI’. In the latter, humans write the programs and provide the input data, and the computer applies the programs to the data to come up with the output (whether that’s a chess move, the next line of a conversation, or a medical diagnosis). Machine learning turns this on its head: humans still provide the data (which may or may not be labelled or otherwise curated) but the computer itself comes up with a set of rules that describe patterns and correlations within that data set (often with the goal of using those rules to make predictions or recommendations about future data points). The ‘learning’ takes place because the algorithm can gradually modify its own rules as more data is acquired; the result is that human developers can quickly lose track of how the system actually works.

It just so happens that this revolution in machine learning has coincided with the rise of ‘big data’. Not only is hardware now fast and powerful enough to process vast quantities of information, but humans are also increasingly willing to provide it for free. Hundreds of millions of tweets, likes, shares and search queries are generated

daily, all containing details about users, their connections and their preferences; these interactions provide a rich training set for machine learning systems. It’s no accident that we now have a cottage industry of AI experts and tech insiders giving TED talks and writing op-eds alluding to alchemy, sorcery and other arcane secrets. Arthur C Clarke famously quipped that “any sufficiently advanced technology is indistinguishable from magic”, and it certainly looks that way when the speed and power of modern AI systems far outstrips that of human cognition.

Calls for transparency aren’t just about understanding, though. They acquire an ethical dimension because AI systems are

“AI systems are increasingly used to make decisions and recommendations in socially significant and morally weighty contexts”

increasingly used to make decisions and recommendations in socially significant and morally weighty contexts, such as whether you qualify for a loan – or for parole. And yet, during the past few years, we have seen a steady stream of occurrences in which, because machine learning systems are trained on data that literally encodes the various biases and prejudices of society at large, the outputs of such AI systems have automated and reinforced these problems.

These include accusations of sexism and gender bias in Google Translate and Amazon’s automated CV-scanning recruitment tool, and the allegation that the COMPAS system – routinely used in several US states and designed to predict the risk of criminal recidivism – is inaccurate in a way that is systematically racist.

What does transparency look like?

In response to problems such as these, calls for transparency have taken a number of forms. Some concern the relationship between the AI system and its users, developers and the media. For example, European Commission guidelines recommend that:

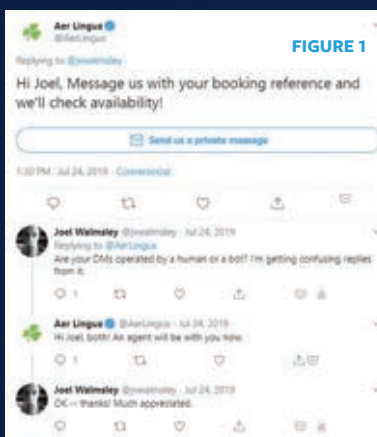
- We should be more upfront about the motivations for developing AI systems, their intended purposes and the rationale for deploying them in various contexts – asking ourselves ‘Why is an AI system being used in this situation?’
- We should be honest about what an AI system can actually do, and avoid the hype and over-zealous marketing that surrounds the



announcement of a new breakthrough and its coverage in the media.

- As AI systems get better at mimicking humans, and companies use them to automate frontline user-facing services, users should have the right to be informed that they are interacting with an AI system rather than a human (see *Figure 1*, depicting a recent interaction with Aer Lingus, in which the conversation does become transparent in this sense...eventually).

These kinds of transparency are easy to achieve with good old-fashioned honesty about the development, use and deployment of AI systems. Transparency about the ‘inner workings’ of an AI system is much more challenging. As mentioned, GDPR regulations stipulate that people have the right to an explanation of automated judgments made about them, and the EC guidelines recommend that particular AI decisions and general underlying algorithms should be transparent and traceable for the purposes of audit. However, because of the automatic nature of machine learning systems and their sheer complexity, this is not always possible. What alternatives are there?



One option is ‘contestability’ – even if we don’t know exactly why an AI system made a particular decision or recommendation, we should have the right to challenge it if it is erroneous, unfair or unjust. Machine learning does have the technical capacity to include user feedback to improve performance (you may have seen this with Spotify’s ‘radio’ function, which learns your preferences faster when you tell it what you don’t like). So-called ‘reinforcement learning’ – a bit like training an animal with a carrot and/or stick – allows the program to use contested decisions, or reported errors, to make minor self-modifications in order to tweak or improve its performance. In order to build AI that’s trustworthy even in situations where we can’t fully understand exactly how a program works, we will need legal and procedural regulation so that users have something like a right of reply, or the due-process of cross examination for (AI) ‘witnesses’.

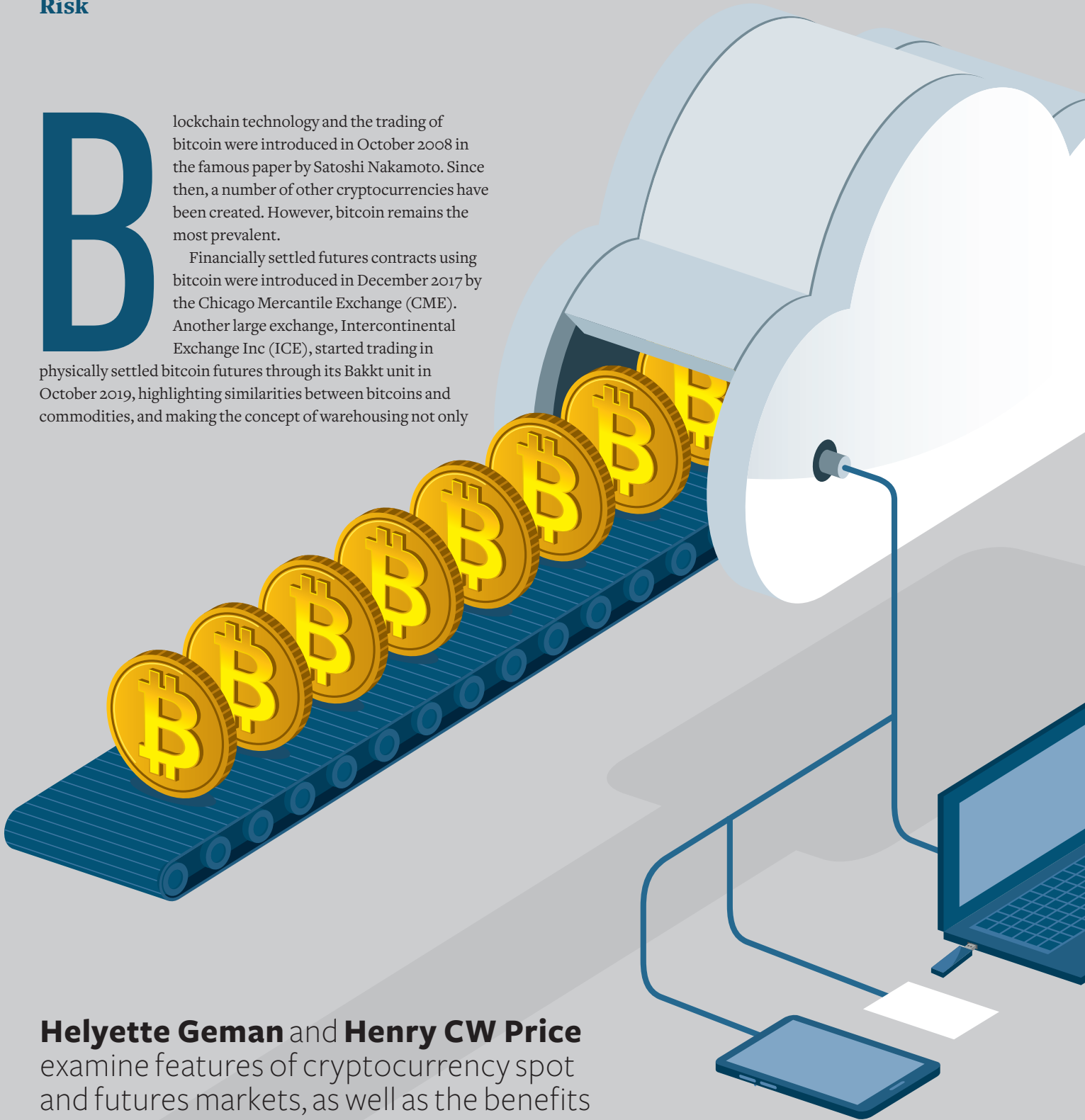
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Blockchain technology and the trading of bitcoin were introduced in October 2008 in the famous paper by Satoshi Nakamoto. Since then, a number of other cryptocurrencies have been created. However, bitcoin remains the most prevalent.

Financially settled futures contracts using bitcoin were introduced in December 2017 by the Chicago Mercantile Exchange (CME). Another large exchange, Intercontinental Exchange Inc (ICE), started trading in physically settled bitcoin futures through its Bakkt unit in October 2019, highlighting similarities between bitcoins and commodities, and making the concept of warehousing not only



Helyette Geman and **Henry CW Price** examine features of cryptocurrency spot and futures markets, as well as the benefits of storage devices and ‘physical’ bitcoin

IN THE VAULTS

relevant but critical. This, in turn, triggered a large number of offers for storage insurance by companies like Lloyd's, Aon, ING and other large insurers.

In this article, we present some features of cryptocurrency spot and futures markets and explain why storage devices ensure the existence of a convenience yield introduced by Working (1949) in the Theory of Storage. Then, we discuss the insurance contracts recently proposed. Finally, we infer from the spot-forward relationship the specific 'benefit' component priced by the market for having physical (versus financial) bitcoins readily available.

Some properties of bitcoin spot prices

Nakamoto's paper described "a fully peer-to-peer electronic cash system". Bitcoin trading requires a blockchain, which is a secured platform and a ledger, and is currently developed for a variety of applications unrelated to the trading of cryptocurrencies. The total market capitalisation of all cryptocurrencies was US\$828bn in January 2018 (just after two exchanges launched futures), US\$200bn in August 2018 and US\$272bn in September 2019; approximately 68% of the total cryptocurrency market cap was bitcoin at the time of writing.

The price trajectory of bitcoin in *Figure 1* shows the remarkable rise driven by enthusiastic investors during 2017. From December 2017, bearish traders were finally able to express their sentiment by taking short positions in future contracts. A cautious comparison can be made with gold, which experienced a 50% drop over two years after futures were introduced on the COMEX (the Commodity Exchange, now part of the CME) in December 1974, the highest value reached by the ounce of gold being the day before gold futures started trading (see Hale et al., 2018).

Many authors discuss the virtues of bitcoin as an investment asset. To our knowledge, this is the first paper which analyses the relationship between bitcoin spot and futures prices, and infers an ownership yield from the convenience yield and cost of insurance for the custody of bitcoins currently offered by large financial institutions; conversely, estimating the ownership yield in bitcoins through other criteria would provide insurance companies with a reference quantity for the cost of insurance they are proposing. Note that the introduction of physical delivery of the futures traded on ICE makes the discussion of warehousing central, and in turn the insurance offer. Along the same line of arguments, options that the CME introduced on bitcoins in January 2020 will probably give a physical settlement as a choice at some point in time.

Futures on bitcoin

The first futures contracts were launched by the CME in December 2017. They have a financial settlement in dollars at maturity, like the S&P 500 Futures contracts but unlike the 'physical' delivery which prevails for crude oil and most commodities. Each CME contract consists of five bitcoins and is settled against an index called Bitcoin Reference Rate (BRR), which is an average of spot prices quoted by different exchanges. CME futures are subject to the regulatory oversight of the Commodity Futures Trading Commission (CFTC), and are protected from counterparty risk by the Clearing House of the Exchange – a desirable feature since more than 36 cryptocurrency trading venues had closed by the end of December 2018.

As of their launch in December 2017, the CME bitcoin futures have required an initial margin of 37% of the previous day's settlement price. Moreover, these margins change daily (called 'floating margins'), a feature which, like the size of the margins (compared to, say, 3% for crude oil futures), reflects the unique bitcoin price volatility.

Coin wallets and cold storage

Cryptocurrencies have taken a further step in the direction of commodities with the emergence of 'cold storage', which is the opposite of 'hot storage'. Hot storage is essentially internet-based storage; cold storage means storing the crypto private keys in an

offline environment in order to avoid the online vulnerability to hacking. The most popular cold storage options are: a) a paper wallet that contains a pair of private/public keys printed on a piece of paper, with keys generated offline securely; b) a hardware wallet, which is an electronic device, but the most robust cold storage choice for cryptos; and c) a USB drive, a very simple cold wallet, which carries the risk that anyone with access to the USB can access the cryptocurrency.

In contrast to dollar-settled futures from CME, Bakkt/ICE Futures are settled with

physical delivery of bitcoin. Trade started in November 2019, after Bakkt was cleared by the New York Department of Financial Services to serve as a qualified custodian for customer bitcoin funds. ICE had declared that Bakkt Warehouse would use biometrically controlled

“Cryptocurrencies have taken a further step in the direction of commodities with the emergence of ‘cold storage’ – storing private keys in an offline environment”

FIGURE 1: Price trajectory of bitcoin – April 2017 to December 2019



bank-grade vaults and enterprise-grade hardware security modules to ensure both safekeeping and availability of customer funds. The cold storage warehouse is covered by a US\$125m insurance policy underwritten by a leading global syndicate of insurers.

