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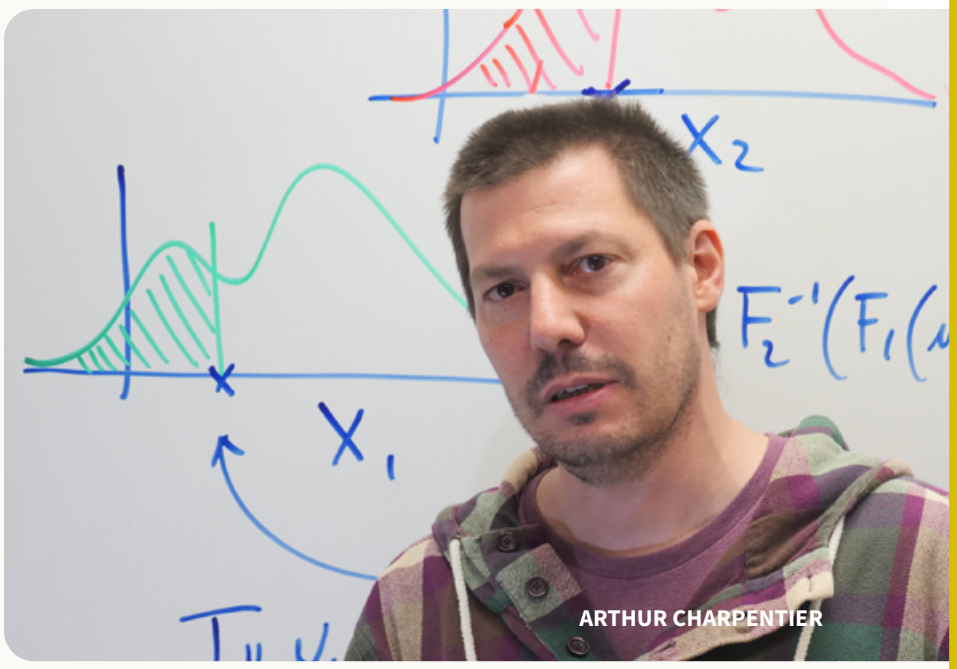
INTERVIEW

BY **JENNIFER BAKER**

ACTUARIAL ETHICS AND THE FUTURE OF THE PROFESSION

Arthur Charpentier, PhD, Fellow of the French Institute of Actuaries, is full professor at UQAM, Montreal, Canada.
He is also the former director of the Data Science for Actuaries program of the French Institute of Actuaries.
He spoke to Jennifer Baker about the future of the profession.



How do you see the actuarial profession today?

I think it's been changing a lot. I've been teaching actuarial science for 20 years. I remember that when we started giving courses, students were willing to get into the data, because previously it was all written exams, which was very, very distinct from what we could be doing in companies. I remember students asking, can we see some data sets? Theoretical models are nice, but can we see exactly what's going on?

So we started to step into data science 20 years ago, and then I remember there was a shift towards regulation. Some aspects were a little difficult to formalise for mathematicians, but there was a clear concern from insurance companies that actuaries would have to be able to deal with all this new regulation, especially in Europe. Then there came the big buzz of artificial intelligence and actuaries went back to the original question of making models and predictions.

So there have been a lot of changes, and now, I think actuaries are involved in those discussions about AI. >

> ***Then there came the big buzz of artificial intelligence and actuaries went back to the original question of making models and predictions.***

There are a lot of important questions about proxy discrimination, because when you start to get more and more data, even if you don't observe something, it's still possible to capture sensitive information through proxies. We have more and more black box models, and we need to understand exactly what's going on before using them. There are a lot of very interesting challenges – and not only from my mathematical perspective, but also about what actuaries are paid to do and whether they're at the core of their job. Insurance is not AI. We have regulation regarding AI, but it's not well suited for insurance, and actuaries want to step in and address specific problems.

Focussing on data sets and the importance of data hygiene or the quality of the data. Where does that intersect with questions of bias?

When you're working as an actuary, you have data coming from both sides – from underwriters and from claims. You link them through the policy order number, or something like that, so you can make a study predicting losses, etc. Then we started to get additional data. We started to get data because the insurance company bought it. For household insurance, for instance, they could get satellite pictures or old data about flood events. Or when you have a car, it's possible to get a lot of additional information – about your credit scoring and stuff like that. So we have a lot of data, but we are not sure exactly if there could be biases. David Hand called those 'dark data'.

Telematic data can be used to detect some patterns, like how you drive and when, but from a legal perspective, if you experience an accident, it's difficult. At one point, I was working on satellite pictures for houses, and when you have black roofs or red roofs, it could be difficult to distinguish the contour of the house from its shadow. So we have a lot of biases everywhere. And unless you really get into the data, it's very difficult to say something objective.

The other point is, sometimes we don't know exactly why those data were collected and how they were collected. Think about credit scoring, Cathay O'Neil mentioned that in her book 'Weapons of Math Destruction'. There are a lot of discussion in the US and the UK about that. Sometimes, we think that we find a good proxy of the risk, but it can be unreliable. What if we start discussing with a client afterwards and say, 'we are going to increase your premium because we noticed a pool in your garden in satellite pictures,' and the client says 'I don't have a pool.' Some external information can be wrong or flawed, and most of the time, clients have no way to correct it.

A final problem is what we call gamification. In sociology we say that when a measure becomes a target, then it's no longer a measure, that is Goodhart's law. Basically, if you know that something will be used against you for your premium, you're going to leverage that.

You mentioned the UK and the US, but in the EU, we have a different sort of regulatory framework, for example the GDPR. How big are the differences between the US, Canada, the UK and the EU? Is it more difficult in the EU to get trustworthy data? Or do these regulations actually make actuaries' lives easier? >

> ***One thing I did observe in the US, is the big part played by data brokers.***

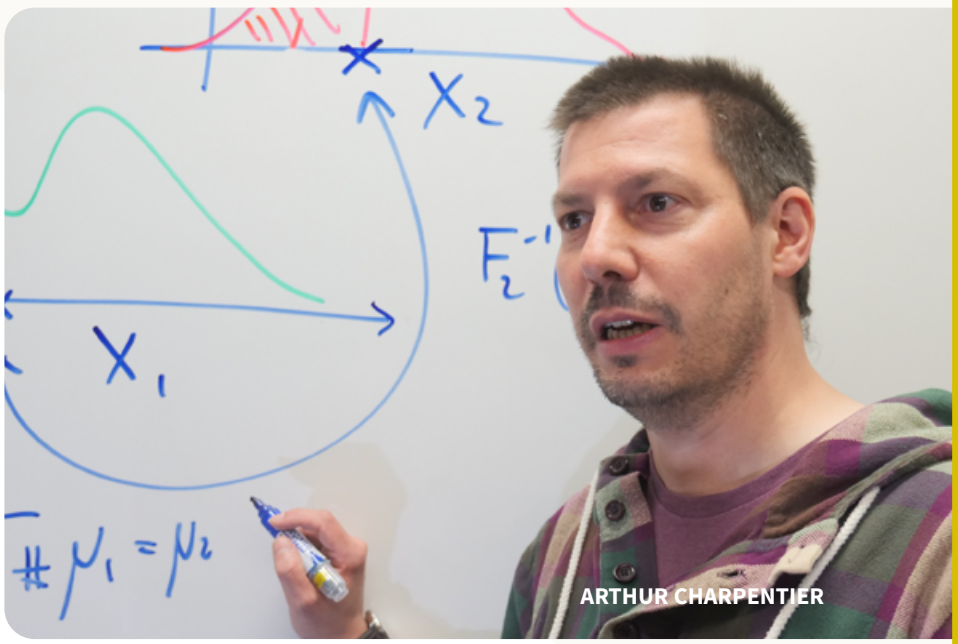
I think it's a difficult question. So first of all, I'm a mathematician, so I try to work on fundamentals, with well-defined concepts. The other thing is, sometimes it's hard to follow. You mentioned GDPR, which is obviously helping policyholders to protect information, especially sensitive information. But then came the discussion about FIDA, the Financial Data Access regulation, which is about allowing the sharing of data between insurance companies and banks, and third parties. I really wonder how we can address privacy in that context, for example.

One thing I did observe in the US, is the big part played by data brokers. If you want to get a lot of data for someone, then it's possible to buy it. People don't do that in Europe, which I think is a very, very good thing. One consequence I see in North America is that it's impossible to get your insurance company to forget something. There's no right to be forgotten. So for example, if you got cancer a few years ago, and even if you recovered, it's still somewhere and it can be used against you. I think regulation is going in a good direction in Europe, but things can change very, very fast. There are a lot of lobbies in Europe.

