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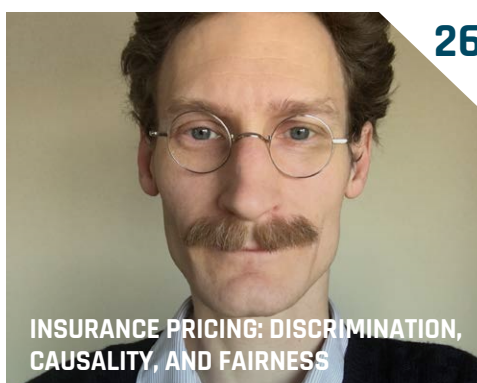
MAN AND MACHINE:
A BRIGHT FUTURE FOR INSURANCE?

INTERVIEW BY
JENNIFER BAKER

Artificial intelligence has long held the promise of making our work lives easier. Now that promise is becoming a reality, thanks in part to new insurtech products, like those developed by Mateusz Maj.

MAJ, the CEO of Vivadrive, has been an entrepreneur since 2012, co-founding technology startups and mentoring at the University of Warsaw Incubator. He is also a data analyst with seven years of experience as a 'quant' in the financial industry.

The insurance industry has already demonstrated the potential of AI in areas like fraud detection, pricing, risk assessment, customer service and claims automation. Is the insurance industry a leader in the adoption of AI or are there other industries that have advanced further in their use of AI technology?

'AI is all the buzz these days, and with good reason! Thanks to our connected world, it's now a part of almost everything we do. ChatGPT is a prime illustration and is currently the subject of much conversation. In my business practice, it is present in almost all my conversations with customers.

And in the insurance world, data analysis and data science are super important. The insurance industry is always looking for ways to do things better, so it's no surprise that they were one of the first to embrace AI. But it's not just insurance — AI is making a big impact in industries like healthcare, finance and retail.

Personally, I keep an eye on the transportation and mobility sector, where AI is doing amazing things. For example, AI is making cars drive themselves, helping to keep vehicles running smoothly, predict potential maintenance issues and even helping to plan electrification of fleets.'

Are insurance companies prepared to capture value from the oncoming wave of innovation?

'Well, it depends! There's no easy answer. Some insurance companies are jumping on the AI bandwagon and others are taking a more cautious approach. For example, Lemonade uses AI to speed up the process of giving customers policy quotes. Root uses AI to give customers insurance prices based on their driving habits. And wefox is

> *'There are very good examples of insurers who have invested in the necessary technology and infrastructure, and have a strong data culture.*

using AI and data analytics to make insurance simple and personalised for their customers. But not all insurance companies are using AI in the same way, so it really depends! These are examples of insurtech companies who are perceived as hyper-innovative.

But just being innovative isn't always enough. According to a study by Boston Consulting Group, a consultancy, publicly traded insurtech companies are having a tough time balancing the expectations of technology and insurance investors. As a result, their value has gone down since their public offerings. Although these companies were initially praised for their user-friendly experiences and growth, the excitement around them has died down as it turns out their business models weren't a good fit for the complex and regulated insurance industry. These companies had access to cheap funding and were able to offer great customer experiences, but it wasn't enough to keep them afloat in the long run.

On the other hand, publicly traded P&C insurers are doing well and, I believe, are not

MATEUSZ MAJ

lagging behind in terms of innovation. There are very good examples of insurers who have invested in the necessary technology and infrastructure, and have a strong data culture.

Great examples of AI adoption in insurance are Allstate, which invests heavily in AI and has used it in underwriting, claims and customer service; AXA which uses it for fraud detection >

> *The EU is also working on a new AI-Act that should regulate the use of AI in Europe.*

and underwriting; and Swiss Re which has implemented AI in underwriting, claims and risk management.

However, some companies struggle to embrace digitalisation and innovation. This could be due to a lack of resources, resistance to change, regulations, or a focus on traditional business models.'

From the perspective of a typical consumer, what are the potential benefits of AI use in the insurance industry?