In contrast, insurers rarely cover hot storage risks, because of the dangers of hacking. In the case of ‘offline’ cold storage, insurance policies can be by incident or total value and explicitly exclude hacking.

Bitcoins as commodities: Convenience yield and ownership yield

We observe that bitcoin has been regulated since 2015 in the US by the CFTC, and that the CFTC chairman declared in September 2019 that Ethereum, an alternative to bitcoin, was also a commodity. We argue that holding physical bitcoin presents a benefit because of frictions in the purchase of spot bitcoin, hence a convenience yield deserves to be extended to bitcoin. This would be similar to the one introduced for commodities in the founding papers of Working (1949) and Brennan (1958) to represent the virtue of owning a physical commodity rather than a derivative/financial contract written on it. Geman and Vasicek (1999) discuss the crucial issue of storability in the valuation of commodity futures. The recent insurance contracts offered at the end of 2019 to the institutions proposing warehousing to their customers is further evidence of the storability of bitcoin.

We denote this convenience yield y (defined as benefit minus storage cost) and write the spot-forward relationship for cryptocurrencies as

$$f(t, T) = S(t)e^{(r-y)(T-t)}$$

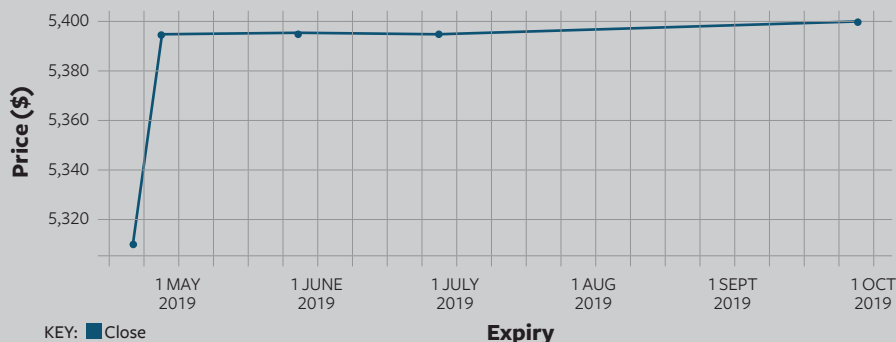
where $f(t, T)$ denotes the price at date t of the future contract maturing at date T , $S(t)$ is the spot price of the crypto, r is the short term rate and y is the convenience yield. Both r and y are assumed constant over the period (t, T) . It is important to highlight that this relationship also holds for currencies and equities. It has the beautiful property of being independent of the choice of any stochastic process representing the spot price (see Geman, 2005).

Lastly, under constant interest rates (an acceptable assumption since maturity T is typically within a year) the forward price $f(t, T)$ and the future price $F(t, T)$ of the same maturity are equal. Both spot and future price data is available from a suitable exchange.

Take as an example the forward curve observed on 22 April 2019 (Figure 2) when the spot was US\$5,310. It was increasing, indicating that the investors were optimistic, possibly because it was the time when Libra, the cryptocurrency proposed by Facebook, was first discussed.

From the spot-forward relationship written for the maturity $T = 30$ September 2019, we have that $T - t = 5/12$, and we derive from $f(t, T) = \$5,400$ that $r - y = 0.68\%$, hence $y = 1.32\%$ for a short term rate $r = 2\%$.

FIGURE 2: CME forward curve on 22 April 2019



The cost of insuring bitcoin storage currently quoted by Coinbase, the largest bitcoin warehousing provider with US\$7bn worth of bitcoins in custody, is $c = 50$ basis points or 0.5% ; remembering that y is the convenience yield net of storage cost $y = b - c$, we obtain that the pure benefit b perceived by the market in the ownership of a physical bitcoin is of the order of 1.82% per bitcoin per year.

After futures contracts, options on bitcoins are obviously the next class of derivatives to be analysed. We know from commodities that the Merton (1973) formula would easily provide the price as long as the crucial quantity $(r - y)$ deservedly discussed above is identified. The transparency in option prices that will prevail after the introduction of options by the CME in January 2020 will let us know whether the other assumptions of the Black-Scholes-Merton model, in particular the one constant volatility for the spot, will be validated by the market. In all cases, the deep understanding of the futures prices (a challenging exercise) is a necessary step to option pricing, in particular in the case of complex underlyings as explained by Taleb (1998).

Conclusion

We investigated in this paper a number of bitcoin properties, in particular the storability and convenience yield, which allows us to write the spot-forward relationship, a fundamental (see Geman, 2005) tool in all traditional asset classes such as equities, currencies and commodities, and crucial in the valuation of options on bitcoin. We discussed the insurance contracts recently proposed by Lloyd's, Aon and ING on bitcoin custody and computed in the specific example of a CME forward curve observed in April 2019 – the benefit or ownership yield (net of storage cost) priced by the market.

For a list of references, please see the online version of this article appearing on The Actuary website – bit.ly/2SXIHRU



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SWIMming lessons

Silvana Pesenti, Alberto Bettini, Pietro Millosovich and **Andreas Tsanakas** present their alternative approach to sensitivity analysis



As insurance businesses have become increasingly complex, so have the quantitative models used to describe them. Sensitivity analysis encompasses an array of techniques for generating insights into models, stressing assumptions and determining what the key model inputs are.

Such analyses, while crucial for model validation, can be computationally demanding. For simulation models like those used in capital modelling, sensitivity analysis entails generating repeated sets of simulations – a process that can be frustratingly time consuming. Moreover, a robust way of interpreting the results of sensitivity analyses is sometimes lacking. Consequently, the fruits of modellers' labours may end up languishing in an appendix, rather than generating value for their organisations.

We present an alternative approach to sensitivity analysis called Scenario Weights for Importance Measurement (SWIM), based on our academic research ('Reverse sensitivity testing: What does it take to break the model?' – available at bit.ly/2RZppuU). SWIM is implemented as a package in the R language and is freely available from the CRAN repository. SWIM quantifies the impact of distorting a random variable in the model (such as a risk driver) on other variables of interest (such as line-of-business losses, portfolio profit and loss). A benefit of our approach is that it works on a single set of simulated scenarios; no further simulations are needed, cutting the need for costly repeated evaluations of the model.

In particular, SWIM is well suited for reverse stress testing. Furthermore, SWIM provides visualisations and metrics that help generate insight from sensitivity tests.

An introductory example

Before getting into how SWIM works, we provide a simple illustration based on a credit risk example. The model represents a loan portfolio with systematic and idiosyncratic risk, consisting of three correlated sub-portfolios. The portfolio loss is represented by L , such that $L = L_1 + L_2 + L_3$, where L_1, L_2, L_3 are sub-portfolio losses (for example, in thousands of £). We have 100,000 simulations from the model, available as an example data set in the SWIM package. Summary statistics for the losses are given in *Table 1*.

TABLE 1: Summary statistics	L	L_1	L_2	L_3
Mean	1,104	20	454	629
Standard deviation	527	28	311	320
Skewness	0.94	2.1	1.3	0.95
Excess kurtosis	1.33	6.2	2.5	1.26
25th percentile	719	0	225	395
50th percentile	1,021	0	384	580
75th percentile	1,399	20	609	810

Now, we introduce a stress to our baseline model in order to quantify how changes in assumptions impact the portfolio. Specifically, we require that the mean of L_2 , the second sub-portfolio, is increased by 20%, from 454 to 545.

Subsequently, using SWIM we can evaluate the impact of this change on the distribution of the portfolio loss. *Figure 1* shows samples of the

FIGURE 1: Correlation between sub-portfolio loss L_2 and portfolio loss L

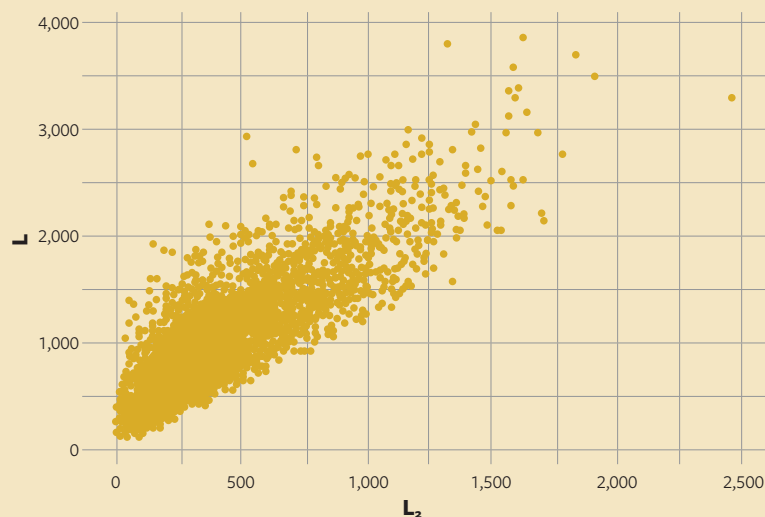
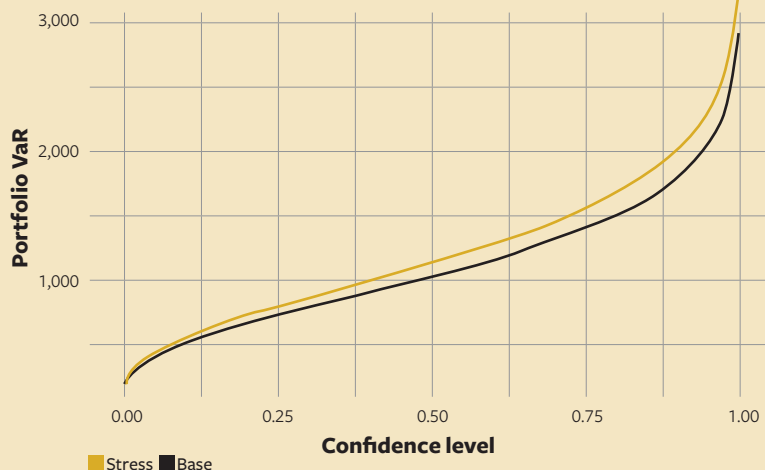


FIGURE 2: Impact of stressing sub-portfolio L_2 on portfolio loss L



portfolio loss L against the sub-portfolio L_2 . The high positive dependence is apparent, indicating that the stress would be impactful at portfolio level. This is confirmed by *Figure 2*, where the values at risk (VaR) for L are shown for the baseline and stressed models.

How does SWIM work?

How can distributions be changed without re-running the simulation model? The SWIM methodology can be summarised as follows.

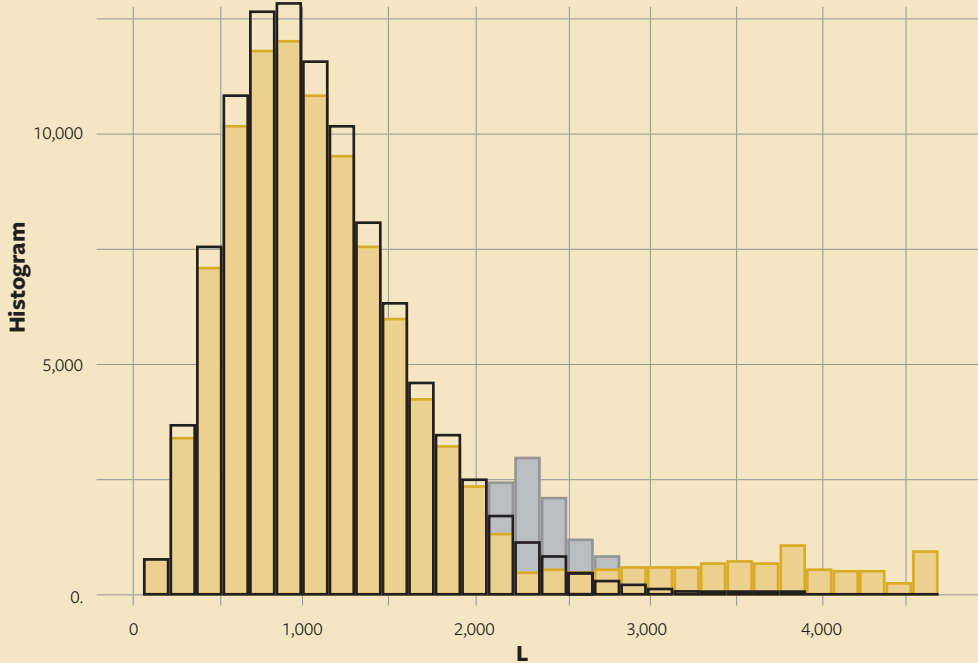
The starting point is a table of simulated scenarios, each column containing outcomes of a different random variable. This table forms

the dataset on which SWIM bases its calculations.

A stress defines a particular modification of one or more variables. This can be a change in means and standard deviations of risk factors, in the probabilities of specific events (such as net asset value lower than a critical level), or of portfolio risk measures, such as VaR or tail value at risk (TVaR). SWIM implements these options directly and offers the possibility of designing customised stresses.