In Europe everything is claimed to be done for the good of consumers. But sometimes being good for consumers in insurance is to go against the common good. It's not possible to say to policyholders 'it will be good for you' because usually if it's good for you, it will be bad for someone else. We have this problem in insurance, which is sort of a zero sum game. So we need very good regulation, and I don't really see that in Europe.

Regarding equality and diversity, where do we see that playing out in the practice of actuaries in the actuarial workplace?

Well, actually, it's everywhere. I mean, in the 'handbook of discrimination', by Kasper Lippert-Rasmussen, there's one chapter dedicated to insurance. I think the very sentence is, 'insurance is complicated, and it's complicated because at the core of insurance, you have discrimination.' Actuaries are paid to discriminate. But it's only to make a discrimination with respect to the risk. So if you claim that someone taking more risks should pay a higher premium, it sounds fair. The thing is, sometimes it's complicated because you are more a more risky policyholder, but it's not a decision or a choice you made. So I think there are a lot of issues regarding >



ARTHUR CHARPENTIER

> ***I think in some way, actuaries are the 'canaries in the coalmine.' I think actuaries should be more involved.***

actuarial fairness. In fact, the term 'actuarial fairness' has been introduced by economists – it's about efficiency and accuracy, not ethics.

It's about having a premium which is proportional to the risk. And the problem is that some people are more risky, but it's not a choice that they make. But the frontier is very difficult to assess. For example, if someone is willing to do extreme sports, it's a choice. So it's legitimate and fair to ask for a higher premium. But if someone has hearing disabilities and it makes his life difficult, should we charge him more? It's not something that that person desires, so it's very difficult to say what could be seen as fair and unfair. And then on top of that, you get regulation. And obviously, if regulation says you cannot discriminate based on gender? Well, you have to respect it, even if you observe in your data that there's a difference. For example, you observe that women live longer, you might want to take that into account to calculate pensions. We need to find a decent way to address this problem.

Finally, one of the biggest risks that we see facing us is climate change. What is the role of Actuaries or the insurance industry when it comes to helping to plan and mitigate some of these risks?

Yeah, climate change is clearly a very important topic. It has a little bit to do with fairness. For example, when we talk about flooding in insurance, we know almost exactly where the risky areas are, so insurers don't want to sell insurance in those areas. That is a reminder of an old problem that was observed in the US, which was 'redlining'. Now we have exactly the same problem, sometimes called bluelining, which is having areas where we don't want to sell insurance, because of a risk. What was observed in the US is that actually we again target poor communities and minorities. So all those problems are connected.

But I think the problem of talking about insurance and climate change is that insurance typically comes into play only after a problem has occurred, footing the bill for the damages. And I think if we keep doing that, it's not going to work.

I think actuaries should step in at the beginning of the problem – for example to lobby to avoid building houses in already risky areas, or at least warn that it would be risky. In California, a lot of insurance companies moved away because of the wildfires. And when you try to understand why the company moved, one of the problems is that most of the software used by companies to forecast risks are black box models.

I think in some way, actuaries are the 'canaries in the coalmine.' I think actuaries should be more involved. We should get actuaries working more deeply in the writing of IPCC reports. There should be actuaries involved everywhere just to help make wise decisions.

I also want to add that I think actuaries need to communicate more, and must be more pedagogical. We need to explain to the people that insurance is somehow a zero sum game. Basically, insurance is the contribution of the many to the misfortunes of the few. We collect premiums, and then we repay people having losses. So it's essentially about how we collect the money and how we share it afterwards. Insurance companies don't create money. It's a welfare and fairness problem. <

REVIVING UK INVESTMENT

BY **ASHOK GUPTA**

Investment into the UK economy is vital to our prosperity, to address societal inequality, to support the climate transition and fuel economic prosperity. Yet the UK investment system itself is ineffective and needs reform. The potential that actuaries have to help realign the investment system to better support society is not well understood.

This may come as a surprise to many readers, but it becomes obvious when you consider the investment system as a whole. Through that lens, the pivotal role that actuaries play in determining how investment monies are allocated becomes clear.

Understanding and improving the investment system is the challenge New Capital Consensus (NCC)[1] has set itself. NCC's evidence for the failure of the UK investment system derives from the UK having the second largest pool of investment within the OECD yet remaining one of the worst invested countries. The UK investment system is failing to channel UK savings into the UK economy.

Our work to date has focused on the UK – a complicated enough challenge! Future research is hoping to consider other countries. Clearly if these failings are true of the UK, similar factors could be affecting investment in other countries?

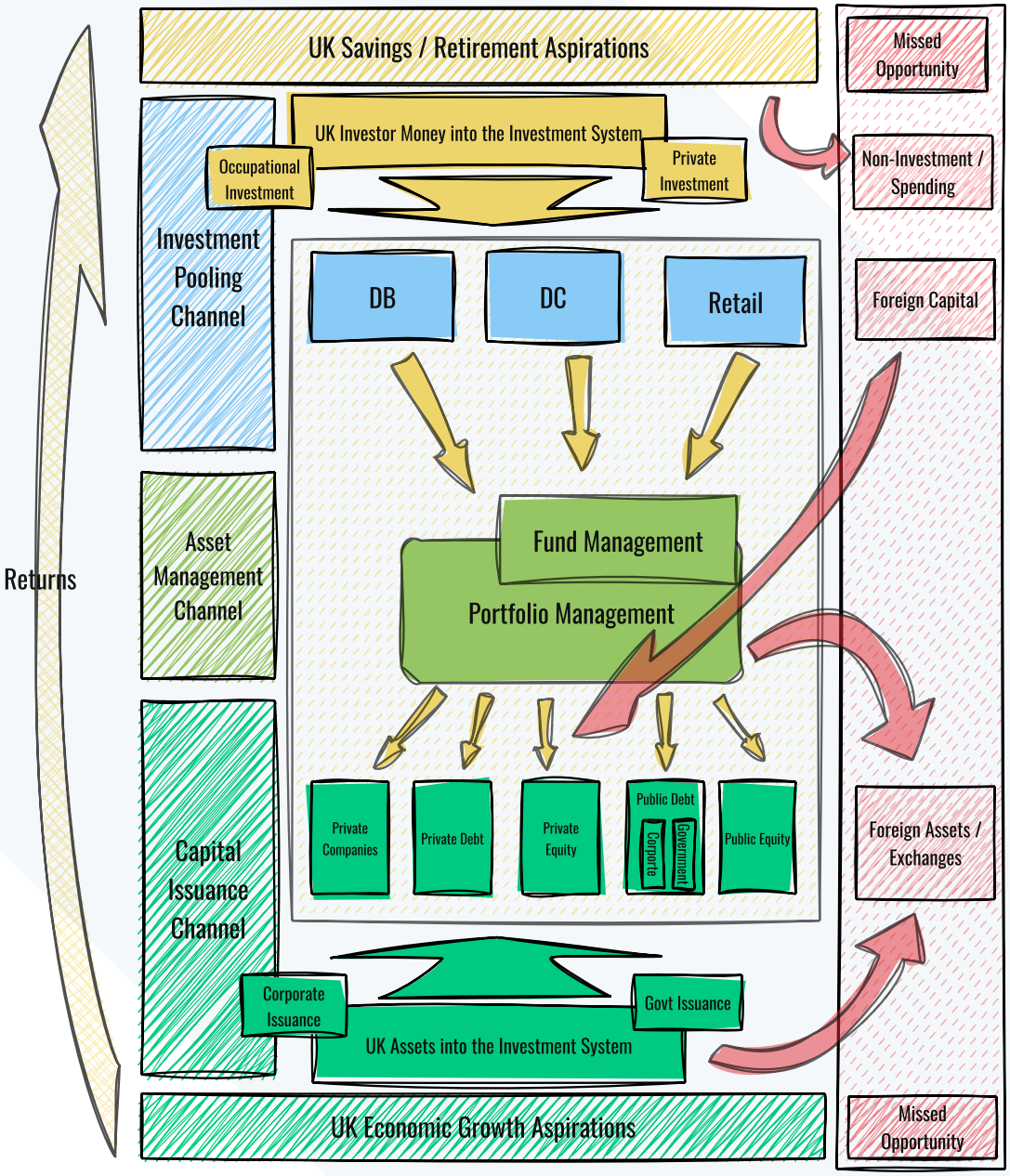
THE UK INVESTMENT SYSTEM

The origin of UK savings is the population; their savings are comprised mostly of investment for retirement and the system primarily needs to work for them. The destination for part of these savings should be the UK economy, comprised of companies who need investment capital to produce goods and services, create jobs and economic prosperity.