'AI in insurance offers benefits such as improved customer service with AI-powered chatbots and virtual assistants, faster claim processing, personalised pricing based on data analysis, and better fraud detection. These advancements result in improved customer experience, faster payments to policyholders, more accurate pricing, and lower fraud losses for insurance companies. I think it's beneficial both to insurers and all the customers.'

In the past, there have been instances of unethical practices such as price walking within the insurance

industry. *Is there a risk that the use of AI could exacerbate these issues, or is it a solution to them? And are there any other challenges you see in the implementation of AI in the insurance industry?*

'The use of AI in the insurance industry can both exacerbate and solve ethical issues. On one hand, AI can be used to automate unethical practices, such as discriminatory pricing or fraud. On the other hand, AI can also be used to identify and prevent unethical practices, as well as promote fairness and transparency in the insurance industry.

For me there are several important challenges in the implementation of AI. Firstly, bias and discrimination. AI algorithms can amplify existing biases, leading to discriminatory practices. Fortunately, we have an existing non-discrimination directive that regulates that. The EU is also working on a new AI-Act that should regulate the use of AI in Europe.
Secondly there is often a lack of understanding of AI among business and insurance industry stakeholders, including customers, regulators and insurance professionals. This also pertains to the third

concern: Data privacy. The use of AI in the insurance industry raises concerns about data privacy and security, as insurance companies have access to sensitive personal and financial information. Finally, integration with legacy insurance systems can be complex and time-consuming, requiring significant investment and expertise.'

In what ways can actuaries contribute to the development and implementation of AI in insurance companies?

'Actuaries are the superheroes of the insurance world! They use their maths and data analysis powers to help keep everything running smoothly. They're like the guardians of AI in the industry, making sure that it's used in a responsible way that benefits everyone. They're experts in risk assessment and they always keep the ethics of using AI in mind. Without actuaries, the insurance industry would be a wild, wild west of uncertainty!

On a serious note, actuaries will continue to play an important role in an AI adoption, in processes like: **>**

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> ‘ *Actuaries play a crucial role in the adoption and implementation of AI in the insurance industry.*

- Risk assessment: Actuaries use statistical models to assess risk and make predictions about future events. These models can be used to inform the development of AI algorithms in the insurance industry.

- Data analysis: Actuaries are experts in analysing data and drawing insights from it. They help insurance companies make sense of the large amounts of data generated by AI systems and identify opportunities for improvement.

- Model validation: Actuaries are trained to validate and verify the accuracy of statistical models. They play a critical role in evaluating the accuracy and fairness of AI algorithms used in the insurance industry.

- Regulation: Actuaries have a deep understanding of the regulatory environment in the insurance industry and can help ensure that AI systems are designed and used in compliance with regulations.

- Ethical considerations: Actuaries are trained to consider ethical issues and can help ensure that AI systems are used in an ethical and responsible manner.’

Finally, what specific skills or knowledge do actuaries need to acquire in order to stay current with advancements in AI within the insurance industry?

‘Actuaries play a crucial role in the adoption and implementation of AI in the insurance industry. In order to effectively leverage AI to drive innovation and growth, actuaries need to have a diverse range of skills and knowledge.

First, actuaries need to have a strong understanding of technology, data science and machine learning. These concepts and techniques form the foundation of AI, and actuaries need to have a deep understanding of them in order to develop and deploy AI systems that deliver real business value. Actuaries also need to be proficient in programming in languages such as Python, R or SQL. It is critical for actuaries, as these languages are widely used in data science and machine learning. Finally, the knowledge of processing large amounts of data and cloud computing platforms will help to develop production-ready solutions.

Another key area is ethics and bias in AI. Actuaries need to be aware of ethical considerations and biases in AI and machine learning, as these can impact the accuracy and fairness of AI systems. They should be able to identify and mitigate these biases to ensure that AI systems are used in an ethical and responsible manner. Finally, actuaries need to have strong communication skills. They need to be able to effectively explain and interpret the results of AI systems to non-technical stakeholders, including customers, regulators, and other insurance professionals.