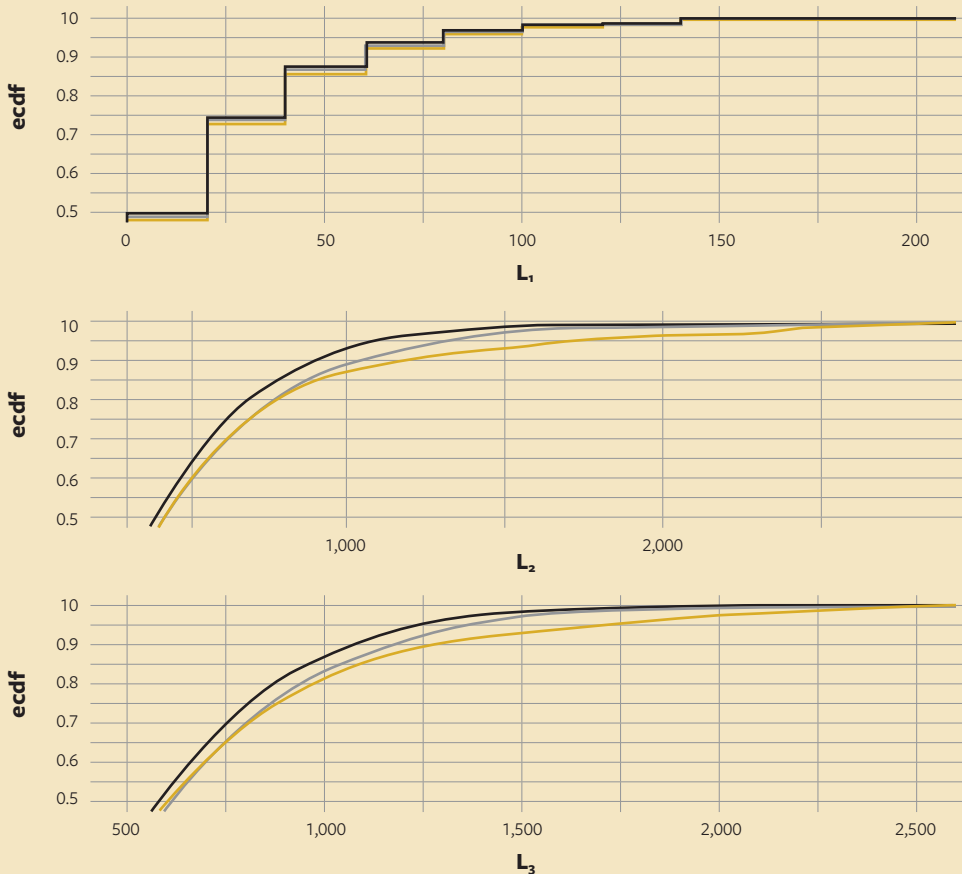
Then, SWIM calculates a set of scenario weights, acting upon the simulated scenarios. Scenario weights are derived such that the

FIGURE 3: Impact of reverse stress tests on portfolio loss



KEY FOR FIGURES 3 AND 4: ■ Stress 1 ■ Stress 2 ■ Base

FIGURE 4: Impact of reverse stress tests on sub-portfolios



defined stress is fulfilled while keeping distortion to the baseline model to a minimum (as measured by relative entropy). This captures the essence of the SWIM approach: rather than simulating new scenarios, the probabilities of already existing scenarios are modified, impacting the distribution of all variables in the model.

Finally, with the calculated scenario weights, the impact of the stress on all model components is worked out. SWIM carries out these calculations, providing and plotting distributions and key metrics (such as VaR and TVaR) for any variable of interest.

The SWIM approach works whatever the model structure may be, including the case of non-linear aggregations – there is actually no need for the portfolio structure to be explicitly known to the user. The only limitation is that the existing scenario set contains situations relevant to the stresses applied (for example, one cannot ask for the mean of a variable to be higher than the observed maximum simulation).

Reverse stress testing

Let us now consider a reverse stress test. We study the effect that changing (the tail of) the aggregate portfolio loss has on the three sub-portfolios. In this way, we seek to assess their comparative importance. In the language of Solvency II internal models, such a stress corresponds to the question: what would the likely SCR for individual sub-portfolios be if the total SCR were to increase by, say, 20%? (Of course, one can also ask the alternative question: which sub-portfolios could drive a reduction in the total SRC?) Questions such as this can be answered with SWIM, which works out likely changes in the distributions of all variables, along with the change in the total loss distribution.

In our current example, we carry out two stresses: first, a 20% increase on the portfolio VaR at level 90% ('stress 1'); second, a 20% increase in the VaR and a 50% increase in TVaR, at the same confidence level ('stress 2'). *Figure 3* displays the histogram of the portfolio loss under the baseline and the two stressed models. It is seen how stressing VaR and TVaR has a higher impact on the right tail of L, compared to stressing VaR only. This is consistent with the tail-sensitive nature of TVaR.

Next, we analyse the impact that stressing the aggregate loss has on the sub-portfolios L_1 , L_2 and L_3 by plotting their cumulative distribution functions (cdfs) in *Figure 4*. All stressed cdfs are below the corresponding baseline ones, indicating an increase in probability of high losses. It is seen that the stresses have no substantial impact on L_1 , while L_2 and L_3 are more affected, indicating a higher sensitivity to those two variables.

Sensitivity measures

It is helpful to have a numerical measure of comparative sensitivity of sub-portfolios, so as not to rely on visual tools only – this is particularly important when considering large models with many variables of interest. SWIM implements various sensitivity

“The SWIM approach works whatever the model structure may be, including the case of non-linear aggregations”

A RANGE OF APPLICATIONS

SWIM is a free and powerful tool for sensitivity analysis, which can be used to analyse the simulation output of models used by insurers. It offers both standard choices for stressing models and the ability to design custom stresses and sensitivity measures. Further examples and details about SWIM are provided in our R vignette ‘Scenario Weights for Importance Measurement (SWIM) – an R package for sensitivity analysis’ (bit.ly/2RDkxhf).

We can see a wide range of practical applications in insurance. Whenever insurers generate simulations from multivariate risk factors and corresponding losses, users could feed these as inputs into SWIM and ask questions such as:

What would happen to the total SCR if the mean and/or volatility of a risk driver (such as longevity risk or natural catastrophe loss) was increased by 20%? If the total SCR became 30% larger due to growth of part of the business, what would the likely SCR be for, say, credit risk? What would the impact on SCR be if joint extremes of risk factors occurred more frequently than the model currently predicts?

SWIM can provide answers to these questions in a consistent and numerically efficient way, generating insight into the dynamics of the business, as well as into the model itself, as part of a streamlined validation process.

We look forward to collaborating with insurance practitioners in order to explore the potential of SWIM and help address some of the challenges faced by actuaries and insurance organisations.

metrics. Here we focus on the ‘Gamma’ measure, which we introduced and applied to a London market portfolio (bit.ly/2RZppuU). That measure calculates the normalised change in the mean of variables, under the applied stresses. Given the flexibility offered by SWIM, it is not hard to generate variants of that metric, for example to measure the impact of stresses on the tails, rather than the means, of distributions.

The values of the Gamma sensitivity measure are reported in *Table 2*. Consistently with what the distribution plots of *Figure 4* showed, L_2 emerges as the most important sub-portfolio, followed by L_3 and L_1 , when the portfolio VaR and TVaR are stressed.

We now carry out an additional piece of analysis, as an example of a

TABLE 2: Sensitivity metrics	L_1	L_2	L_3
Stress 1 (VaR)	0.15	0.82	0.77
Stress 2 (VaR and TVaR)	0.11	0.74	0.64
Stress 3 (VaR with fixed driver)	0.01	0.02	0.37

more complex customised stress. We suspect that the high importance of L_2 is specifically due to the impact of a risk driver, representing random default probabilities for a set of loans. We now repeat the stress on the portfolio VaR, but this time fix the mean and 75th percentile of the risk driver to its baseline values ('stress 3'). This means that, while the portfolio loss is stressed, the impact of this stress on L_2 via the risk driver is limited. It is seen in *Table 2* that this stress test drastically reduces the sensitivity of L_2 , thereby demonstrating the risk driver's importance.



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Strict data regulations may hinder the role of AI and data analytics in bringing innovative insurance products to the European market, warns **Frank Schiller**

The wealth of data held by insurers is a treasure trove. Technologies such as AI and data analytics are enabling the industry to create a world of products that can adapt more individually and more quickly to customers' needs than ever before. Strict data protection requirements

still give life assurers in Europe a certain market advantage – but for how long?

Daniel Schreiber, CEO of Lemonade, had a provocative message for the insurance sector in 2018: “The next insurance leaders

will use bots not brokers, and AI not actuaries.” Some other sectors are already on the home straight in this journey. Airbnb makes exclusive use of a digital interface to arrange customers' accommodation, and Uber has completely revolutionised taxi booking services via comprehensive digitalisation, automation and the involvement of a wide community. The use of big data and AI has not only provided a new, more attractive customer interface – it has also completely revolutionised products themselves. What would the consequence be if we were to apply these concepts to life insurance? In view of the strict regulation of the insurance sector in Europe, is this even possible?

China leads the way

With Ant Financial as the product provider, Chinese conglomerate Alibaba launched a revolutionary product in autumn 2018, covering specified services for around 100 critical illnesses. When the contract is concluded, a simplified risk assessment, based on Alibaba's Sesame Credit point system and a general age differentiation, is carried out; there is no medical risk assessment. Sales and claim assessments are handled online and, if required, other Alibaba customers are involved to help identify fraud. The premium is not guaranteed in advance; instead, the actual claim payments incurred across the board are charged to all customers in equal fortnightly instalments.

The product itself has been kept very lean. Policy issue and the operation of the policy are linked to existing processes at Alibaba and are digital. Claim assessments are carried out digitally by a small team, with the help of the community where required. Everything is done digitally, implementing large elements of Schreiber's vision.

After just nine days, 10m customers had bought the product. After six months, the figure was more than 65m, around 10% of Alibaba's customer base. Of these customers, 62.5% had never before considered buying a comparable product.

The product's formula for success is its combination of simplicity and transparency. Every customer with at least 650 Sesame Credit points can buy it. Ongoing contributions depend solely on claims paid out. Even these are transparent, and each individual has a certain amount of influence.

The second pillar of success is Alibaba's excellent market penetration. This is the only reason the company was able to launch this experiment and adapt the product over time to make it even more successful.

Ultimately, the large number of customers and high evaluation frequency (24 times per year) enable the product to be improved continuously based on sound data. As a result, it is optimally aligned with short-term customer requirements and the economic situation.

Transferring the concept to Europe

For companies in Europe, there are several requirements and problems to be addressed when transferring these solutions.

Supervisory requirements

The European Insurance and Occupational Pensions Authority (EIOPA) has clearly expressed its expectations regarding products based on big data. Earlier in 2019, EIOPA chairman Gabriel Bernardino said: “Insurers have to adapt their governance frameworks to address the challenges posed by these new technologies, in particular issues with the fairness of the use of big data analytics and the accuracy and explainability of ‘black-box’ algorithms.”

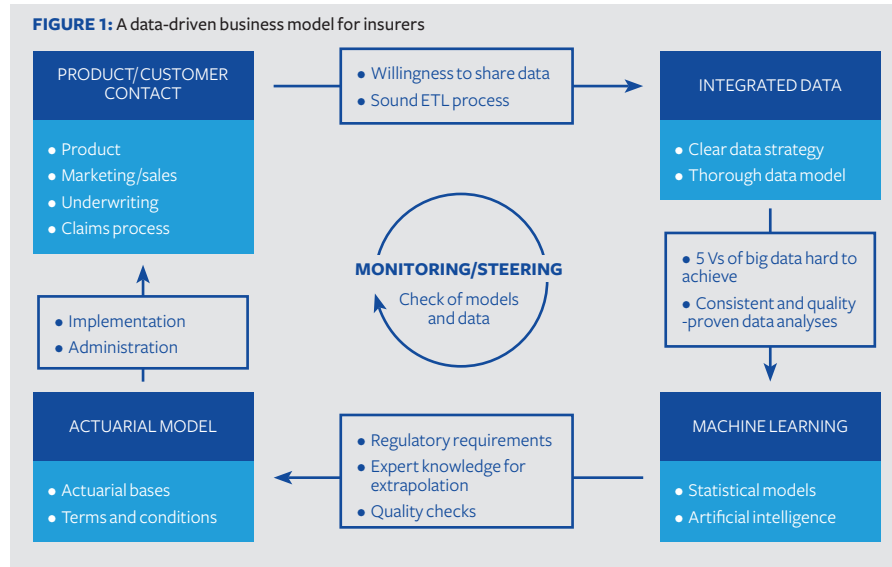
In terms of processes, the supervisory authorities are clear that responsibility for the results of processes based on big data and AI cannot be assigned to machines. When insurers are designing (partially) automated processes, it is important that they guarantee these processes are grounded in an effective, appropriate and proper business organisation.

In addition, the aim of supervisory authorities is to keep financial services access open to as many people as possible. Consumers of AI and data analytics applications present a number of regulatory issues for insurers. If there is an entry threshold (such as the Sesame Credit points), it must involve no implicit illegal discrimination based on, for example, gender or origin; therefore, a threshold value cannot be derived purely using algorithms based on the available data. It is necessary for the results to be verified and corrected by experts – in insurance, typically actuaries.