While trustee fiduciary duties require them to make asset allocation decisions in the interests of their stakeholders, and many argue they invest overseas to get better returns, inefficient asset allocation techniques result in few DB schemes getting the levels of return enjoyed by the large Canadian schemes. >

[1] NCC, an independent, not-for-profit, apolitical project, the result of a coalition of Chatham House Sustainability Accelerator, Leeds University, Radix (a think-tank for the radical Centre) and the IFoA's own FinSTIC (Financial Systems Thinking Innovation Center).

NCC'S VIEW OF THE UK INVESTMENT SYSTEM



The bulk of the system comprises three channels:

- the Investment Pooling Channel, which comprises DB and DC pension schemes, the Retail Investment sector plus financial advisors;
- the Security Issuance channel, which raises capital for UK companies and of course the government, through both public and private capital markets; and linking these
- the Asset Management channel, which takes pools of capital provided by asset owners and invests them utilising capital markets.

The UK investment system does not live in isolation and is connected to other UK financial systems like the banking or insurance systems and forms part of an interconnected global system, as illustrated by the column on the right.

UK SYSTEM FAILINGS

NCC's quantitative research has identified the amount of money in the system, where it resides and how it has been invested. In addition, a series of nearly >

50 interviews has been used to identify the incentives within the system and how these drive the allocation of savers' money. What has **NCC's research** found?

Interviewees identify that current market structures have developed in an amorphous way and do not today support the effective allocation of capital, eg the interface between the investment pooling and the asset management channel is a key point of weakness. Thousands of asset owners all feed into a very concentrated set of investment consultants and fund managers. This has led to herding behaviours, so that most investment strategies are very similar. All but the very large asset owners have insufficient agency. Structures and incentives all drive long-term money to be invested in a short-term way.

What may make sense for an individual pension scheme, such as derisking its investment strategy and developing a glide path to buy-out, makes less sense when done by the entire system and has resulted in significant loss of money from the system.

The Investment Pooling Channel comprises three distinct interconnected submarkets (DB, DC and retail and private savings), each with its own regulatory and market structure, imposing a patchwork of regulation upon the UK's pensions and savings industries. This is inefficient in terms of economic funding and creates complications for individuals whose savings are governed by multiple regulatory regimes.

The primary incentives identified are all the ones you expect - regulation, accounting, tax, risk management and market practices. These all drive a very heavy focus on cost minimisation, elimination of volatility and provision of liquidity. Given volatility and liquidity are secondary factors for long-term investors, this seems unhelpful. Public price transparency helps regulators reduce fraud, but the hunt for liquidity and short-termism is the antithesis of long-term investing. Asset managers, of course, invest according to the mandates provided by asset owners which are constrained by their regulatory risk appetites.

What is more interesting are the incentives that are absent. Bizarrely there are almost no incentives to seek returns; and limited incentives to close market gaps, such as providing decumulation solutions and low-cost advice/guidance using technology, or to account for externalities (including the future value of investment as distinct from its immediate cost).

The feedback loops identified that have developed over time are key. Many actuaries will recognise that DB accounting standards have led to short-termism in the investment mentality of DB Schemes. For those of you not familiar, the excellent **report of the House of Lords Review** into the Liability Driven Investment (LDI) crisis of September 2022, that severely disrupted the UK gilt market, is a must-read.

The feedback loop of most relevance to actuaries relates to risk management. The system focus on short-term volatility as a proxy for long-term investment risk has contributed to risk aversion. The system tries to eliminate short-term volatility rather than find the appropriate trade-offs between long-term, outcome-centric risks and rewards. This has contributed to UK Defined Benefit pension funds reducing their holdings in equities, which when combined with a shift to greater use of global mandates, has resulted in the UK now having one of the lowest levels of investment in its own companies across the OECD.

But perhaps the most damning criticism of the system is that its desire for liquidity disincentivises primary investment, i.e. investment by companies in their businesses to help them provide the products, services and jobs the country needs to fuel economic prosperity. **>**

WHAT CAN BE DONE?

The Government has already set out on the right path through its Pensions Investment Review led by a Minister that sits across the UK Governmental Department for Work and Pensions (DWP) and the UK Treasury. It is vital that this review is ambitious in its scope. NCC has set out a series of recommendations that could reorient the incentives within the system.

DB consolidation is clearly needed for private as well as public schemes. We also believe we need to change tax incentives to reflect what wrappers invest in. We need better long-term risk management measurement and mandates that reflect the needs of savers. Removing the requirement for daily liquidity in DC and retail investments will help pensions schemes to exploit their inherent ability to invest long-term. Too many mechanisms, e.g. Default fund lifestyling and buy-out guide paths, encourage pension schemes to derisk far too early, reducing investment risk at a time when investment pots are high, and risk appetites remain substantial.

Policymaking is itself a patchwork affair, the disparate elements of which (from Pensions Review to Industrial Strategy) need to be analysed as a networked whole.

Individually actuaries operate on a micro level in providing advice to clients and organisations. Collectively, as a profession, we have an obligation to consider and articulate the effects of actuarial work on society. Certainly, many of our techniques are driven by regulation, but we are consulted and engaged on these regulations and actuaries are involved in the technical details.

If we fail to speak out about the potential damaging impacts of inappropriate regulation, our reputations and that of our profession are at risk. The Profession has a voice, we need to make sure it uses it – to create a financial industry that is not failing our society but investing in it. <

ASHOK GUPTA

ASHOK GUPTA is a Founder of New Capital Consensus, a non-profit, independent coalition of organisations set up to analyse the UK investment system and identify leverage points capable of encouraging long-term investment in societal objectives. He also has various NED roles. He has chaired an industry review of the Defined Benefit pensions sector and was joint deputy chair of a Bank of England Working Group on Procyclicality.

INTEGRATED AND EXPANDED **WELFARE MODELS** A CHALLENGE FOR ACTUARIES

BY **GIAMPAOLO CRENCA**

The concept of welfare is usually divided into three 'pillars'. The first pillar incorporates all public policies carried out by a state that have the purpose of providing for assistance and the wellbeing of its people by satisfying their essential needs; this is referred to as a whole as the welfare state.

As changing demographic and economic factors severely impacted the welfare state in many European countries, two extra pillars have emerged. The second pillar of welfare refers to what is collectively disbursed, for example through corporate agreements. This corporate welfare functions as an additional support to the welfare state. The third pillar is individual welfare, wherein people autonomously seek out solutions for integrating the other named types of welfare. >

The main goal of corporate and individual welfare is to bridge gaps in public provision. While the initial emphasis is on delivering social security, health and assistance, these ideas also involve envisioning expanded horizons for welfare. With this in mind, it is notable that there are significant application potential in the welfare area for PP schemes, that is public-private.

It is also important that such projects give consideration to integrating the various components of welfare, and reflect on the potential for welfare implementation to be further expanded so it also takes in other aspects of human life. A good goal would be to put in place a single integrated and expanded welfare system for the whole of Europe.

At the corporate level, before the details of a welfare plan can be worked out it is essential to make a distinction between 'welfare' and 'fringe benefits' – which may simply be called 'benefits' – because there is often confusion here, and sometimes the two are somewhat intertwined.

Companies should also understand welfare as being more than simple provision. A successful welfare implementation is capable of supporting social innovation, for example; it can strengthen the relationship between trade unions and employers, imply a new organisational model and help build loyalty in a company. There are clear advantages for companies that get it right.

The first essential step is to specify priorities within the vast field of welfare. An immediate list here might include death, permanent disability due to poor health or injury, long-term care, serious illness and major surgery. To that we could add pension funds, medical expense reimbursements, loss of employment, nursery care, school support – all to be integrated with each other to create an integrated welfare concept. Then, if we take the most extensive view and seek to implement an expanded welfare concept, it may make sense to include other areas of life such as housing, cars and the insurance coverage associated with these – thereby widening the scope of welfare needs beyond the human person. Once these priorities are dealt with it is possible to even start looking at fringe benefits such as spa access, company cars, travel tickets, ski passes, and more.

These lists are not exhaustive and are perfectly feasible – as previously mentioned, there are already instances of fringe benefits being included in the welfare area and vice versa. One option for avoiding confusion in classification would be to eliminate the distinction entirely and simply refer to all of it as welfare – after all the most important part is clearly naming the priorities!