It looks very challenging, but actuaries who are able to stay ahead of the curve and effectively leverage AI to drive innovation and growth will be well-positioned for success in the rapidly changing insurance industry, and won't be replaced by the AI Actuary.’ <

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LEADERSHIP

(AND INFLUENCING)
WITH THE BRAIN IN MIND

BY **LORI SHOOK**

Leading people can seem like a mystery. Why do they behave the way they do? At times motivated, inspired and engaged and other times surprisingly disruptive, resistant, irrational or irritable. Why can't they (or rather, we) be more consistent and predictable?

IT'S JUST THE BRAIN'S PROGRAMMING

If you know some of the secrets of the brain's programming, human behaviour is a lot more understandable, manageable and even predictable. Knowing this programming will help you understand people's drivers, manage their development, prevent emotional reactions and even influence their choices. The first thing to understand is that our brains are pre-programmed for certain sensitivities and needs/desires. This is our nature; we can't get around it and we are constantly driven by this programming, which shows up as emotional drivers. We may be very logical, but the underlying programming is still having its way as it tries to ensure our survival. This means that people often unconsciously make decisions based upon these primitive emotional drivers rather than logical facts.

The emotional brain is only trying to keep us safe. Its job is to ensure our survival which it does by using chemical signals that tell us to move towards or away from situations, people or activities. We inherently understand this when it comes to physical safety: if we encounter a dangerous animal, we can feel the brain telling us in no uncertain terms to *do something! Run!* This is our basic fight or flight reaction. But because we are social animals, much of our programming is about social threats more than physical ones, which is where things get interesting – and perhaps confounding.

EMOTIONAL BRAIN RESPONSE WHEN ANTICIPATING GIVING FEEDBACK

You know you need to give feedback to someone about their performance, but every fibre of your being is screaming, *don't do it!* This is your survival-focused brain telling you that this conversation poses a threat to your survival. Back when our brains were evolving, such a conversation could have dire consequences; you might have been attacked by the other person or even thrown out of your community. It was better to just keep your mouth shut.

Unfortunately, this innate programming is still very much driving us, even though the circumstances of the twenty-first century are quite different than those more barbaric days. But the brain doesn't really know that – it still thinks the person across the table might be harmful. **>**

CARROTS AND STICKS; THREATS AND REWARDS

Our programming generally works as a carrot and stick mechanism using chemicals. If the brain interprets (correctly or incorrectly) a situation as dangerous, it will issue a **threat** signal, by generating doses of adrenaline and cortisol. This tells you to flee or fight back. These days, that might mean not answering an email, being argumentative or even trying to get back at someone to 'make things right'. A threat signal can occur when you anticipate a feedback conversation, when you are uncertain about what's next, when you feel you are being talked down to or when a manager is micro-managing you.

If the brain interprets that a situation is good for your survival, it issues a **reward** signal by producing dopamine which feels good – it's simply a message to keep doing what you are doing. An experience of dopamine is motivating; when people experience it, they want to continue doing what they're doing or perhaps do what they are being asked to do. **>**

Be SAFE & Certain

Belonging
a need to be a part of a team or group

Status
a feeling of being relevant in the team

Autonomy
having a sense of independence in how to do something

Fairness
feeling that all in the team are treated fairly

Expectations
anticipation, hopes and dread, especially about what will happen with others

&

Certainty
knowing what will happen in the future

Threats
Cortisol, Adrenaline

Rewards
Dopamine

> ' *These days, that might mean not answering an email or being argumentative'.*

This **Be SAFE & Certain** model shows six primary social factors that the emotional brain monitors and creates threats and rewards in response to. Most of us have a favourite one, so as you read through them, think about which of these may be important to colleagues you interact with regularly.

THE LEADERSHIP ANGLE

Because we are all driven by this threat and reward mechanism and the Be SAFE & Certain factors are always in play, you can easily leverage this as a leader.

Knowing which elements your direct reports are most attuned to or sensitive to, can help you provide motivation and can even influence them to make a particular choice.