Special protection for health-related data

Compared to China, there are significant restrictions on data processing in the life and health insurance sector in Europe. According to the EU’s General Data Protection Regulation, processing of personal and health-related data requires the highest level of protection. Within a company, personal and medical data can only be evaluated on a need-to-know basis and when the customer has consented to processing of the data. It is prohibited to pass the data to third parties.

“The use of big data and AI has not only provided a new, more attractive customer interface – it has also completely revolutionised products themselves”



Data volume and evaluation frequency

Some features of life insurance make it unsuitable for the use of big data, at least in the short term. In terms of the key dimensions of big data, these are:

Volume: The data volume should be huge – but the number of death or critical illness claims tends to be just

a few hundred per year

Velocity: It should be possible to generate and process the data quickly – but in insurance the frequency tends to be annual

Variety: The data should be very heterogeneous to enable robust

predictions to be made – but insurance frequently has very narrowly defined target groups

Veracity: The data quality should be good – but insurers frequently have to battle with legacy systems for their data

Value: Ultimately, the product has to be an economic success.

Actuaries will play a major role in a data-driven business model for insurers. They will be needed in particular for the pooling, extrapolation and checking of data, assumptions and models, as well as interpretation of the results (see *Figure 1*).

Missed chances

For life insurance in Europe, regulation is both a support and an additional burden. It is difficult for providers such as Amazon – the Western equivalent of Alibaba – to develop and market insurance solutions directly through established sales channels and using their superior technical methods in the European regulatory environment. The regulatory requirements in data protection and the additional business organisation necessary make it unattractive for them to become directly active in the European life insurance market.

As a result, some life insurers feel protected, invest little in their own digital developments and show minimal interest in experiments. They are missing out on the chance to become purely digital players and transform into agile companies that quickly adapt to customer needs and the economic environment.

Major tech companies such as Uber and Airbnb have set the example in their fields, but life insurance players will soon come up with a comparable market dynamic. Only agile insurers will then have sufficient resources and data – and the required expertise – to play an active role in this environment.



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**“Modern industrial
wind turbines do
not include any
measurement of flow
complexity – despite
each costing millions
of pounds”**

MACHINE LEARNING WITH LASER FOCUS

New laser wind measurement systems could help actuaries price risk wind-sensitive assets, say **Theodore Holtom** and **Anthony Brooms**

Wind energy technology is relevant to the international political objectives of the Paris Agreement, UN Sustainability Goals, the declared climate emergency, reduction of pollution, and UK green growth strategy. A number of insurance products are sensitive to wind. Wind measurements feed into the assessment of investment risk during project planning and development, while development and operational projects are subject to due diligence assessment during financial transactions, making reference to the site wind conditions and asset performance (actual or expected). Assets also need to be engineered appropriately for local wind conditions – during operation, wind turbines and some other assets, such as tall buildings and bridges, undergo engineering fatigue as a result of wind. Additionally, wind turbine suppliers may provide warranty and maintenance agreements that include performance-based bonuses or penalties based on availability to generate, or guarantees of electricity sales revenue. Knowledge of wind conditions, therefore, is of financial significance.

Wind farms tend to be built in windy locations, using cranes. Crane construction limitations also depend on wind, especially when conditions are gusty, stormy or turbulent. Risks increase with

a raised centre of mass; wind can cause a load to swing and rotate. Accidents cost money and reputations, as well as having a human cost – so complex wind flow is also important to the construction industry, especially when it is using cranes.

The UK is a world leader in offshore wind farm construction, where jack-up vessels or barges employ cranes in harsh offshore conditions. Cranes may be used in windy conditions such as port or harbour operations and high-rise construction. The urban environment can be particularly complex due to funnelling effects as wind flows through streets and avenues between high buildings. Crane construction and architecture, therefore, are subject to major wind influence.

Wind can be significant in other industries too, such as in aviation, where it affects runways and helipads. The history of insurance is interwoven with maritime shipping and storms, including wind.

Can better wind measurements be used:

- In planning, in order to reduce revenue risk?
- For improved operational control, in order to reduce asset maintenance lifetime risk?
- For safety alarms and automation, in order to reduce the risk of accidents?

Can we employ machine learning methods to capture complex relationships between advanced wind data and engineering loads for improved operational productivity?



FIGURE 1: Existing diverging beam designs (left) suffer disadvantages compared with the converging beam approach (right) both for ground-mounted or floating devices (above) and for forward-looking turbine-mounted devices (below).

	DIVERGING BEAM WIND LIDAR DESIGN WEAKNESSES		CONVERGING BEAM DESIGN ADVANTAGES AND UNIQUE SELLING POINT	
GROUND-MOUNTED/ FLOATING WIND LIDAR		<ul style="list-style-type: none"> • Combines velocity components from wrong points in space • Wrongly assumes uniform flow • Floating system suffers from sea motion • Fails in complex flow due to complex weather, complex terrain or wakes 		<ul style="list-style-type: none"> • Combines velocity components from correct measurement point • No assumption of uniform flow • Floating system uses sensor data to adjust beam steering and cancel sea motion • Succeeds in complex flow due to complex weather, complex terrain or wakes
TURBINE-MOUNTED FORWARD-LOOKING LIDAR		<ul style="list-style-type: none"> • Cannot measure point turbulence intensity • Wrongly assumes horizontal flow • Cannot map wind in 3D • Maybe diverging beam LIDAR can be improved upon 		<ul style="list-style-type: none"> • Can measure point turbulence intensity • Can also measure non-horizontal flow • Can map wind in 3D • The USP is 3D wind mapping which increases energy yield and wind farm lifetime, reduces O&M costs and investor risk

Measuring flow complexity

Research reveals that complex terrain and weather are sources of complex wind flow, but modern industrial wind turbines do not include any measurement of flow complexity – despite each costing millions of pounds. They measure only wind speed and direction within a horizontal plane, failing to account for the fact that wind velocity is a three-dimensional vector.

Although existing instrument measurements feed into operational control systems, these only provide measurements at a single point. This would be reasonable if the incident wind velocity field was constant across the whole rotor, but wind varies spatially.

Moreover, wind turbines are subject to substantial variation across their large rotor diameters, now greater than 200 metres.

When we observe a large tree in a breeze, we can see the dynamic and spatial variability of wind, pushing hard and from different directions – from side to side and from top to bottom. Since the aerodynamic forces of lift and drag generated along each wind turbine blade length depend on relative airspeed and angle of attack, the variability of the wind velocity field is

important to turbine performance, both for power generation and for loads within the structural components and foundation.

Only a beam scanning system of converging LIDAR beams can measure the three-dimensional wind velocity at a plurality of locations. This enables planar or volumetric wind field mapping that feeds into improved look-ahead pitch and yaw control.

“The variability of the wind velocity field is important to turbine performance, both for power generation and for loads within the structure”

The new laser wind measurement technology employs three converging beams instead of a diverging beam design, which suffers from a number of disadvantages (see Figure 1). Doppler LIDAR laser wind measurement works by measuring the Doppler shift of laser light reflected from microscopic particles carried by the wind. However, this only gives the wind velocity component along the laser line of sight. By employing three converging beams with different directional components gathered at the chosen measurement point, it is argued that the three-dimensional wind velocity is more accurate; by scanning from point to point, one may map the wind velocity vector field through space. This allows proper consideration of three-dimensional wind flow effects and variation of wind flow across large wind turbine rotor areas.

Seeing patterns

The use of this new ‘big data’ in machine learning systems could present us with great opportunities. Artificial intelligence such as neural networks are known to perform well at pattern recognition tasks. Given a training data set, a neural network can evolve its neural weighting factors in order to process

a large number of input data and thus correctly categorise the inputs by flagging an output signal.

For instance, photographs of cats and dogs may consist of an array of pixel data. The input data may be represented as a large vector of numbers and the output signal may simply be a number between zero and one, where an output closer to zero indicates ‘cat’ whereas



a number closer to one indicates 'dog'. The training data is provided as sets of photos paired with a zero or one confirming the category, and as more training data is fed to the neural network, its blind performance improves.

In the case of wind turbines, or indeed other structures such as cranes, the input data is simply the converging beam LIDAR-measured wind data representing samples of the wind flow vector field. The question in this case is not whether the inputs represent a cat or a dog but whether they are associated with increased loading in the wind turbine, crane or other structure. To gather training data, we also need to use load sensors, which measure the loads.

For example, wind turbines often employ vibration condition monitoring sensors on the rotating drive train. Wind turbine blades can be instrumented with strain sensors. The foundations, the tower and indeed any component may be instrumented with its own sensors. The same goes for components of a crane, which may include hook load sensors, strain sensors, cable tension sensors and other measurement devices. Any given sensor could represent a binary output analogous to categorising a cat or dog, but in this case the load sensor binary category might denote a high load sensor value, above an alarm or warning threshold.

A given set of wind conditions, including wind shear, non-horizontal inclination angle or generalised vector field time series data, may give rise to a whole set of outputs in a set of load sensors. Instead of a single binary cat-dog categorisation, the output may therefore be a vector of numeric values representing the overall load sensor suite. The neural network can be trained in order to predict which wind field attributes will give rise to sensor output vectors, with one or more sensors indicating an alarm state.

As the neural network evolves, its performance can be monitored. As long as the load sensor data is available, we can check it against the machine learning prediction. We can evaluate the success rate and the false alarm rate of a neural network. Once the success rate is high enough and the false alarm rate is low enough, we may consider that the machine learning has reached a level of education sufficient to be employed for a task. For instance, new control functionality may be switched on in order to reduce the loading and ride through more smoothly what would otherwise be damaging conditions.

Collaborating with Dr Brooms of Birkbeck, University of London, the team's work (bit.ly/2uJRSGs) calculates, in a very precise manner, how LIDAR measurement errors propagate through to the reconstructed velocity. Consequently it is possible to calculate these errors for a given measurement configuration, to design LIDAR measurement configurations more intelligently, and to achieve reduced forward uncertainty propagation in wind measurement – both for assessment of financial risk at the planning stage, and for feeding into improved control systems that reduce financial risk at the operational stage.

+
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INSIDE

Winning with words

The ability to write well is a sometimes-overlooked skill within the actuarial world, says Julian Maynard-Smith

People and society news

A round-up of actuarial and social news

Puzzles

Brain teasers for your coffee break

On the record

Marc Safa on actuarial habits and 'the ultimate A-Team'

Student

What does space insurance look like? Adeetya Tantia investigates





WINNING WITH WORDS

Julian Maynard-Smith
shares his simple tips for
clear, concise writing

How far have you progressed in your actuarial career? And what skills do you need right now? Whether you're a graduate student or a fellow, there's one skill you're guaranteed to need: writing well. Whether it's an exam paper or a group actuarial report, you'll be judged on how clearly and concisely it's written.

Anyone can learn to write well

Considering the importance of writing well, why are so few actuaries taught how to do it? Is it because 'anyone' can learn on the job and if you don't, it's your fault? Because studying the art of writing is for humanities graduates, not actuaries? Because writing is some mysterious gift bestowed on the few? Because either you're a numbers person or a words person?

All these 'because's are myths. Yes, a little artistry helps, but much of business writing is like carpentry: master the tools and you can build solid documents with seamless joinery and plenty of polish.

Know your outcomes and readers

As with carpentry, you first need to clarify your aims. So just as it's not 'planks on a wall' but 'somewhere to put your books', it's not a 'report for management' but 'persuading management to do X not Y'. Before you write a word, ask yourself:

- Who's my audience?
- What do they want or need?
- Why should they care?

The top reason documents fail is that they don't address these questions. For example, a policy full of passive sentences ('reports are written, risks are monitored') has failed to achieve its fundamental purpose of explaining who must do what.

The question '*Why should they care?*' is crucial, because people read only when they have to or when they want to. It's naïve to assume that 'have to' is enough to get people to read. Think of those terms and conditions that are so boring we click 'Accept' without reading them: for all we know, we've unwittingly agreed to sell Google or Amazon our kidneys.