Once the components have been individually prioritised it is possible to design a corporate welfare plan, going through the following steps to do so:

1. **Corporate analysis**
2. **Analysis of workers' needs**
3. **Definition of objectives**
4. **Selection of benefits types**
5. **Selection of a financing model to support the designed welfare strategy**
6. **Continual monitoring of the welfare plan**

The first step serves to ensure a full understanding of the actual corporate situation; this is important for identifying exactly which workers fall within the scope of the welfare plan. It also incorporates a gap analysis to reveal the shortcomings of welfare coverage; this gap analysis should include the impact of state welfare. Only after this is done is it possible to address the actual needs of the workers, by means of a specific examination that always keeps the agreed order of priorities in mind. >

The goal here is to design a set of benefits that is simultaneously:

- **consistent with the actual needs of workers**
- **competitive in relation to the market**
- **tax attractive**

Once the strategic welfare plan has been designed it is then necessary to decide on the financing model, which could include the following solutions, either individually or in combination:

- **company resources**
- **using a portion of the workers' income**
- **conversion of corporate bonuses into welfare**

Other possibilities can obviously be investigated.

If the cost of the entire welfare plan is too onerous to be borne in one year, there is the option of implementing a gradual financing plan which expands over time, with priority given to the more urgently requested workers' needs.

What about the acquisition of welfare goods and services? The market here is extensive: companies can explore the insurance and financial sectors, pension funds, supplementary private health funds and many other providers.

Tax rules are an important consideration. There may be surprises in this area, as these rules are sometimes very different within the welfare space, especially in relation to pension funds, supplementary private health funds and assistance.

Is it possible to build an individual, customised welfare plan to suit professionals, for example? Yes, and doing so requires very similar steps to those described above. The financing model could present a particular problem here – a gradual plan may be the answer.

What is the actuary's role in this? The actuarial approach enhances all the steps described above with quantitative and qualitative analysis, so that the designed corporate welfare plan is founded on a sound technical and economic basis and management is supported to find the best solutions.

Given that welfare is a key issue facing governments and people across all of Europe, this is an opportunity for actuaries to make a great contribution and further develop the profession in Europe. In short, it is about delivering evaluations to support decisions: a challenge made for actuaries. <

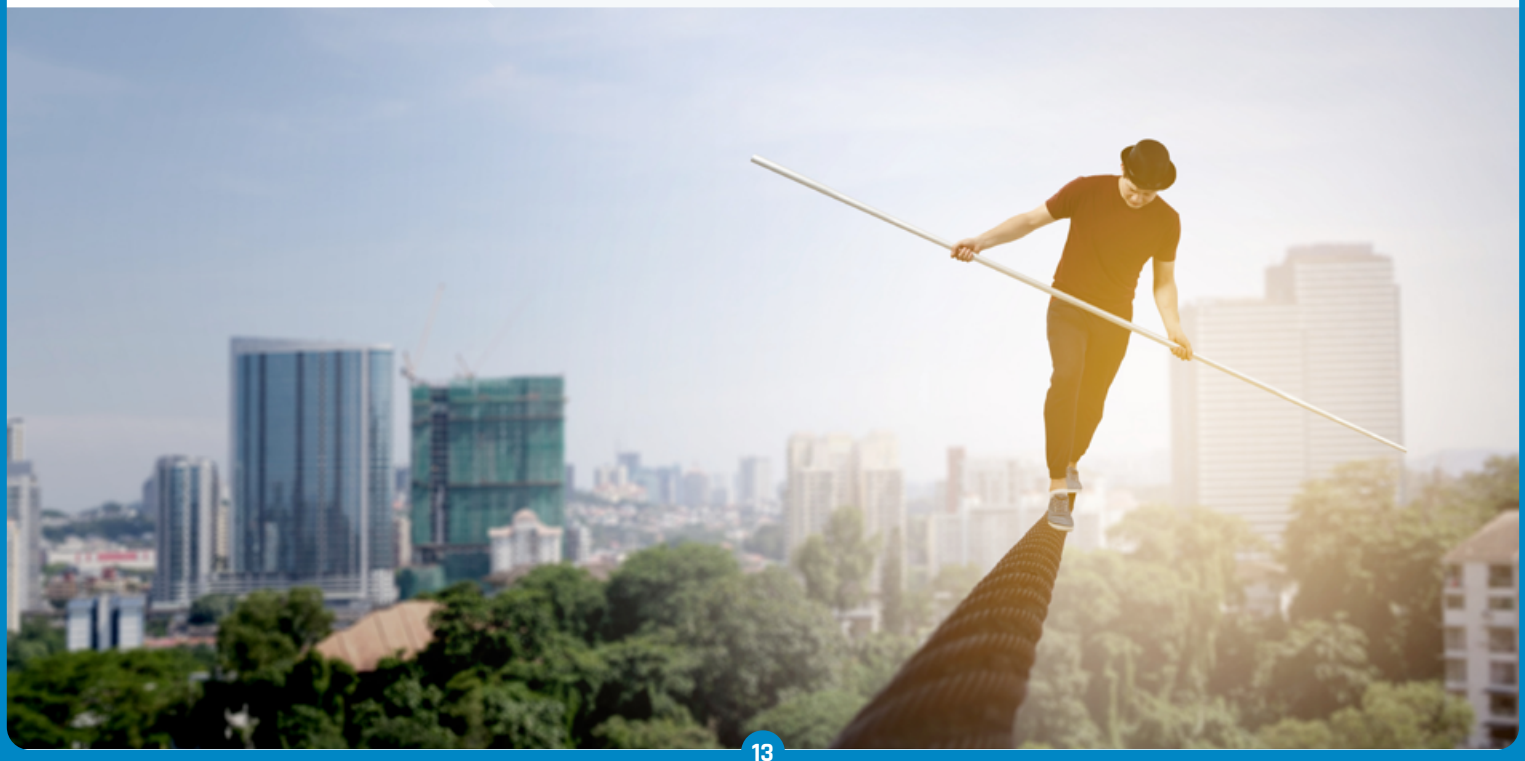
GIAMPAOLO CRENCA is President Italian Society of Actuaries (ISOA).

SOCIAL SUSTAINABILITY IN THE INSURANCE INDUSTRY: A CRUCIAL COMPONENT

BY **FRANK SCHILLER**

Social sustainability is an essential element of the solutions provided by the insurance industry. Insurance effectively safeguards individuals through the pooling of risks across a collective and over time. Insurance companies, while privately organized, must also take into account regulatory requirements (such as Solvency II) and other economic factors (such as regularly paying dividends to shareholders, though mutual insurance companies may face less pressure than publicly listed ones). These considerations ensure that insurers can offer risk coverage sustainably and stably in the long term.

This balancing act may result in potential conflicts between the different ESG (Environmental, Social, and Governance) sustainability goals – such as social versus environmental objectives – or between social goals and the stable, economic financing of insurance solutions. Actuaries, with their specialized training and expertise, are uniquely positioned to design appropriate solutions for these conflicts. >



It is vital for companies to evaluate and weigh the available options and assess how they impact various target dimensions, particularly ecological, social, and economic aspects. Actuaries support management in making informed and balanced decisions that account for the interests of policyholders while also safeguarding the collective of insured individuals.

Beyond the insurance sector, actuaries can also contribute to broader societal solutions by advising policymakers, independently assessing the various options available.
In Germany, there are specific challenges in the fields of pensions, life, health, and property insurance that require the involvement of actuaries. Key areas include:

1. **PENSIONS:** How can the occupational pension system and the current pay-as-you-go system of the first pillar be modernized to prevent old-age poverty despite volatile capital markets and demographic shifts?

2. **RISK ASSESSMENT:** How can personal risks be assessed appropriately in insurance, ensuring affordable premiums and a stable collective, while avoiding the unjust exclusion of individuals or the unjustified increase of premiums and restrictions on access to coverage? Currently, the 'right to be forgotten' regarding certain pre-existing conditions is being discussed at the European level in life and health insurance.

3. **DISABILITY INSURANCE:** In disability insurance, premiums for certain professions can become prohibitively high, making coverage unaffordable for some. Actuaries can develop new coverage models, such as basic capability insurance, offering tailored solutions for these groups.

4. **HEALTH INSURANCE PREMIUMS:** Ensuring the affordability of health insurance premiums, particularly after retirement, is crucial. Actuaries can provide valuable insights into expanding existing models to address this issue.

5. **NATURAL DISASTER INSURANCE:** In natural hazard insurance, a conflict arises between risk-based premiums, which incentivize property owners to take protective measures and improve resilience against natural hazards, and the resulting premium increases, which can make coverage unaffordable, particularly for lower-income individuals, raising the risk of underinsurance.

6. **ARTIFICIAL INTELLIGENCE:** Actuaries play a vital role in ensuring that data and methods used in the development and pricing of insurance products and processes are free from bias and discrimination, particularly with the increasing use of artificial intelligence.

These examples highlight the significant contribution actuaries can make in the coming years, providing data-driven, knowledge-based analysis and fostering informed discussions to develop appropriate solutions. <

FRANK SCHILLER is Chair of the Enterprise Risk Management Committee at DAV.