You have your own preferences, so be aware of that and don't assume that everyone else wants as much or little belonging, autonomy or certainty as you do. Get to know others and adapt your leadership or influencing style to their needs – it will be worth the effort.

USING BE SAFE & CERTAIN

Here are some tips for leveraging Be SAFE & Certain to create more motivation (dopamine) and to reduce stress and emotional reactions (from adrenaline and cortisol) in your team.

- Use 'we' to create a sense of **belonging** and inclusion – we all belong here.

- Support everyone's **status** and purpose on the team; don't just highlight one or two 'superstars' (especially not repetitively).

- Set a direction and let people know the boundaries but still give them some latitude and **autonomy** to use their own initiative.

- Be as **fair** as possible. If you make a decision that favours some people over others, explain why – leaving a decision open to interpretation can trigger feelings of unfairness which leads to a desire to strike back.

- Create positive but realistic **expectations**. Lay out clear expectations you have of others and what they can expect of you. With lack of clarity, interpretations will take the place of fact and brains will generate their own expectations.

- Create **certainty** by telling others what you know and what you don't. If there is a big topic at play with a lot of uncertainty let people know what you will know by when.

USING BE SAFE & CERTAIN TO INFLUENCE OTHERS

As an actuary, you will often provide data and a recommendation to someone. As you do so, you can use Be SAFE & Certain to influence how others respond. These tips will help your stakeholders be more willing to listen to you and accept your input.

- **Belonging:**
  Ensure that the other person feels that you are on the same 'side'; that you are in this together.

- **Status:**
  Don't use a superior attitude; instead, make sure they feel like their opinion matters and that they are valued. **>**

As an actuary, you can use the method to influence how others respond to your recommendations.

- **Autonomy:**
  Give recommendations and show the person where they have some choice and autonomy in how they can use your information. This will move their attention away from the choice of using/not using your information.

- **Fairness:**
  Test your recommendations and see if anything might feel unfair to others; if so, explain your rationale.

- **Expectations:**
  Paint a positive picture of what will happen when they use your information, perhaps help them understand how they will look good when they follow your advice (and be sure to keep that real).

- **Certainty** may come straight from the facts and professional assessment that you deliver but people might also need a *feeling* of certainty from you as well. Sharing your own certainty in your data in a friendly manner will go a long way to helping them also feel certain that this is the right approach.

Find your own way to use these in an easy-going way. You want to ensure that you are creating more rewards than threats. The dopamine rewards will have people open to ideas and threats close off opportunities.

Once you understand the brain's programming and use it in different settings, you will likely find that there are many other applications for this as well. <

LORI SHOOK is a London based coach, trainer, speaker and author. Her company, **shooksvensen**, supports organisations to become great places to work.

HOW THE EU AI ACT
WILL CONCRETELY IMPACT YOUR COMPANIES
AND HOW TO GET READY...

BY **SOPHIE LE GOFF, PAULINE BARON** AND **RACHEL JAOUI**

SOPHIE LE GOFF

After some years of seeming AI 'prosperity', the accumulation of scandals has shed light on the limitations to AI and have caught the eye of several regulators worldwide (UK, China, USA,...). Among them: the European Union, which is on its way to vote on the AI Act this year, with possible enforcement by 2025 or 2026 and notably high fines for non-compliance. If this initiative by the EU Commission looks praiseworthy at first sight, digging into the details reveals several challenges and ambiguities which need to be clarified to assess the impact the text will have on companies, the main one being the distinction between what is considered a provider or a user. Notwithstanding, the major impacts on companies can already be assessed. What are they and how to cope with them?

PROVIDER VS USER

The AI Act distinguishes legal obligations and requirements depending on companies' status towards AI systems. Logically, the burden is more on providers, which are the ones who develop such systems and are supposed to know 'what they are doing'. To simplify, users mostly need to collect information and documentation, register logs, perform data protection impact assessment as well as to report if they notice or suspect any infringements on compliance with high-risk requirements by providers.