How do you discover what your readers need and want? It sounds nugatory, but talk to them. What they care about and know (and, critically, don't know) is likely to differ

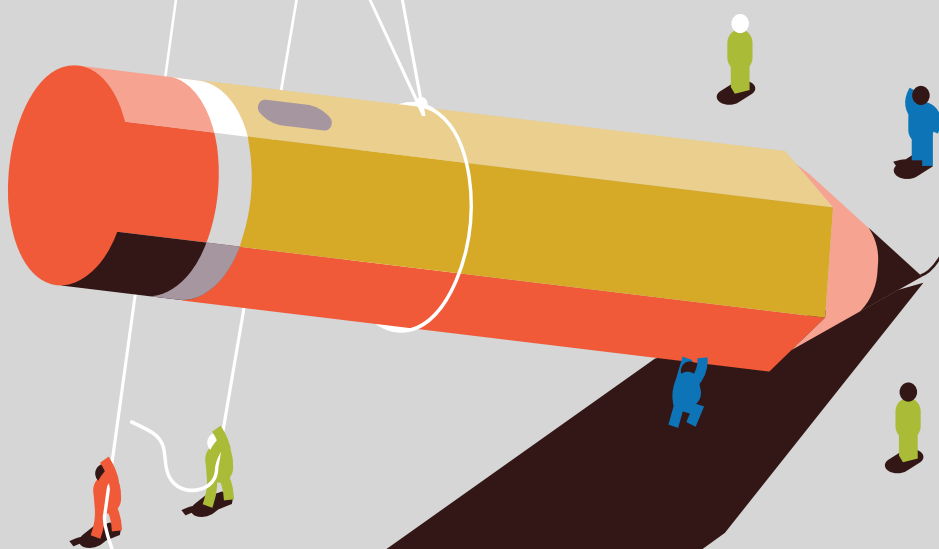


ILLUSTRATION: ISTOCK



At the back Professional development

wildly from what you assume. Smart questions to ask readers include:

- **What do you need to know?** Never assume. When a colleague of mine was asked to write a report for 'Exco' he naturally assumed his readers were the exec committee. He realised too late that it was the board, so his document failed.
- **When do you need to know it?** People don't want 'a document', they want information – so rather than focusing on delivering an artefact, focus on delivering the right knowledge to the right people at the right time. The medium is not the message.
- **What's relevant to you?** For example, both the board and actuarial team may need to understand their firm's catastrophe exposure – but the board is unlikely to care about (or even understand) the implications of modelling using a Gaussian versus Student-t copula.
- **How familiar are you with the subject?** This question affects both what you say and how you say it. Continuing the previous example, all the board may need to know is that the Student-t copula is preferable to the Gaussian copula because it better meets regulations about accounting for the lack of diversification under extreme scenarios but it increases the SCR by £10m.
- **What do you need to achieve?** For example, a car manual for mechanics (how does it work?) is completely different from one for drivers (how do I use it?). Understanding objectives also helps determine tone of voice: 'I want to assemble this flat-pack furniture (so I'm cool with being told what to do – but don't be *too* curt!); 'I want to know how to make a complaint (so don't patronise me because I'm annoyed enough already).'
- **What's your background?** English as a first or second language (so go easy on the jargon and slang)? Colleague or client (so steer the right side of casual/formal)? Senior or junior (be deferential upwards, but kind and supportive downwards)? And so on.

Gather your materials

Now you understand your audience, what next? Gather your materials, which can be either primary (what you know or can ask

or secondary (what's written already).

It's a waste of time regurgitating secondary sources – what I call 'rewriting the wheel' – so ask yourself:

- **Is it documented already?** Any time spent searching your intranet and asking around is more than recouped if you save yourself the bother of writing yet another internal document nobody needs. And if information exists in the public domain, a URL is a lot less trouble than writing it yourself – actuarial glossaries and regulation requirements being classic examples.
- **Can it be generated?** For example, if you need a list of documents with their metadata (owners, authors, review dates, etc), there's no point creating it manually in a spreadsheet when SharePoint libraries do it for you – including giving you an 'Export to Excel' option if you need a point-in-time status report.

Select or design a template

The best templates are easy to use and legible: clear typeface, optimum line length (40-70 characters, roughly eight to 12 words), ragged right margin (more legible than justified), and headers and footers fed by fields such as filename and 'last saved' (easier than having to hand-type the doc name and version number each time).

Pick a filename

A good filename tells readers two important things: what the document's about, and its relationship to other documents. So follow a consistent filename taxonomy, such as Client_topic_doc-type.

Build the structure

It's wise to create a skeleton of headings with a clear narrative spine before fleshing out each section. Give each 'bone' in your skeleton a meaningful label (not 'Introduction' but 'Introduction to <whatever>') and apply a structure strong enough to support your text: for example, familiar to unfamiliar, generic to specific, chronological, and so on.

Write the first draft

When writing your first draft, a great trick is to structure each section according to what journalists call the 'inverted triangle' –

heading, followed by the 'lead' (a one or two-sentence summary of what the section's about) and only after that the details. Information's far easier to grasp if it's contextualised first – and heading/lead/body aids skim-reading.

Don't get too hung up on finessing your text when you're bashing out your first draft. One secret of great writing is 'write fast, edit slowly' – so you unleash your right-brain creativity with your nagging inner critic muzzled, then let your left-brain critic rip your draft to shreds.

Edit, edit, edit

After your first draft it's all about the editing, which includes:

- Grouping information into meaningful chunks using intelligent paragraphing, tables and (in lowest position of usefulness) bulleted lists.
- Creating smooth transitions between each section, paragraph and sentence, and even within sentences. Ways to do this include using transition words showing how one idea relates to the next, such as whether it's a result (*therefore, so*), an example (*for instance*), a contrast (*however*), the next in a sequence (*first, second*), and so on. Another way is using what's called 'referential continuity', which is lining up sentences like dominoes, with the end of one matching the start of the next to form a logical sequence.
- Removing ambiguities and unearthing buried assumptions. One way to do this is stress-testing your sentences by asking whether they address the 'five Ws and one H' (*who, what, why, where, when and how*).
- Trimming verbosity, and fine-tuning your authorial voice.

There's much more to it than this, of course, but I've run out of words so you'll have to wait for the next article. Which reminds me that another good writing technique is to finish on a cliffhanger...



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STUDENT CONSULTATIVE FORUM

RAISING YOUR VOICE

BY JESSICA ELKIN

students in order to gather feedback on the student experience.

You may already know that the IFoA reaches out with regular student surveys, the results of which are collated and discussed at Education Committee, but there is also a team of representatives – the Student Consultative Forum (SCF) – that meets twice a year for the purpose of discussing student issues with the IFoA Executive. Representatives are organised from a variety of regions and societies. Even *The Actuary* has representation on the SCF.

Sometimes the representatives are there to get answers – for example, why does marking take so long? (This question comes up a lot.) However, the IFoA also wants to hear student opinions to help guide its operation. For example, the replacement of work-based skills with the new Personal and Professional Development (PPD) system had a lot to do with feedback on the older system, and reactions to PPD so far have suggested it's a vast improvement. Feedback on exam questions and the syllabus are passed to the examination teams to be considered, and opinions relating to exam centres are helpful in determining where exams will be taken in future sittings. In recent times, students visited potential venues to provide additional feedback; this was arranged through the SCF. You can email your local rep at any time with your burning opinions on entry requirements, exemptions, exams booking and administration, IFoA customer service, syllabus and examinations, and so on.

The SCF has representation not just in the UK and Ireland, but also in six other regions across the globe. In some areas the feedback is highly consistent, for example on online exam platforms or time pressure in exams. However, there is a wider range of issues faced if you have to take exams during UK working hours – which may be in the middle of the night in your region – or if you live somewhere with very specific infrastructure issues. Students with access arrangements will also have their own unique perspectives, and have their own representatives. Regardless, we want to hear it all. Be assured that feedback is always passed on confidentially.

Don't be shy! To find your local representative visit bit.ly/3bB5tHu, or email student@theactuary.com.

It can be difficult in a large global organisation to believe your thoughts and feelings are being heard. However, the IFoA is committed to engaging with its

WHAT'S ON THE WEB

@SophiaDimitria6



Great discussions @actuarynews event on 'the great risk transfer' is the shift in responsibility to individuals to support themselves in retirement fuelling inequality – as the most affluent access advice whilst industry products are often targeted at this demographic?

@tallpaulfoss

Thank you to @actuarynews for inviting @Nat_Numeracy to speak on such an important topic. 49% of adults don't understand percentages (the irony!). This is government data and we CAN take action to address it, if we start with building confidence in using numbers and data first.

@ActuaryLass



Want to know more about the potential impact of the latest #coronavirus? The pandemic edition of @actuarynews Longevity Bulletin makes a good read!

MARRIAGES

Congratulations to Velda Tan (ASA) and Keith Yeo, based in Singapore, who celebrated their marriage on 22 February.



Call for your news...

We would be delighted to hear from you. If you have any newsworthy items for these pages. Please contact us at: social@theactuary.com

COMPETITION

LONDON-BASED ACTUARY RANKED
WORLD'S BEST FINANCIAL MODELLER

A Willis Towers Watson employee has been announced as the winner of the annual ModelOff World Championship, a global financial modelling competition. More than 2,000 field practitioners and students from all over the world took part in the competition, which was won by Andrew Ngai, associate director in Willis Towers Watson's insurance consulting and technology business.

ModelOff 2019 tested financial modelling skills and knowledge in different quantitative disciplines, including financial analysis, banking, insurance, actuarial, engineering, consulting, accounting, Excel and other finance-related practices.

The competition was made up of three rounds and included real-life financial case studies on a number of topics such as discount cash flow modelling and innovative problem solving in Microsoft Excel.

The top 15 contestants from the first two rounds were flown to

London to compete in the live World Finals on 25 January. Entrants competed for the title of the 'World's Brightest Financial Mind' in front of a judging panel comprised of a range of industry experts, and were set a variety of challenges testing innovation, speed, data and risk understanding, and best practice modelling theory. The top finalists shared between them \$10,000 in cash prizes.

Alongside the success of Andrew Ngai, Chicago-based Nick Komissarov, North American Life M&A Leader at Willis Towers Watson, also successfully reached the competition's top 50 professional modellers, achieving an impressive global ranking of 45th best modeller in the world. A 'Rookie'/Student competition ran parallel to the professional competition, in which Willis Towers Watson intern Matt Farmer achieved a Top 25 finish.

To find out more about the ModelOff competition, go to www.modeloff.com



DEATHS

Mr Timothy Gardener, based in the UK, gained fellowship in 1981, passed away aged 67

Mr Raymond Paul, based in the UK, gained fellowship in 1966, passed away aged 77

Mr John Geddes, based in the UK, gained fellowship in 1961, passed away aged 87

Mr Robin Younger, based in the UK, gained fellowship in 1982, passed away aged 64

Mr Norbert Heinen, based in Germany, given honorary fellow status in 1999, passed away aged 65

Mr Garth Griffin, based in South Africa, gained fellowship in 1974, passed away aged 70

Mrs Breeda Jacobsen, student based in Sweden, passed away aged 39

Ms Emily Caine, student based in the UK, passed away aged 25

OBITUARY

Douglas Morrison

Educated at Jordanhill School and Oxford, Douglas spent his entire actuarial career with Standard Life in Edinburgh after a first career with Barr & Stroud Optical Engineers. He quickly rose through the actuarial ranks and gave unstinting service to Standard Life as with-profits actuary until his tragically short retirement in October 2019.

Douglas's wisdom and erudition were legend. He would insert the title of every Dickens novel into a technical presentation and spoke and wrote with extraordinary precision and concision. With his dog-eared copy of *Fowler's Modern English Usage* at hand at all times, Douglas was the unparalleled master of the English language. He was also the fount of all wider knowledge – music, literature, gardening and what to do when visiting the Isle of Arran.

Douglas refused to be flustered, let alone angry. He would patiently answer a question from the With-Profits Committee for the umpteenth time as if it were the first time. For many years he was involved in the recruitment of new actuarial students and the recently-qualified actuaries development programme. He was genuinely interested in each new generation and always available to counsel and advise. He led many professionalism courses for the IFoA.

Douglas's clarity of purpose at all times was best illustrated at the World Actuarial Congress in Cancun in 2001, where he was

admirably clear that attendance at the actuarial sessions would not get in the way of his time at the pool with a good book.

He had a sharp, dry and sometimes mischievous wit, and kept a file of the worst interview answers provided by prospective actuarial trainees. An accomplished raconteur, he would hold court, telling stories with a common theme – how he had got himself into some scrape but how he managed to extricate himself with his self-effacing charm.

Douglas passed away suddenly on 9 November 2019, leaving his wife Abigail, son Alexander, daughter Elizabeth, and many colleagues who described him as genuinely loved.





Student

The final frontier



Adeetya Tantia explores the extraterrestrial world of space insurance

Space is often considered the ‘final frontier’ in humankind’s exploration, and people have been trying to master it since the late 1940s. A handful of nations and private companies possess the technology for successful voyages into space, and they do not always get it right. With more and more private companies looking to commercialise space, the question is: “What if something goes wrong?”

In 1965, the Intelsat-1 was launched into space by the Space and Communications Group of Hughes Aircraft Company for COMSAT. It was covered by the world’s first satellite insurance policy, written by Lloyd’s of London, to cover physical damages on pre-launch.

Space insurance comes with its own set of challenges. Rocket and satellite designs are usually only used once. The Space Shuttle team tried to solve this with a reusable launch system but, due to time and cost issues, accomplished only half its goal. Only SpaceX possesses operational reusable orbital-class launch systems, making it easier to price subsequent launches. In addition, events covered by space insurance are usually high-severity and high-frequency – making

it harder to provide insurance at reasonable rates. The different legal environment of space also makes it difficult to pay out third-party liability claims.

In 1959, the UN created the Committee on the Peaceful Uses of Outer Space, which drafted five treaties to establish a legal regime. These treaties define countries with the ability to launch or procure the launching of an object into outer space, or countries from whose territory or facility an object is launched, as ‘Launching States’.

With the Commercial Space Launch Act of 1984, the US was the first nation to adopt legislation dedicated to space activities conducted by private US enforcement entities. Other states quickly followed – the UK passed the Outer Space Act in 1986. Countries bear international responsibility for the space activities of their private entities, so it is crucial for them to authorise, control and monitor private space activities.

As multiple contractors participate in a launch service contract providing different parts and expertise, an important clause is the ‘waiver of recourse’ clause – mutually enforceable clauses barring contractors from turning against each other. This clause is supplemented by ‘guarantee pacts’, granted by the launching agency or company to all the contractors in the event of damage caused to third parties as a result of the launching operation.