PLANETARY SOLVENCY

GLOBAL RISK MANAGEMENT FOR HUMAN PROSPERITY

BY **SANDY TRUST**

Imagine a successful mid-to-late career individual in a non-financial industry. This senior and respected person has had limited exposure to pensions. Of course, they make contributions but they've never needed to be close to technicalities. Suddenly this individual is elected to the trustee board! She needs to learn all about funding ratios, solvency, longevity, investment strategies, employer contributions and so on. She's never needed to know this but now it is essential knowledge if she is to do a good job.

This is analogous to us today, needing to work out how to drive human activity within the finite limits of the planet we live on. Until recently we really didn't need to worry about climate change, destroying nature or running out of resources like critical minerals or water. Things have changed though because despite huge progress in terms of lifespans, wealth and technology we are sailing into increasingly choppy waters. How so?

Human activity is now of such pace and scale we are driving outcomes on a planetary level. Scientists have mapped out how we are doing against the concept of Planetary Boundaries, producing a Planetary Health Check. The latest assessment shows we have exceeded 6 out of 9 Planetary Boundaries. The lights on this particular dashboard, which includes climate change, are flashing red. >

SANDY TRUST

Do we need to worry about this though? Is going past Planetary Boundaries really a problem, or is it like an overdraft, can't we invent some new technologies and pay it off in the future? If it is a problem, then how can we put in place some planetary risk management to bring us back inside these boundaries? Lets answer these questions and see where we get to.

Do we need to worry about going past Planetary Boundaries, is it a problem?

Oh yes, unequivocally we need to worry. Although we don't think about this a lot in our modern society, it is obvious that you can't have an economy without a society and you can't have a society without somewhere for them to live.

That sounds dramatic yet scientists are warning of significantly reduced human habitability if we do not mitigate climate change. Our global civilization has evolved in an unprecedentedly stable climate for the last 12,000 years, known as the Holocene. It is very handy for agriculture if you can be reasonably sure about seasons and good conditions for growing your crops.

The impact of human activity is now changing these conditions, with a rapidly changing climate starting to impact reliability of the food system, often through too much water or too little water. This seems counterintuitive, how can there be both too much and too little? Well, a warmer atmosphere holds more water, 7% more for every degree rise in temperature. It gets sucked up from somewhere (droughts) and dropped somewhere else (floods). So the weather is changing.

However, as the global average temperature increases past 1.5C we invoke the looming menace of tipping points. These tipping points include irreversible Greenland ice sheet melt, coral reef loss and major ocean current disruption, with the potential for catastrophic impacts, including loss of capacity to grow major staple crops, multi-metre sea level rise, altered climate patterns and accelerated global warming. Tipping points can trigger each other, causing a domino effect or cascade of accelerating and unmanageable damage.

Another way of putting this is that for every 0.1C temperature rise, we decrease our agency and increase the challenge of bringing temperatures back down. If tipping cascades are triggered we may push the planetary system out of the Holocene stability pattern and into a hot-house Earth state. As far as we can tell, the Earth has never been above the 2C mark for millions of years. Scientists call this the corridor of life, if we leave it we enter what climbers call the death zone – escalating climate impacts which it might prove very challenging to successfully adapt to.

Tipping points show that the overall threat posed by the climate and ecological crisis is far more severe than is commonly understood. Climate change and nature risks, driven by human activity, are now a matter for human security with populations already impacted by food system shocks, water insecurity, heat stress and infectious diseases. If unchecked then mass mortality, involuntary mass migration, severe economic contraction and conflict become more likely.

So although 1.5C may not sound like much, perhaps we should view it and other planetary boundaries as akin to solvency limits for our civilization. Developing the concept further we could seek to define risk tolerances and appetites, leveraging our financial risk and solvency management toolkit to supply a risk led message to policyholders.

Developing a global risk management toolkit, to raise the profile of these systemic risks

In 2022 *Climate Endgame*, proposed a new scale of societal impacts for climate change, recognizing that there has been limited analysis of higher warming scenarios. This isn't scaremongering, >

RATING	FINANCIAL IMPACT	NON-FINANCIAL IMPACT			
	GDP losses	Human mortality	Climate	Nature	Societal
EXTREME	≥ 50%	≥ 50% > 2 billion deaths	3C or more by 2050 Multiple climate tipping points triggered, tipping cascade.	Breakdown of several critical ecosystem services and Earth systems. High level of extinction of higher order life on Earth.	Significant socio-political fragmentation worldwide and/or state failure with rapid, enduring and significant loss of capital, and systems identity. Frequent large scale mortality events.
CATATROPHIC	≥ 25%	≥ 25% > 2 billion deaths	2C or more by 2050 High number of climate tipping points triggered, partial tipping cascade.	Breakdown of several critical ecosystem services and Earth systems. Major extinction events in multiple geographies. Ocean circulation severely impacted.	Severe socio-political fragmentation in many regions, low lying regions lost. Heat and water stress drive involuntary mass migration of billions. Catastrophic mortality events from disease, nutrition, thirst and conflict.
DECIMATION	≥ 10% > $10 trillion annual losses	≥ 10% > 800 million deaths	Global warming limited to 2C by 2050. Several climate tipping points triggered.	Severe reduction in several critical ecosystem services. Major extinction events in some geographies. Frequent global food and water crises.	Severe socio-political fragmentation in regions exposed to climate and/or nature impacts. Failure of vulnerable states and mass mortality events in impacted areas.
SEVERE	≥ 5% > $5 trillion annual losses	≥ 5% > 400 million deaths	Global warming limited to 1.5C by 2050 following overshoot. Some proximate climate tipping points triggered.	Some impacts to critical ecosystem services. Ongoing species extinction. Regular global food and water crises.	Some socio-political fragmentation in most vulnerable states, where adaptation has been limited. Fragile states exposed to climate risks see mass migration and mortality events from heat, water and stress and weather events.
LIMITED	≥ 5% > $1 trillion annual losses	≥ 1% > 80 million deaths	Global warming below 1.5C by 2050, with limited overshoot. Climate tipping points largely avoided.	Mass extinction avoided and ecosystem services largely functional. Occasional global food crises and widespread water crises.	Ongoing significant climate impacts with many hundreds of billion dollar + loss events annually and associated mortality and socio-political stress.

it's simply good risk management to think about adverse outcomes, and to inform whether any additional action is required to mitigate or avoid risks based on the defined appetites.

Planetary Solvency builds on *Climate Endgame* to define a civilization level risk impact matrix across five dimensions of mortality, economy, nature, climate and society as shown above. >

Once your risk matrix is determined, then its relatively simple to plot risk positions and trajectories. The risk analysis is based on current scientific knowledge, meaning that the risk-based approach is applied to detailed scientific climate analyses that have already been performed. Based on the impact definitions in the risk matrix, our risk trajectory is concerning, with *Catastrophic* or even *Extreme* climate impacts *Likely* or *Highly Likely* by 2050. As with any risk management exercise, the likelihood and impact levels need to be combined, so that the high likelihood and high impact should ring a loud warning bell.

Accompanying this risk assessment would be high-level commentary, supported by further supporting detail. For example, for the climate change dimension this might be:

CLIMATE CHANGE: There is a risk that climate change is not mitigated, leading to further global temperature increases and increasingly severe climate impacts, which overwhelm societies ability to adapt.

a) Risk position: AMBER
Impact Limited, trending to Severe in 2024 with increase in $billion+ loss events and 10k+ mortality events globally. Ongoing increase of emissions and GHG levels, with warming implications. The risk mitigant of the energy transition is accelerating rapidly.

b) Risk trajectory: RED
Tipping points increase risk exponentially past 1.5C. Emissions and GHG levels imply >2C by 2050. *Highly likely Catastrophic* warming levels experienced pre 2050 with *Extreme* warming *Possible* to *Likely*. Policy support required to radically accelerate transition, reduce emissions and leverage natural solutions.

Risks are interconnected, climate and nature impacts are likely to have societal consequences. But as in financial services, a *Catastrophic* level of warming does not mean there will be an immediately *Catastrophic* economic shock or mortality event. For example, today we are at around 1.5C of warming, so *Severe* on the climate dimension but still impacts are *Limited* on the economic and mortality dimension. However, as climate and nature risks ratchet up, increasingly severe societal impacts become more likely.

As with any risk management exercise, Planetary Solvency would point to the action required to mitigate risk.