As insurers mainly design their pricing and underwriting models (use cases that may be classified as 'high-risk' by the EU), they will probably undergo the many requirements and obligations listed in the draft. But insurance >

PAULINE BARON

companies should not forget that they could also be targeted by the high-risk classification in other activities: AI used in recruitment (e.g. AI tool screening resumes), but also credit scoring, as it is allowed in some European countries to use it to help determine customer risk profile. Some of these use cases often require buying solutions from external providers.

The boundary becomes blurry when a 'substantial modification' is made to an AI system. According to the text, in this case, a user could be considered as a provider. But what does the Commission mean by 'substantial modification'? The answer is vague: 'change to the AI system following its placing on the market or putting into service which affects the compliance of the AI system with the requirements [...] or results in a modification to the intended purpose for which the AI system

has been assessed'. Let's assume an insurance company buys a General-Purpose AI solution based on NLP to read customer documentation and automatically uses these inputs to assess their eligibility to an insurance product. Company A selling the product could be considered as the provider. But is it fair to consider it is a provider of 'high-risk AI' when it is Company B that will use it for a high-risk application? Also, if Company B is in turn considered a provider of high-risk AI because it 'modifies the intended purpose' of the AI system, can it really access the details of how Company A designed and trained its AI without infringing on intellectual property?

This example is not the only ambiguity. Therefore, companies should be able to anticipate various scenarios. But let's assume any definition and situation are crystal clear to companies, what about the concrete impacts they may face?

TYPOLOGY OF IMPACTS

The implementation of the AI Act will drive significant impacts on companies, both at financial, organizational and operational levels, on top of competitiveness.
First, the compliance of current AI systems will be quite costly for European organizations. According to a study from the Center for Data Innovation, compliance costs would be around 11 billion euros per year by 2025[1] - and this does not include the opportunity costs lost in the investment in AI. Also, like most regulations, the AI Act provides for financial penalties in case of non-compliance, ranging from 2% to 6% of the company's worldwide turnover, depending on the severity of the offense committed.

The organizational and operational consequences of the AI Act on companies also need to be considered. Indeed, companies should aim to implement a 'Responsible AI by design' approach. **>**

[1] How Much Will the Artificial Intelligence Act Cost Europe? From the Center for Data Innovation, July 2021.

RACHEL JAOUI

However, while this would make sense for efficiency reasons, it could also paradoxically lead to more constraints on the organization by requiring more checks and documentation at the start of projects and thus becoming a procedural burden. Therefore, the question of whether to establish a new governance from scratch or embedding it in existing processes is pivotal. Also, as many departments and functions will be affected to a greater or lesser extent by the AI Act, companies need to anticipate the impacts of each of them.

For example, Compliance and Data Management departments will be particularly impacted, while the consequences on the Purchasing department will depend on outsourcing strategies. Additionally, there will likely be impacts on

human resources, not only on training and acculturation of stakeholders but also on recruitment and talent retention, which will be made more complex due to the increase in controls and the possible demotivation of technical profiles.

Finally, the impact on European companies' competitiveness raises some concern, especially as the EU is already behind the world AI race. According to a recent study from the Initiative for Applied Artificial Intelligence, 73% of polled VCs expect that the AI Act will reduce or significantly

'While waiting for further notice, our main advice is to take action and fine-tune later.'

reduce the competitiveness of European startups in AI, and 16% of AI startup founders will consider halting AI development or relocating outside the EU[2]. To go even further, competition within the EU might even occur: on top of the AI Act, sectoral regulators that operate nationally, like the ACPR in France, might implement stricter guidelines, which could create further discrepancy if one country over-regulates compared to others.