In case of Own Damage insurance, there are three distinct risk phases – ‘on the ground’, ‘during launch’ and ‘during life in orbit’. The risks covered in each phase will

be different. On the ground, the satellites and even the launchers may be insured during assembly, integration, testing and transport. On the launching site, they may be against the risks of damage due to external causes. During launch, only the satellite itself is covered. ‘Launch Risk Guarantees’ offered by the launching agency to its client, which allow for a relaunch or financial compensation in instances of failure to launch, may also be covered by policies. During the orbiting phase, space objects can be covered from the end of the launch to the end of their contractual life. In the launch and operation phase, the satellites are insured for any total, partial or deemed total loss. In principle, these policies cover almost all risks. To not pay out a claim, insurers may invoke only specific exclusions indicated in the policy. It is therefore up to insurers to prove that an exclusion applies.

In case of Third Party Liability, the 1967 Outer Space Treaty and the 1972 Liability Convention, the liability is qualified as ‘absolute’ when the damage is caused on land or in airspace. Victims need not show fault of the launching state, but rather must just prove that the space object caused damage. On the other hand, liability is said to be ‘for fault’ when damage occurs in outer space. The launching agency and all contractors are covered by the space insurance policies. Pricing such policies is especially difficult, as one has to take into account the launch site used, the trajectory, backup and security procedures, launch history, launch agency experience, satellite technical details, orbital positioning, planned movements, and so on.

The next frontier in space insurance will definitely include policies for commercial space travellers, who sign off any claim against the commercial space flight entity in case of death or injury. Some would say that space insurance is proving to be just as exciting as space exploration.



ADEETYA TANTIA

is a guest student editor

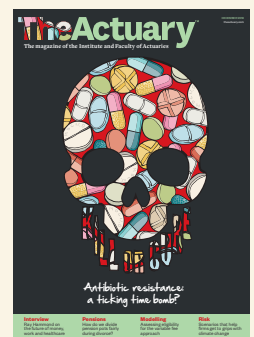
FEATURES LIST 2020

PLEASE NOTE THE THEMES FOR EACH ISSUE ARE NOT EXCLUSIVE.

The schedule is subject to occasional revisions.

Please check with the features team prior to contributor deadlines for further details. **Contact: features@theactuary.com**

ISSUE	DEADLINES	SUBJECT THEMES
▶ May 2020	Published: 07 May 2020 Contributor deadline: 16 March 2020 Ad booking deadline: 17 April 2020	<ul style="list-style-type: none"> ■ Finance/investment ■ Life insurance ■ Environment/sustainability
▶ June 2020	Published: 04 June 2020 Contributor deadline: 15 April 2020 Ad booking deadline: 14 May 2020	<ul style="list-style-type: none"> ■ Regulation/Solvency II/IFRS ■ General insurance/reinsurance ■ Pensions
▶ July 2020	Published: 09 July 2020 Contributor deadline: 20 May 2020 Ad booking deadline: 19 June 2020	<ul style="list-style-type: none"> ■ Technology/Big Data/analytics ■ Careers/professional development ■ Risk management
▶ August 2020	Published: 06 August 2020 Contributor deadline: 15 June 2020 Ad booking deadline: 17 July 2020	<ul style="list-style-type: none"> ■ Environment/sustainability ■ Health and care ■ Life insurance
▶ September 2020	Published: 03 September 2020 Contributor deadline: 13 July 2020 Ad booking deadline: 13 August 2020	<ul style="list-style-type: none"> ■ Regulation/Solvency II/IFRS ■ Investment ■ Modelling
▶ October 2020	Published: 08 October 2020 Contributor deadline: 10 August 2020 Ad booking deadline: 18 September 2020	<ul style="list-style-type: none"> ■ General insurance/reinsurance ■ Risk management ■ Health and care
▶ November 2020	Published: 05 November 2020 Contributor deadline: 14 September 2020 Ad booking deadline: 16 October 2020	<ul style="list-style-type: none"> ■ Life insurance ■ Pensions ■ Finance/investment
▶ December 2020	Published: 03 December 2020 Contributor deadline: 12 October 2020 Ad booking deadline: 13 November 2020	<ul style="list-style-type: none"> ■ Modelling ■ Risk management ■ General insurance/reinsurance
FURTHER INFORMATION For further information and advice please contact features@theactuary.com	WRITING FOR THE ACTUARY See terms and conditions at www.theactuary.com/contribute	MORE CONTENT ONLINE Additional content can be found at www.theactuary.com



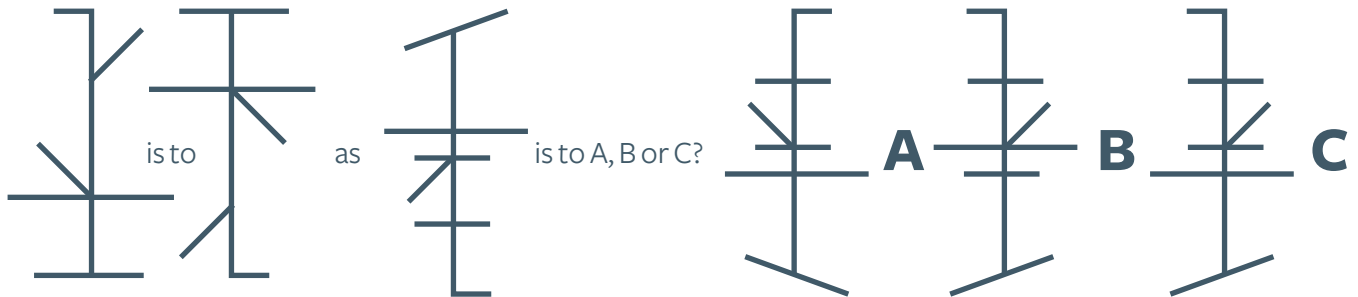


iQ



www.mensa.org.uk

Lining up Mensa puzzle 778



Supermarket sweep Mensa puzzle 779

A customer pays £16.06 for their shopping. They pay with four different denominations of coins and the largest denomination is 50p. The customer uses exactly the same number of each coin for their payment.

How many of each coin do they use and what are the coin values?



Symbolic victory Mensa puzzle 780

Which symbol should replace both question marks to continue the sequence?

X	£	O	\$	#	#
£	X	X	£	O	\$
O	S	#	#	\$	O
\$	O	£	X	X	£
#	#	\$	O	£	X
?	?	\$	O	£	X

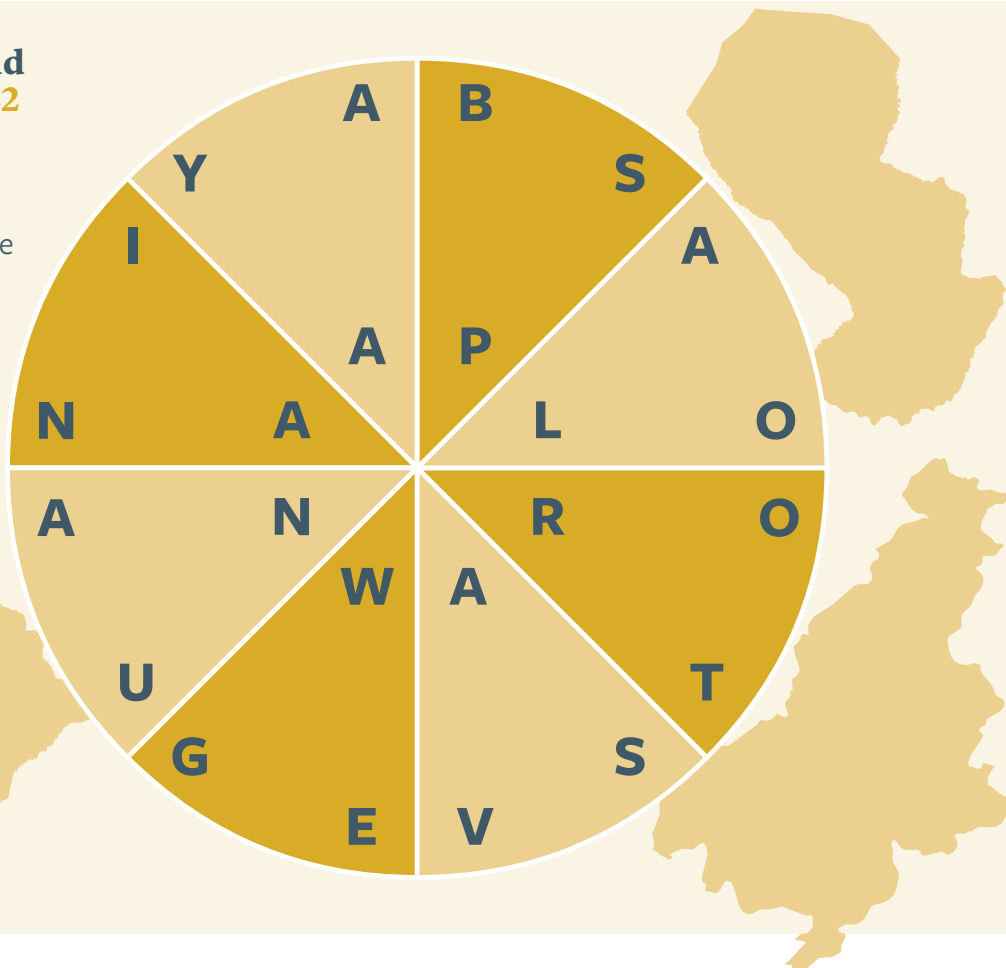
Broken speech Mensa puzzle 781

A quote by oil magnate J. Paul Getty has been split up into groups. Rearrange the groups to form the quote. What should it say?

**ACTU IFYO
CHMAN COUN
EALL EYYO ALLY
NOTR RMON
TYOU UARE
UCAN YARI**

Around the world Mensa puzzle 782

Take one letter from each sector to give the name of a country. Take a further letter from each sector to give a second country. The remaining letters will give a third country. What are the three names?



Answers: 778: C. Turns upside down; 779: 22 each of 1p, 2p, 20p and 50p; 780: #. A sequence of X£O\$# runs along the top row then reverses and runs back along the second row and so on; 781: if you can actually count your money you are not really a rich man; 782: Botswana, Slovenia and Paraguay.



At the back
Actuary of the future

On the record



MARC SAFA

Employee benefits, Willis
Towers Watson

How would your best friend describe you?

Really tall.

What motivates you?

Achieving my goals and targets. One of them includes **owning a wine estate**.



What would be your personal motto?

A motto which I came across and liked: 'Tomorrow is another day'.

Name five dream companions to be stuck on a desert island with

Lara Croft and the A-Team, which for me is the ultimate A-Team.

What's your most 'actuarial' habit?

Providing a response that is provisional and not definitive, sort of like a disclaimer. Key phrases that I tend to use are "it seems", "I could be mistaken, however" and "depends if".

Favourite Excel function?

Concatenate, I just like the way it sounds. It can also come in handy when working on an untidy file.

How do you relax away from the office?

After hours of sitting in front of my screen at work, I like to exercise a bit by playing some good old **rugby league** during the weekend.



What is the funniest thing that has happened to you recently?

A colleague once provided me with a task that appeared to be simple, so I told him "this seems pretty straightforward". Without going into too many details, let's just say the task took seven hours to complete. I found it hilarious.

Alternative career choice?

I've just started learning to **play the guitar**, so maybe a musician.

If there were a movie produced about your life, who would play you, and why?

A bearded **Ben Affleck**. He's tall and has a big forehead – can't think of a more accurate description of myself. Plus, he wasn't bad in the movie *Gone Girl*.

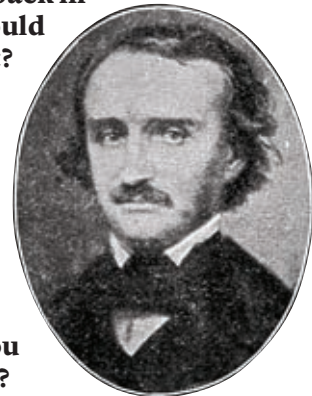


What song best describes your work ethic?

Harder, Better, Faster, Stronger – Daft Punk.

If you could go back in history, who would you like to meet?

I would be interested in having a conversation with **Edgar Allan Poe**. Seems like a fun person to have a drink with.



Greatest risk you have ever taken?

Due to an unforeseen circumstance, I had to send a work-related email once without any technical review. Thankfully no one got hurt.

If you could be anyone else, who would it be?

Being James Bond for a day would be nice. Doesn't match the thrill of being an actuary, but it would still be interesting.

Do you know an actuary destined for greatness? You can nominate an Actuary of the Future by emailing aotf@theactuary.com



Jobs

To advertise your vacancies in the magazine and online please contact:
theactuaryjobs@redactive.co.uk or +44 (0) 20 7880 6234

Capita

Grow your actuarial career with Capita

At Capita Regulated Services we provide trusted and flexible actuarial support to our clients across the **life and pensions** industry. Capita has been helping leading life companies for a number of years and our continuing growth means we're expanding our actuarial team of 100. This offers an excellent opportunity for experienced and knowledgeable actuarial candidates to join us.

We're offering permanent roles at a variety of levels, from mid-level students through to those who have recently qualified. Strong technical ability is essential, and we value broad practical experience over qualifications alone.