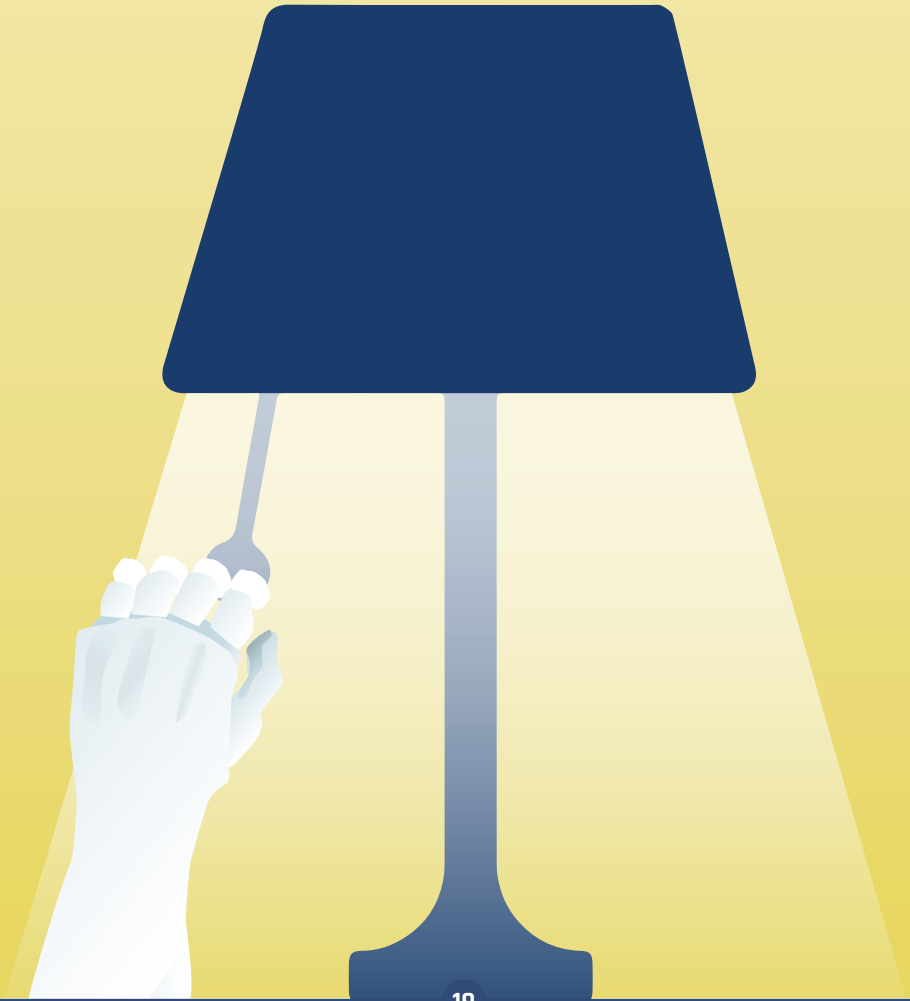
With policymakers seemingly unable to hear warnings about risks to ongoing human progress or unwilling to act upon them with the urgency required, could this be an enhancement to global risk management that could help to mitigate the systemic risks we face? <

SANDY TRUST is an IFOA Council member and supports a variety of industry initiatives on climate and nature risk assessment.

EXPLAINABLE AI
FOR C-LEVEL EXECUTIVES IN INSURANCE

BY **ANNI HELMAN, BOGDAN TAUTAN, CLAUDIO SENATORE RESO, ESKO KIVISAARI, JONAS HIRZ, LEONID ZELDIN** AND **STEPHANOS HADJISTYLLIS**

Artificial Intelligence has quickly become a cornerstone of innovation in insurance, offering transformative potential in areas like underwriting, claims management, and risk assessment. But as AI systems grow in complexity, one critical challenge has surfaced: *the ability to explain how decisions are made by AI*. Enter Explainable AI (XAI)—a vital tool not only for regulatory compliance but also for fostering trust among customers and stakeholders. >



As noted in the AAE's recent discussion paper, 'Explainable Artificial Intelligence for C-Level Executives in Insurance', the stakes are high. With increased regulatory scrutiny, such as the AI Act and General Data Protection Regulation (GDPR), insurers must ensure that their AI systems are transparent, understandable, and fair. XAI plays a central role in achieving this, transforming AI from a mysterious 'black box' into a system that provides clear insights into decision-making processes.

WHY XAI MATTERS FOR EXECUTIVES

The growing reliance on AI in the insurance industry has led to a rise in operational, ethical, and regulatory risks.
Lawsuits and fines related to opaque AI decisions are on the rise, underscoring the need for transparency. For C-level executives, understanding how AI systems arrive at critical decisions, such as claims approval or pricing, is essential not only for regulatory compliance but also for maintaining customer trust.

AI models, especially in areas such as claims management and risk scoring, have traditionally been difficult to interpret. Customers, regulators, and even internal teams often struggle to understand how decisions are made. By adopting XAI, insurers can enhance the transparency of these processes. For example, tools like SHAP (Shapley Additive Explanations) and LIME (Local Interpretable Model-Agnostic Explanations) help explain how specific features influence AI decisions, allowing for greater transparency and accountability.

Actuarial standards and methodologies are still in development and so it is highly recommended to diversify approaches by applying more than one methodology in order to obtain a broader overview for the explainability of results.

REGULATORY IMPERATIVES

In Europe, the regulatory landscape is rapidly evolving, making XAI a strategic priority. The AI Act, currently under development, sets out rigorous requirements for transparency and accountability in AI systems. Similarly, GDPR requires companies to provide explanations for decisions made by automated systems, particularly in cases where decisions impact individual rights. Failure to comply with these regulations can result in significant penalties.

XAI offers a solution to these challenges. By integrating XAI tools, insurers can ensure compliance by providing clear explanations of how decisions are made, mitigating the risk of regulatory fines and legal challenges. More importantly, it allows executives to demonstrate their commitment to ethical AI practices, reinforcing their reputation with regulators, customers, and shareholders alike.

BEYOND COMPLIANCE: BUILDING TRUST AND VALUE

Regulatory compliance is just one piece of the puzzle. For C-level executives, the true value of XAI lies in its ability to foster trust and unlock the full potential of AI systems. When customers understand how their claims were processed or how their premiums were calculated, they are more likely to trust the insurer, leading to higher customer satisfaction and loyalty.

Moreover, XAI enhances internal decision-making. With clearer insights into AI models, executives can make more informed strategic decisions, identifying potential biases and ensuring that AI-driven decisions align with the company's broader goals. In this sense, XAI is not just a compliance tool; it is a strategic enabler that empowers executives to extract greater value from their AI investments. >

PRACTICAL STEPS FOR IMPLEMENTING XAI

Implementing XAI is vital for ensuring that AI systems are transparent, accountable, and aligned with regulatory requirements. More importantly, it enhances stakeholder trust by demystifying how AI-driven decisions are made. To successfully embed XAI, C-level executives must approach the task strategically, ensuring it becomes an integral part of their organisation's AI and governance frameworks.

The first step is aligning key stakeholders across the organisation. Buy-in from IT, compliance, legal, and senior leadership teams is essential to emphasise the importance of ethical AI, ensuring that explainability is not just a technical add-on but a strategic priority.

Next, it is crucial to select the right XAI tools. Depending on your AI models' complexity, tools such as SHAP, LIME, or ICE should be chosen carefully. These tools help provide explanations for individual decisions (local indicators) or broader trends (global indicators), addressing the varying needs of internal teams, regulators, and customers.

Finally, XAI must be integrated into a broader AI governance framework. This includes regular audits and continuous monitoring to ensure the transparency and fairness of AI models over time. Embedding XAI into your governance processes guarantees ongoing compliance with ethical standards and helps mitigate risks, such as biased or opaque decision-making.

Actuaries, with their deep expertise in risk management, data analysis, and ethical standards, are uniquely positioned to lead the implementation and governance of XAI within insurance companies. Their ability to assess complex risks, interpret large datasets, and uphold rigorous ethical codes can support the need to ensure that AI systems remain fair and transparent. As trusted advisors on financial risk, actuaries can provide C-Level Executives with actionable insights into AI operations, bridging technical complexities and business priorities. By integrating their understanding of regulatory requirements and ethical considerations, actuaries can drive the adoption of responsible AI practices, ensuring alignment with both strategic goals and stakeholder trust.

CONCLUSION

Explainable AI is no longer a luxury—it is a necessity for insurance companies looking to harness the power of AI responsibly. For C-level executives, XAI is the key to not only meeting regulatory requirements but also building trust and unlocking the full potential of AI. By embedding XAI into their governance frameworks, executives can ensure that AI systems are transparent, ethical, and aligned with the company's strategic goals, positioning their organisations as leaders in responsible AI.