HOW TO GET READY?
While waiting for further notice, our main advice is to take action and fine-tune later. Indeed, even if the proposal is not finalized and has not been voted upon yet, we already have a clear picture of the philosophy of the text and the first concrete impacts. Companies can thus already gear up for its implementation.
For instance, among the various actions, they can already map their AI systems and estimate **>**

[2] AI Act Impact Survey - Exploring the impact of the AI Act on Startups in Europe from The Initiative for Applied Artificial Intelligence, December 2022.
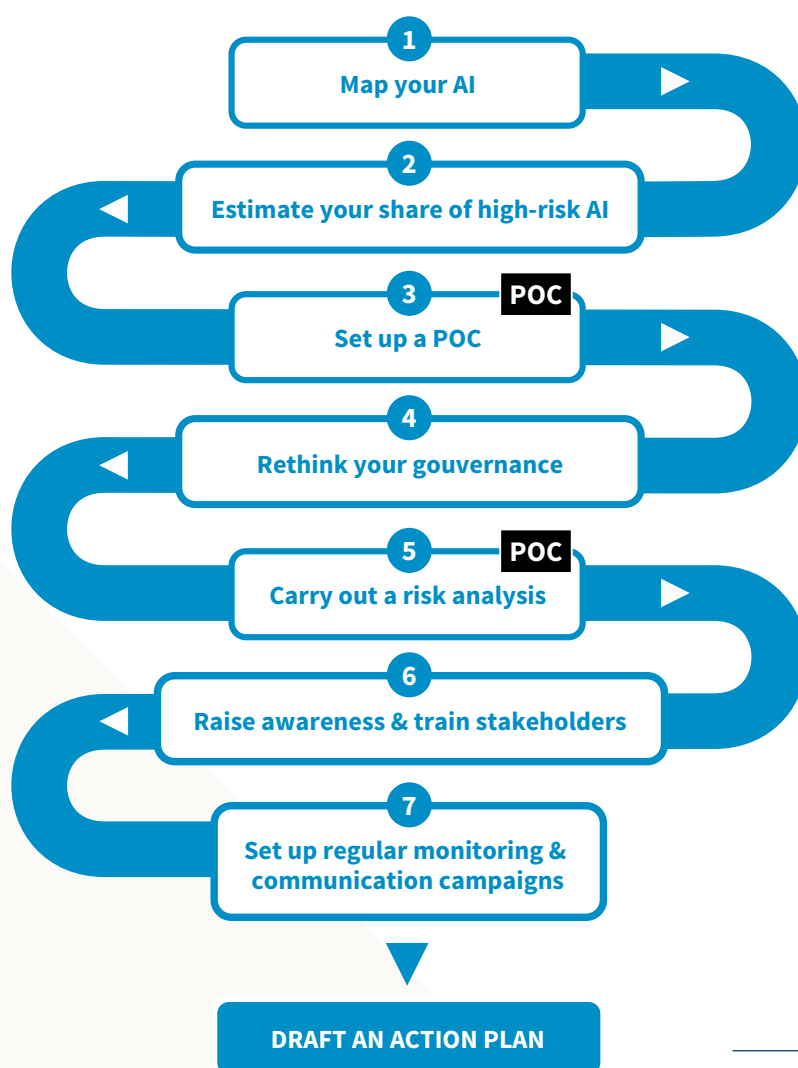
their share of high-risk AI. Also, they can perform a risk analysis on a small sample of use cases via a Proof-of-concept, and review their current governance frameworks. In parallel, companies should conduct a regulatory watch on the evolutions of the text (definition of AI, classification of high-risk use cases, obligations and requirements,…).

They should also communicate and raise awareness of AI governance and regulation topics internally.

By taking these steps, companies will be able to define action plans and roadmaps before the AI Act is enacted. Anticipating will save a lot of time and money when the time comes! **<**

OUR RECOMMENDATIONS TO PREPARE FOR THE EU AI ACT

1 Map your AI

2 Estimate your share of high-risk AI

3 POC — Set up a POC

4 Rethink your gouvernance

5 POC — Carry out a risk analysis

6 Raise awareness & train stakeholders

7 Set up regular monitoring & communication campaigns

DRAFT AN ACTION PLAN

SOPHIE LE GOFF is Partner Insurance & Compliance at SIA Partners, **PAULINE BARON** is Senior Consultant Insurance at SIA Partners and **RACHEL JAOUI** is Consultant FSI at SIA Partners.

ACTUARIAL JOBS OUTLOOK

The field of actuarial practice has widened over recent years; actuaries are now found working not only in traditional areas but also in wider fields such as banking, data science and sustainability. This change can of course also be seen in the prospects that young career starters face on completion of their studies.