You may be looking for more variety, a better work-life balance, or perhaps you're considering a move away from contract roles due to IR35 changes. Regardless, if you have what we – and our clients – are looking for, then there's a place for you to make an impact and help shape our future at Capita.

If you're interested in working directly with clients, are happy to travel and enjoy a variety of work, then get in touch to see how you can expand your horizons while helping to create better outcomes for our clients.

Contact actuariesolutions@capita.com to learn more and arrange a call with one of our team.





At the back Appointments

Permanent and Contract Opportunities at APR

Permanent roles for entry-level (school leavers and graduates), mid / senior students and qualified actuaries

Positions based in London and Edinburgh, with the option for locating to Dublin

Contracting opportunities across UK for actuarial professionals at all levels of experience



Join our growing team - opportunities for a range of placement and consulting projects

Drawing on the high quality of the solutions we are providing to clients, whether individuals on placement or delivering project-based services, our business is continuing to grow. Our permanent actuarial staff gain exposure to a wide range of clients and projects, while benefiting from our highly-regarded training and support. Those who contract through APR enjoy our professional, focused approach to finding suitable roles and supporting our contractors on placement. We currently have the following opportunities:

Graduate Actuarial Associate

Our well-established graduate training programme is based on comprehensive initial training and exposure to project roles selected with your development in mind.

Our exam pass rate far above the UK average gives you maximum chance to qualify quickly as you launch a successful and varied actuarial career.

Actuarial Analyst (CAA)

Drawing on our experience and strength in training actuarial students, we have now been recruiting Actuarial Analysts for three years.

As well as giving you experience across a range of client projects we support our analysts to take the CAA qualification, hopefully as a first step towards full FIA qualification.

Actuarial Contractor Roles

We are suppliers to most of the UK's largest insurance firms, giving you access to a wide range of contracting opportunities. Our actuarial expertise and targeted approach to filling roles maximises your chances of securing contracts that suit your skills and preferences.

We continue to support contractors to meet the challenges presented by the upcoming IR35 changes.

Actuarial Associate / Senior Actuarial Associate

We are looking out for high-quality actuarial students and qualified actuaries to supplement our team.

Those attracted to an associate role at APR are often looking for a broader range of actuarial experience or an increased level of responsibility through working for a smaller firm.

For further information see:

<https://aprllp.com/working-for-apr/>

<https://aprllp.com/actuarial-contracting-with-apr/>

Or contact: recruitment@aprllp.com

www.aprllp.com

RISK < REWARD A RISK WORTH TAKING...



Senior Manager/Director (GI)

London/Flexible

Up to £155,000 + benefits

M&A Actuary (Life/GI)

London

Up to £135,000 + benefits

Reporting Actuary (start-up)

London/Home Counties

Up to £90,000 + benefits

Senior Pricing Analyst

London

Up to £60,000 + benefits

✉ ACTUARIAL@BWD-SEARCH.CO.UK

🌐 BWD-SEARCH.CO.UK

☎ 0203 854 5000 | 0113 274 3000



GENERAL INSURANCE – UK

HEAD OF PRICING

- To £120,000
- + Benefits
- City of London

This is a high profile and autonomous position with a Technology-led MGA which specialises in writing and developing products in the Non-Standard personal lines sector. The role will involve setting up, building, running and developing the pricing systems, modelling external data to review portfolio transfers, reporting on profitability and helping to develop plans for future strategy and direction. You will also be involved with interaction with capacity providers.

You will need to be a self-starter with extensive pricing experience in any personal lines discipline, combined with strong communication skills. You will also need to be comfortable working in a smaller environment where you will need to handle a breadth of responsibilities.

Contact: Jeremy.Cross@ipsgroup.co.uk Tel: 020 7481 8111 Ref: TAM141544JCCC

Manager, Capital Modelling

Up to £120,000 + Package – City of London

This is a high profile role with one of the world's largest insurers and will involve considerable autonomy with monitoring the adequacy of reserves and capital, calculations of capital requirements, model development and ensuring SII compliance. Managing a small team, you will also take ownership and have responsibility for a particular workstream. You will need to be a qualified actuary with non-life insurance experience and extensive capital modelling expertise. In addition you will need effective communication skills and have the ability to manage a team.

Contact: Jeremy.Cross@ipsgroup.co.uk 020 7481 8111 Ref: TAM141418JCC

Capital Modelling Analyst

Up to £50,000 Base Salary + Bonus – City of London

We are working with a prestigious Lloyd's syndicate who are looking to hire a Capital Modelling Analyst to join their small but growing Capital Modelling team. This is a diverse role where you will be involved in Business Planning, Reinsurance purchase analysis and other ad hoc reserving and pricing. You will report into the Head of Capital, and work closely with the underwriting team across all areas of the Syndicate SCR Capital production. This position is the most junior of a team of five, so you have a number of experienced individuals to learn from.

Contact: Gary.Ahern@ipsgroup.co.uk 020 7481 8111 Ref: TAM141490GA

Catastrophe Modelling Analyst

Up to £55,000 Base Salary + Bonus – City of London

An International Independent Insurance Broker are currently searching for an experienced Catastrophe Modeller to join a new and growing centralised function. The role will be working very closely with the lead Catastrophe Modeller and be building out their capability to work across a number of new lines of business. This role is a blend of both a technical catastrophe role, where you will be involved in the automation of models and also a very commercial one, as you will be sitting with the Broking team.

Contact: Gary.Ahern@ipsgroup.co.uk 020 7481 8111 Ref: TAM141633GA

Risk Actuarial Analyst

Up to £50,000 Base Salary + Bonus – City of London

The role will be working closely with the Head of Risk and Capital, where you will be involved in the areas of model validation and regulatory capital while also contributing to the wider development and maintenance of a robust risk management process. This isn't a standard back office model validation role, the team are key in influencing the business and assisting with important strategic decisions. You will be joining a growing team where you will be given the opportunity to manage junior individuals.

Contact: Gary.Ahern@ipsgroup.co.uk 020 7481 8111 Ref: TAM141405GA

Senior Pricing Analyst

Up to £75,000 Base Salary + Bonus – City of London

We are working with a growing Personal Lines Insurtech who are seeking an individual to join their pricing department. The role reports directly into the Head of Pricing, you will be key in the development of pricing strategies and the statistical analysis of the portfolios. The individual will need to have significant experience within a Personal Lines Pricing role, as you will be leading a team of junior individual who are looking for guidance. You will need to have strong programming skills with a knowledge of machine learning techniques.

Contact: Gary.Ahern@ipsgroup.co.uk 020 7481 8111 Ref: TAM141566GA

Senior Reserving Analyst - 12 month FTC

Up to £70,000 Base Salary + Bonus – City of London

A Global Lloyd's Syndicate are currently looking to hire an experienced Reserving Actuary. You will be a key member within this team, where you will be expected to run with the reserving process and suggest how this can be developed and improved. You will have responsibility for Reserving across all lines of business and you will also have the opportunity to work across Pricing and Capital Modelling. This position is a fantastic opportunity for an individual who is looking to take the next big step in their career.

Contact: Gary.Ahern@ipsgroup.co.uk 020 7481 8111 Ref: TAM140298GA

SENIOR PRICING ACTUARY & DATA SCIENTIST

London, £competitive

A global insurer is looking to bring on board a Senior Pricing Actuary and Data Scientist to assist in designing and implementing innovative solutions.

The candidate will be responsible for building and optimising commercial lines, harnessing their own market knowledge to deliver best in class pricing capability reviews.

The role involves developing strong relationship with current and new clients therefore requires high levels of communication and interpersonal skills.

The ideal candidate will have at least 8-10 years of pricing experience as well as prior use of data manipulation packages (SAS, SQL, WPS, etc.), and programming.

Contact: james.rydon@eamesconsulting.com | 0207 092 3239

ACTUARIAL ANALYST - MIXED ROLE

London, up to £60,000 + bonus + benefits

A leading London-Market company is looking to hire a part to nearly qualified actuary to assist across all lines of business.

The candidate will undertake a mixed reserving and pricing role whereby the day-to-day will range from undertaking the evaluation of Solvency II technical provisions to building innovative pricing models and evaluating large to boutique risks.

The ideal candidate will be ambitiously pursuing their actuarial examinations and have at least a 2:1 in Mathematics, Actuarial Science or any other relevant field.

Candidates from both reserving and pricing backgrounds will be considered with Lloyd's experience being preferable.

Contact: rafaela.fakhre@eamesconsulting.com | 0203 846 5909

CAPITAL ANALYST

London, up to £55,000 + bonus + benefits

A Lloyd's syndicate is looking to bring on board a Capital Analyst to assist the Capital Manager in assessing both internal and international risk categories.

The candidate will be responsible for using Tyche to producing multi-year capital projections, delivering risk profile information and liaising with the pricing team to drive loss ratio analysis.

The ideal candidate will be a part to nearly qualified actuary with at least a 2:1 in Mathematics, Actuarial Science or another relevant field.

Non-life capital experience is strongly preferred with solvency II experience also desired.

Contact: rafaela.fakhre@eamesconsulting.com | 0203 846 5909

RESERVING MANAGER - PERSONAL LINES

London, up to £80,000 + bonus + benefits

A personal lines insurer is looking to bring a Reserving Actuarial Manager to build out and manage their reserving function.

The candidate will be giving support to the Chief Actuary and CEO in their reserving processes in both the motor and household accounts.

The role involves developing strong relationships with senior professionals so excellent communication and interpersonal skills is essential.

The ideal candidate will be nearly/newly qualified and have strong reserving experience.

Contact: rafaela.fakhre@eamesconsulting.com | 0203 846 5909

PRICING/RESERVING ACTUARY

London, £competitive package

A Lloyd's/London Market insurer is looking to bring on a newly or nearly qualified actuary to join their team in a mixed Pricing and Reserving role.

The candidate will be giving support to the Head of Reserving and Head of Pricing.

The role involves developing strong relationships with senior professionals so excellent communication and interpersonal skills are essential.

Contact: james.rydon@eamesconsulting.com | 0207 092 3239

SENIOR DATA SCIENTIST

London, £competitive package

A leading motor insurance specialist is looking to bring onboard a Senior Data Scientist to join their technical pricing team.

You will be responsible for overseeing a pricing team whilst implementing data science, machine learning and other statistical techniques to innovate front end business solutions.

The ideal candidate will be experienced in building an array of predictive models and managing large-scale data sets. Therefore, experience using SQL, Python, R, MATLAB, etc. is strongly desired.

A strong academic background is also essential, candidates should have a master's degree or PhD in Computer Science, Physics, Actuarial Science or any other relevant field.

Contact: james.rydon@eamesconsulting.com | 0207 092 3239

Our team work on both permanent and contract opportunities across life and non-life insurance and the pensions and investment markets. If you are looking for your next career move or to discuss other opportunities we may have, get in touch with a member of our team today for a confidential discussion. Alternatively, please visit our website for more information on the opportunities our consultants are working on.

RESERVING ACTUARY

London, up to £75,000 + bonus + benefits

A Lloyd's syndicate is currently seeking a nearly/newly qualified actuary to join their reserving team. The role will be responsible for designing and implementing new processes/tool in order to increase their reserving capabilities.

Candidates will ideally have a wealth of reserving experience from within the Lloyd's market.

Contact: james.rydon@eamesconsulting.com | 0207 092 3239

HEAD OF PRICING

London, up to £110,000 + bonus + benefits

A leading personal lines insurer are currently seeking a qualified actuary to lead their pricing function. The role will be responsible for all technical pricing models and optimising their use to deliver greater profitability. In addition the role will manage a team of actuaries and pricing analysts.

Ideal candidates will have strong personal experience within technical pricing, with previous exposure to running teams. GLM modelling expertise is essential.

Contact: james.rydon@eamesconsulting.com | 0207 092 3239

TECHNICAL PRICING MANAGER

South Coast, up to £75,000 + bonus + benefits

A leading personal lines insurer is looking to hire a Pricing Manager to join their technical pricing team. You will make insightful pricing recommendations using new technologies that will generate profitable business growth. These processes will then shape the use of data analytics used within the company moving forward.

Key responsibilities will include the maintenance of existing predictive models and implementing new machine learning techniques to enhance these models. Offering mentorship to junior actuarial analysts will also fall within your remit.

The ideal candidate will be a nearly/newly qualified actuary with previous experience in personal lines insurance. Expert knowledge of Emblem and Python/R/SAS is desirable.

Contact: rafaela.fakhre@eamesconsulting.com | 0203 846 5909

PRICING MANAGER

Birmingham, £competitive

A personal lines insurer is looking to hire a Pricing Manager to manage one of their Pricing teams in Birmingham. Key responsibilities will include the decision-making surrounding the pricing of general insurance products and supporting the work intended to enable increased profitability of the direct distribution channel.

Providing guidance for junior colleagues will also fall within your remit. The suitable candidate will be nearly or newly qualified actuary with an extensive knowledge in general insurance pricing.

Previous experience with SAS software, or an equivalent, is required with an exposure to Emblem and Radar being advantageous.