For further detail and information please refer to the full AAE discussion paper, '**Explainable Artificial Intelligence for C-Level Executives in Insurance**'. **<**

HOW WRONG IS YOUR MORTALITY PROJECTION MODEL?

BY **STUART MCDONALD**

Mortality assumptions are central to the valuation of pension funds and life insurance portfolios. Typically, they comprise two parts:

- Assumptions about mortality rates today
- Assumptions about how mortality rates will change in the future

While the first of these assumptions can often be tackled in a relatively data-driven manner, the second requires significant judgement.

Actuaries typically use mortality projection models to analyse past trends and extrapolate these into the future. Different models can produce materially different forecasts, so it is important that actuaries understand the assumptions that they are making, whether explicitly or implicitly, when they choose and parameterise a particular model.

Models are by necessity a simplification of reality. As the statistician George Box said, 'all models are wrong, but some are useful'. Model risk arises when a model is not fit for purpose and leads to decision-making which is not optimal.

The Netherlands provides an interesting case study to understand the materiality of model risk in respect of mortality projection models. This is because there are two different industry-wide models in use, both produced by well-respected actuarial organisations, which give very different projections.

PROJECTIONS LIFE TABLE

The Projections Life Table produced by the Koninklijk Actuarieel Genootschap (the Royal Dutch Actuarial Association) is widely used by Dutch pension funds and by primary insurance companies. The latest version of the model, **Projections Life Table AG2024** ('AG2024') was released in September 2024. Its predecessor '**AG2022**' was released in 2022. >

STUART MCDONALD is Head of Longevity and Demographic Insights and a partner at LCP. He is Deputy Chair of the Continuous Mortality Investigation (CMI) and founded the influential COVID-19 Actuaries Response Group. He was awarded an MBE for services to Public Health in the 2022 New Year Honours.

> *All models are wrong, but some are useful*
>
> George Box

CMI MORTALITY PROJECTIONS MODEL

The CMI Mortality Projections Model ('CMI model') is produced by the Continuous Mortality Investigation, and has widespread usage in the UK. The core model is calibrated to data for England & Wales, but the model can be calibrated to other populations. This is often the starting point for global reinsurers looking at different markets, and some reinsurers active in the Dutch market use mortality assumptions informed by the CMI model. The latest version of the model , CMI_2023, was released in May 2024.

At the time of writing, the CMI has announced plans to consult on the next version of the model, CMI_2024, which is due to be released in March 2025.

Since there is no 'official' CMI model for the Netherlands, the analysis in this article is based on a calibration of the model produced by the author and colleagues at LCP. Pre-2022 data was obtained from the Human Mortality Database. 2022 and 2023 data are estimated based on provisional data from the Short-term Mortality Fluctuations database.

COMPARING MODEL FORECASTS

The impact of the different projections on life expectancies varies by age and sex, and also depends on how much weight is placed on 'post-pandemic' data (2022 and 2023) when using the CMI model. Since this is a subjective choice, the charts and table below show the full range of forecasts that can be obtained by varying the weight parameter. No weight is placed on data from 2020 or 2021 to prevent the exceptional mortality from distorting the trend.

Figure 1 shows that the forecasts for male mortality rates from the AG2022 and AG2024 models are similar to the forecast obtained from the CMI_2023 model when no weight is placed on data for 2022 or 2023. As more weight is placed on 'post-pandemic' data the CMI_2023 model projects slower improvement in mortality. >

FIGURE 1: COMPARISON OF PROJECTED MORTALITY RATES – MALES

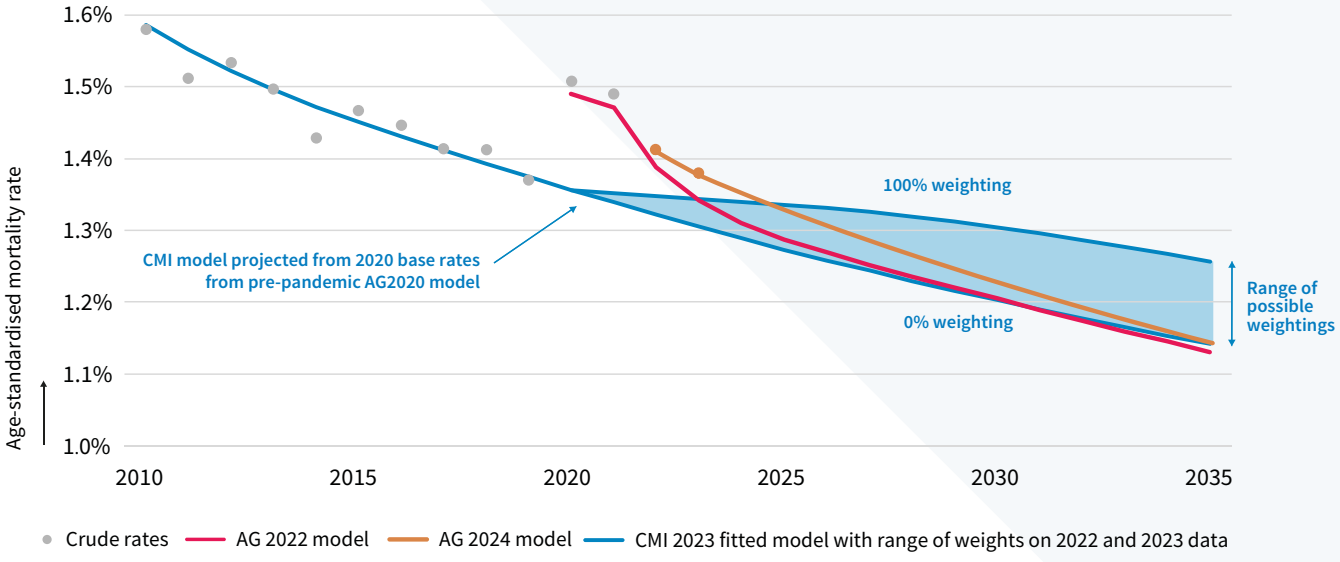


FIGURE 2: COMPARISON OF PROJECTED MORTALITY RATES – FEMALES

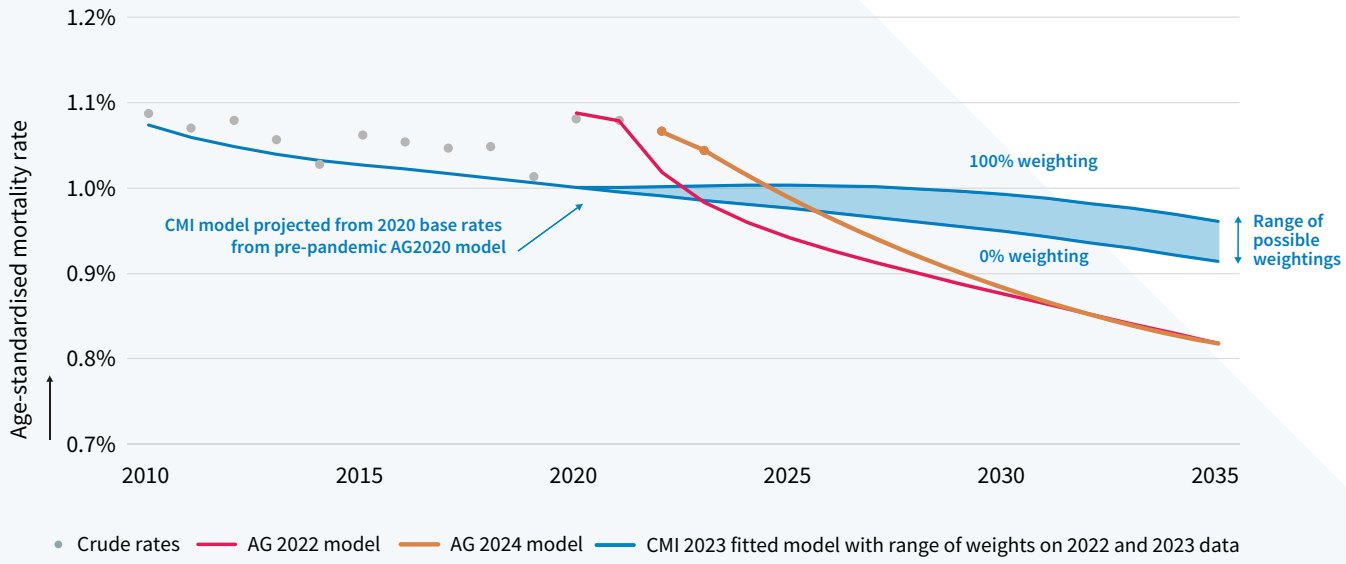


Figure 2 shows that the forecasts for female mortality rates from the AG2022 and AG2024 models are very different from the forecast obtained from the CMI_2023 model, irrespective of the weight placed on data from 2022 or 2023. The CMI model projects materially slower mortality improvement, and hence higher mortality rates.