Contact: james.rydon@eamesconsulting.com | 0207 092 3239

SENIOR CAPITAL MODELLING ANALYST

London, up to £70,000 + bonus + benefits

One of the top London Market Syndicates is looking for a Senior Actuarial Analyst to assist their Capital Modelling Team. The candidate will be responsible for capital modelling and Solvency II requirements. The syndicate has recently implemented Tyche as its new software. The role involves developing stakeholder relationships across the business, therefore, requires a high level of communication as well as very strong analytical ability and logical approach to problem-solving. The ideal candidate will have at least 2 years of non-life insurance Capital experience. You should also be studying towards the actuarial exams.

Contact: rafaela.fakhre@eamesconsulting.com | 0203 846 5909

ACTUARIAL MANAGER

London, up to £75,000 + bonus + benefits

A personal lines insurer is looking to bring a Actuarial Manager to build out their technical pricing function. The candidate will be giving support to the Head of Pricing and will be responsible for creating models from scratch in motor and household accounts. The role is also going to be heavy on the research aspects rather than BAU. The role involves developing strong relationships with senior professionals so excellent communication and interpersonal skills is essential. The ideal candidate will have at 3-4 years experience in technical pricing, GLM and Emblem and be nearly/newly qualified or making good progress in their exams.

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Ireland's Leading Actuarial Recruitment Agency

Non-Life Manager/Director

Fantastic opportunity for a qualified actuary to join a multinational company in a senior management role. Our client is looking for a senior individual to work as part of the leadership team. Successful candidates must be non-life actuaries with deep experience of working within the European Regulatory environment. The organisation offers flexible working arrangements.

Commercial Pricing Actuary

Excellent opportunity for a non-life pricing actuary to join a growing commercial pricing team, based in the IFSC in Dublin. This role involves pricing for commercial lines that include casualty, property, and financial lines. This position will suit a part-qualified/nearly qualified actuary with 2 – 3 years non-life commercial pricing experience.

Actuarial Analysts

Part-Qualified actuaries needed for Reserving and Modelling analyst positions in a multinational insurance organisation based in Dublin city. A second European language would be beneficial. This role requires strong technical and communication skills and offers the chance to work in a company with fantastic benefits.

Finance and Capital Actuary

Finance and Capital Actuary required to join the European hub of our Dublin city center based client. The position will involve a mix of reserving and capital work. The organisation are open to individuals who are part-qualified or nearly/newly qualified, from either non-life or life backgrounds. This is an exciting opportunity to join a company with excellent benefits.

Head of Financial Reporting

Excellent opportunity for a qualified technical life actuary to join an organisation at a very exciting time of growth. The focus of the role will be to lead and manage a motivated, highly skilled team of actuaries and actuarial analysts. It's a rare opportunity to join this company at a senior level. Candidates must have 10 years Life experience and deep solvency II and risk modelling experience.

Risk Actuary J3956

Are you a Risk Actuary looking to expand your experience in a cross-border team? A Dublin based international insurer is looking for a Qualified Risk Actuary to take a responsible position within a team of risk professionals. This role is likely to expand to a risk management role. The position supports home/flexible working.

Actuarial Manager

A leading Dublin based consultancy are looking for a manager for their Life actuarial practice. The role is positioned between the team and senior management. The person will be involved in all aspects of client projects. Excellent communication and IT skills are required and experience in financial reporting, regulatory work or risk management is preferred.

12 month Contract

Are you an actuary with strong leadership and technical skills who can work with a senior team whilst the company goes through a period of change? Our client is looking for a qualified experienced actuary with experience of management and a track record of successful delivery of reporting and regulatory deadlines in a cross-border environment.

Non-Life Pricing Positions

Fantastic actuarial pricing opportunities with a global general insurer. These roles are at various levels, from graduates through to qualified pricing actuaries and will join existing pricing teams in Dublin and other European locations. Strong IT skills are required for these positions and individuals must have a passion for pricing work.

For further information on these and other opportunities in Ireland please contact us at jobs@raretec.ie
If you are a company looking for permanent or contract actuarial resources then call us on **+35315311400**

We look forward to hearing from you www.raretec.ie



Actuarial opportunities available at Lloyd's

London

The Market Reserving & Capital (MRC) team at Lloyd's is responsible for market oversight, including monitoring the adequacy of reserves and capital at syndicate level and for the calculation of capital requirements for members and the Central Fund. This involves undertaking reserving and capital work for the corporation of Lloyd's and also reviewing syndicate submissions.

As well as providing interesting and unique technical challenges, the work of the team provides a perspective of the Lloyd's market as a whole and all of the businesses within it.

Senior Actuarial Associate, Syndicate Capital

Qualified capital actuary with the ability to successfully lead oversight of syndicate capital and provide challenge to senior representatives at a Managing Agent. In a fast paced environment this role will see you apply your technical capital knowledge as well as adapting to changing priorities and the communicate complex areas to a wide and varied audience.

Senior Actuarial Associate, Syndicate Reserving

Qualified reserving actuary with the ability to successfully lead analysis on reserving selections and provide challenge to senior representatives at a Managing Agent. In a fast paced environment this role will see you manage multiple resources, changing priorities and the communication of complex areas to a wide and varied audience.

Senior Actuary, Syndicate Capital

Qualified capital actuary with the ability to successfully lead oversight of syndicate capital and provide challenge to senior representatives at a Managing Agent. This role will see you lead and deliver MRC processes as well as enable you to apply your technical capital knowledge as well as communicating complex issues to internal and external stakeholders including Managing Agents and regulators.

Senior Actuary, Lloyd's Internal Model

As a qualified capital actuary you will use your analytical and problem solving skills to manage complex and challenging issues. With your capital knowledge you will provide leadership and expertise to a small team of specialists while communicating results to a varied internal and external audience.

If you are interested in taking the next step in your career at Lloyd's please visit lloyds.com/careers

As the successful candidate, you can expect to be rewarded with a competitive salary, an enviable range of benefits in an environment committed to flexible & agile working. At Lloyd's we believe that innovation comes from having an inclusive culture of equality and diversity. Should you feel that you require reasonable adjustments during your application process, we request that you please contact recruitment@lloyds.com



EXCLUSIVE

<p>HEAD OF ACTUARIAL OPERATIONS Qualified Leading Insurer LIFE FLEXIBLE LOCATION STAR6119</p> <p>Use your leadership experience and influencing skills in this highly-visible and strategic role. Working closely with the CFO, you will develop the risk culture and operating model of our client's finance function.</p>	<p>FIRST ACTUARY IN THE BUILDING Qualified Healthcare Insurer HEALTH SOUTH EAST STAR6133</p> <p>As Senior Pricing Actuary, you will be responsible for individual and corporate pricing. You will develop and maintain pricing models, assist in product development, sign-off rating models and manage portfolio performance.</p>	<p>CLIENT FOCUSED ACTUARY Part-Qualified / Qualified Global Reinsurance Leader LIFE LONDON / EUROPE STAR6079</p> <p>In this transaction-focused role, you will travel extensively and use your expert market knowledge to deliver cutting-edge capital management and reinsurance solutions to leading clients.</p>
<p>IFRS 17 REPORTING LEAD Qualified Major Insurer LIFE LONDON STAR6135</p> <p>Lead on the development and implementation of our client's IFRS 17 reporting capability. Using your strong understanding of reporting metrics, you will provide strategic direction for the methodologies, systems and processes used.</p>	<p>SUPERSTAR CATASTROPHE RISK ACTUARY Qualified Offshore Reinsurer NON-LIFE RISK GUERNSEY STAR6106</p> <p>In this varied role, you will use your property catastrophe risk experience as you collaborate closely with stakeholders on strategy, risk and capital management, and reinsurance purchase.</p>	<p>SENIOR TECHNICAL PRICING MANAGER Part-Qualified / Qualified Specialist Insurer NON-LIFE LONDON WITH TRAVEL STAR6070</p> <p>Drive technical pricing strategy to support profitable growth, using a variety of models. You will lead value-adding analysis and the delivery of pricing and underwriting proposals.</p>
<p>LONDON MARKET CAPITAL ANALYST Part-Qualified Lloyd's Reinsurer NON-LIFE LONDON STAR6115</p> <p>In this exciting career development opportunity, you will support the parameterisation and validation of our client's capital model. You will have sound knowledge of stochastic modelling techniques, and detailed experience in ReMetrica/Igloo/Tyche.</p>	<p>TECHNICAL PRICING ACTUARIAL MANAGER Part-Qualified / Qualified Major Insurer NON-LIFE SOUTH EAST STAR6139</p> <p>A fantastic opportunity to lead the analysis of pricing and underwriting performance. You will research, develop and implement new actuarial and statistical techniques, including machine learning and data science.</p>	<p>CAPITAL LEADERS Qualified Market Leader NON-LIFE LONDON STAR5958</p> <p>Leverage your Lloyd's or London Market capital experience in an outward-facing role which offers extensive stakeholder interaction, and requires the appetite and ability to lead a team of qualified actuaries and students.</p>
<p>BPA REINSURANCE ANALYST Part-Qualified Major Insurer LIFE LONDON STAR6068</p> <p>Use your experience in cashflow and financial modelling to develop and implement de-risking solutions in this excellent role. You will assist with pricing and modelling, and support the reinsurance tender process.</p>	<p>BPA PRICING ANALYST Part-Qualified Global Leader LIFE PENSIONS LONDON STAR6120</p> <p>Play a key role, conducting mortality experience investigations, manipulating scheme data, managing associated queries, and producing accurate cashflow projections for use in de-risking solutions for DB pension schemes.</p>	<p>IN-HOUSE PENSION RISK MANAGER Part-Qualified / Qualified Leading-Edge Firm PENSIONS RISK LONDON STAR5565</p> <p>In this fantastic in-house role, you will monitor pension risk and develop alternative funding and investment strategies, co-ordinating input from external advisers.</p>
<p>INVESTMENT CONSULTANTS Part-Qualified / Qualified Leading Consultancy INVESTMENT VARIOUS LOCATIONS STAR6149</p> <p>Provide high-quality, bespoke investment advice to a wide range of clients, using your strong understanding of all major asset classes, how they interact and their role in meeting client objectives.</p>	<p>IN-HOUSE INVESTMENT Qualified Leading Client INVESTMENT LONDON STAR5866</p> <p>Seeking an investment actuary or CFA, with strong technical and communication skills and a proactive approach, to take up this new role, which can be shaped to the successful candidate.</p>	<p>PART-QUALIFIED ACTUARIES</p> <p>There is currently extremely high demand for part-qualified actuaries across all areas of actuarial specialism.</p> <p>Opportunities exist both to further your career within your current sector and to make a move to another sector.</p> <p>Contact us now to discuss the wide range of options available.</p>

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 <p>Antony Buxton FIA MANAGING DIRECTOR +44 7766 414 560 antony.buxton@staractuarial.com</p>	 <p>Louis Manson MANAGING DIRECTOR +44 7595 023 983 louis.manson@staractuarial.com</p>	 <p>Joanne O'Connor OPERATIONS DIRECTOR +44 7739 345 946 joanne.oconnor@staractuarial.com</p>	<p>+44 20 7868 1900 staractuarial.com</p>

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Corporate Actuarial Consultant

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Hannah Burgess

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charlotte.smith@ojassociates.com

Prophet Modelling Actuary

UK Wide

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Laura Sharkey

+44 (0) 203 861 9149

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EXCLUSIVE

IN-HOUSE PENSIONS POLICY ACTUARY

LONDON £ excellent package



Star Actuarial Futures are pleased to be bringing this role to market exclusively on behalf of RPMI Railpen, the asset manager for the £30 billion railways pension schemes. The railways pension schemes have over 350,000 members who are connected to the railways industry. There are over 100 actuarially independent sections and over 150 sponsoring private and public sector employers.

We are seeking a qualified pensions actuary with excellent communication, negotiation and inter-personal skills to join the Pensions Policy team. With detailed knowledge of pensions legislation and defined benefit arrangements, you will also possess experience of dealing with senior lawyers, actuaries, covenant advisors, trustees and employers at board level.

The Pensions Policy team sits alongside the Employer Covenant team within the Integrated Funding team which will expand this year to deliver a client asset liability modelling function. The Pensions Policy team will play a key role in the assimilation of the new function.

Key responsibilities include:

- Taking the lead on policy relating to particular clients, having responsibility for reporting to the Trustee Board and the Trustee's Integrated Funding Committee on these clients and engaging with the Chairs as necessary.
- Providing actuarial pensions consultancy services to the Trustee, employers and Pensions Committees (local trustees), covering results of actuarial valuations; addressing shortfalls or surpluses; changing contribution rate patterns; and changes in benefits.
- Providing benefit design pensions consultancy services to the stakeholders above.
- Developing integrated funding solutions covering contributions, benefits, investments and covenant support in conjunction with experienced specialists and external professional advisors.
- Providing investment strategy pensions consultancy services as part of integrated funding solutions.
- Liaising with governmental bodies, principally the Department for Transport, on pension matters affecting the railways schemes.
- Liaising with the Pensions Regulator on scheme funding matters as appropriate.

Key Requirements:

- Pensions industry expert and senior actuary covering both DB and DC arrangements with significant client-facing consultancy experience at Board level.
- Ability to operate at senior levels across a range of disciplines, including: the railway industry; Government; the Pensions Regulator; and professional advisors.
- Excellent analytical, investigative and influencing skills.

Please contact Adam Goodwin of STARACTUARIALFUTURES to make an application or for further information.