Table 1 sets out the impact of the different mortality projections on life expectancy (cohort life expectancies, which allow for future changes in mortality). For a male aged 65, CMI_2023 produces life expectancies which are between 1.4% and 4.9% lower than the AG2024 model. For a female aged 65 the CMI_2023 life expectancies are between 5.3% and 6.7% lower.

These life expectancy differences illustrate the materiality of the model risk. The differences between the AG and CMI models are far larger than the differences recently seen between successive versions of either the AG model (life expectancies fell by 0.1% for males and 0.2% for females between AG2022 and AG2024) or the CMI model (life expectancies at age 65 fell by 0.4% for males and 0.2% for females between CMI_2022 and CMI_2023).

UNDERSTANDING THE DIFFERENT MODELS

The explanation for the large difference between the projections is relatively simple.

The AG2024 (and AG2022) projection assumes that excess mortality seen since the Covid-19 pandemic will run off very quickly, with annual improvements in mortality quickly reaching a stable rate for the long-term. This rate varies by age and is based on the trends seen in selected European countries over the previous five decades. It is much higher than the rate of mortality improvement seen >

TABLE 1: COMPARISON OF COHORT LIFE EXPECTANCIES

Life expectancy (years) in 2024	AG2024 model	CMI_2023 (no weight on 2022/23 data)	CMI_2023 (full weight on 2022/23 data)
Male; Age 65	20.5	-1.4%	-4.9%
Male; Age 80	8.7	+1.7%	-2.1%
Female; Age 65	23.3	-5.3%	-6.7%
Female; Age 80	10.2	-2.8%	-4.9%

in the Netherlands since 2010, which has been low, especially for females.

Meanwhile, the CMI_2023 model calibration assumes that the lacklustre improvements in mortality seen in the Netherlands since 2010 will continue in the near term, trending only slowly up to a higher long-term rate of improvement. This is specified by the user of the CMI model and again varies by age. For this analysis the long-term rate has been chosen so as to be appropriate for the Netherlands. It is similar to the rate in the AG model and is not driving difference between the model forecasts.

Part of the explanation for the different forecasts is that the CMI model identifies that the birth cohort who have recently reached retirement age have historically experienced lower mortality improvements, and projects that this pattern will continue in the future.

Figure 3 shows the heatmap of historical and projected mortality improvements for the Netherlands from the CMI_2023 model calibration. A positive number shows improving mortality.
The equivalent charts for the AG model show much less variation in projected mortality improvement by age and calendar year, and include no variation by year of birth.

ALTERNATIVES TO EXTRAPOLATION

While there are strengths and limitations to both the AG and CMI models, they are both extrapolative models (at least over the short to medium term).

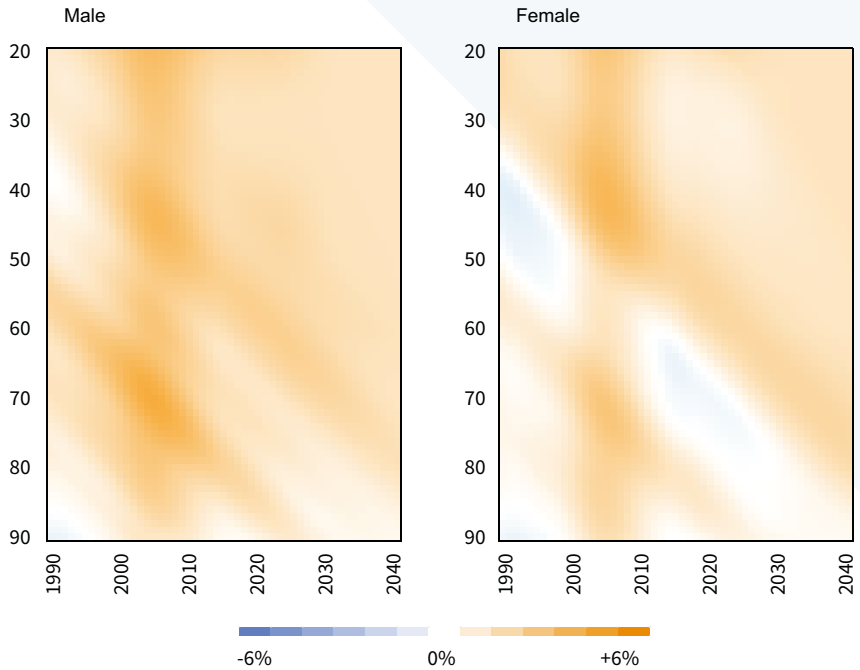
Extrapolative models can work well during periods when patterns are relatively stable but perform less well when there are sustained periods of higher and lower mortality improvement (for example the Netherlands saw strong mortality improvements in the 2000s and much weaker improvements in the 2010s). They also do not cope well with recent extreme outliers, as produced by the Covid-19 pandemic.

This is seen in the very different forecasts produced by the two models analysed here.

An alternative approach to forecasting short to medium term mortality improvement is to seek to understand what is driving mortality rates, in aggregate and for major causes of death. Actuarial forecasts can be improved with multi-disciplinary expert input from health professionals, epidemiologists and public health experts, which should include representation from the country in question.

One way to do this in practice is a Structed Delphi process – an iterative forecasting method that relies on a panel of experts, surveyed individually, with results discussed as a group. The results of such a process for the Netherlands have been invaluable for understanding recent mortality patterns and can help us to assess which of the actuarial forecasts is likely to be 'least wrong'. <

FIGURE 3: HEAT MAP OF CMI_2023 MORTALITY IMPROVEMENTS



COLUMN

TOGETHER WE SUCCEED

We need to become 'actuaries for the future'. Why? Because the world is changing – and in a changing world, a long-term perspective and the ability to quantify risk are essential to enable decision-makers to take the best and most robust strategic decisions. As professionals skilled in quantifying risks, actuaries can help with this. Is it always obvious how we should do so? No. Which means we need to stay curious, and always support each other with continuous education to ensure we remain relevant and can keep learning how best to handle new emerging risks.

We would be wise to note the lessons offered by companies such as Nokia and Blockbuster: these corporate players paid the price for failing to change their business model fast enough as the environment changed. If actuaries don't want to be left behind, we need to be adding value every day. And we cannot assume that it is sufficient to only develop our hard skills – i.e. advanced modelling – but must also improve our softer skills. To be able to usefully communicate our insights to management, it is essential that we understand our environment. We have to be proactive and identify needs before they arise.

How can we do this? It is not something that each of us can tackle alone – we need to help each other by sharing ideas and using our experience. That is where AAE has plenty to offer. Watch our **video** to inspire you as part of a larger community.

Before becoming a board member at AAE I was Chairman of the Danish Actuarial Association (DDA). We developed a new strategy to help our members stay relevant in the future. This particularly focused on inclusion of young actuaries, with the aim of empowering them to challenge established ideas and provide new ways of thinking.

DDA gave talks at universities, celebrated new actuaries and developed an onboarding programme. We also supported academia in collaboration with industry – in a programme called '**InterAct**' – to ensure that actuarial education at the highest level is addressing problems which are genuinely relevant for society.

We need more young actuaries to be active in AAE. We need them to be involved and engaged, because their fresh eyes, new perspectives and unique experiences are critical if the actuarial profession is to evolve.

That is why I'm thrilled about the Young Actuaries Initiative (YAI), in which young actuaries can come together, network and combine professional insights with a meaningful personal journey. The scheme is tailored to ambitious young professionals, designed to equip them to thrive in the actuarial field. It also offers the opportunity to collaborate with European peers in exploring actuarial topics.

I was present at a YAI event in Budapest. At the start of the workshop the level of interest in YAI and the AAE was not high – because the young actuaries present felt that their jobs provided them with enough opportunities to learn. But by the end, participants had come to understand the real and relevant value of being inspired by other actuaries beyond their immediate colleagues.

In November the YAI will hold a workshop hosting more than 30 people from 11 countries. I am really looking forward to seeing what new initiatives come out of the event. This is exactly the kind of input AAE needs to support actuaries in our mission of always 'advising, achieving and engaging'.

Together we succeed!
Jette Lunding Sandqvist, AAE Board Member

COLOPHON

The European Actuary (TEA) is the quarterly magazine about international actuarial developments. TEA is written for European actuaries, financial specialists and board members. It will be released primarily as e-mail newsletter. The views and opinions expressed in TEA are those of the authors and do not necessarily reflect the official policy or position of the Editorial Board and/or the AAE. The Editorial Board welcomes comments and reactions on this edition under info@theeuropeanactuary.org.

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