SLOVAKIA

The current actuarial jobs situation is challenging for employers in Slovakia. This is driven by three linked factors specific to our country: firstly, demographics. Around 20-25 years ago – when Generation Z was arriving – the birth rate dipped significantly in comparison to previous years. With fewer people to fill the universities competition for students has increased, so programmes covering actuarial topics fight for attention with subjects such as data science. Finally, demand for actuaries in Slovakia is not only coming from insurance and consultancy companies but also a couple of service centres which employ a significant number of actuarial roles.

Zuzana Weber and Jozef Hancar, Slovenská spoločnosť' aktuárov

SPAIN

The actuarial profession is a regulated profession in Spain, with reserved activities in the three pillars of Solvency II, IORP II and valuation of personal damages caused by traffic accidents. To become an actuary in Spain, it is necessary to achieve an official Master's Degree in Actuarial and Financial Sciences and to hold membership of the national actuarial association – these parameters mean there are strong links between the job market, universities and the IAE. In fact, students are required to undertake professional internships as part of their studies, and these usually result in them being hired by the companies. Additionally, IFRS17 is already creating a new field for actuarial jobs.

Rafael Moreno, Chair, Instituto de Actuarios Españoles.

ITALY

Demand for actuaries has exceeded supply in Italy for a number of years, despite a healthy increase in the number of university students. The Italian Actuarial Association is investing major efforts into developing the actuarial profession by means of several significant sub-projects, including a broad communication strategy; this is yielding good results. As such demand for actuaries – both as employees and as self-employed actuaries – has increased a great deal, initially in the traditional fields (particularly due to Solvency II and IORP2) then also in some wider fields.

Some students start work even before graduating, when all that remains of their course is the thesis or a couple of exams. After graduation, the job search generally does not last long. As a first stage graduates gain some experience and after 1 or 2 years they are usually ready to take the state exam to become fully qualified actuaries and be registered in the official list ('Albo') – in Italy the actuarial profession is protected and regulated by law. So recruitment prospects for students are based directly on market demand. They can find opportunities by sending CVs to insurance companies, pension funds, supplementary health private funds, financial institutions and companies, and in the case of public entities they can also participate in public competitions.

*Giampaolo Crenca,
President ISOA
(Italian Society of Actuaries)*

UNITED KINGDOM

The actuarial job market in the UK continues to be buoyant, with year-on-year increases in the number of advertised actuarial roles. New jobs for actuaries are expected to grow by 9% in 2023. This growth is primarily in traditional areas such as insurance, as well as with the UK's large professional service companies.

This growth is creating new opportunities for IFoA members and we are confident that actuaries are ready to face this demand, supported by our commitment to their career-long learning.

New entrants to the profession are currently still most likely to have a mathematics background, but employers are increasingly seeking to broaden their recruitment pool to improve socio-economic diversity.

The Institute and Faculty of Actuaries UK

GERMANY

After a slight 2020 decline due to the COVID-19 pandemic, the actuarial job market in Europe is now expanding again, as it did before the crisis.

In the German market, for example, actupool – DAV's specialist online job platform – has recorded a 15% increase in advertisements placed in comparison to 2021. The job ads published cover the entire actuarial spectrum; though traditional topics are still relevant, new roles such as Data Scientist and IFRS 17 Specialist are also emerging.

The German Actuarial Association (DAV) is also happy to report that there continues to be a direct and positive correlation between actuarial job prospects and DAV membership. Most junior actuaries continue to be supported by their employers to take the examination route to DAV membership following their academic education.

Martin Oymanns (left), German Association of Actuaries / **www.actupool. com** *and Henning Wergen (right), German Association of Actuaries*

ARTIFICAL
INTELLIGENCE
THE ACT AND THE IMPACT

BY **JONAS OFFTERMATT** AND **MICHAEL ZIMMER**

As data and AI become more widespread, the issue of ethical AI is also becoming increasingly important.
What is ethically justifiable in AI-based or AI-supported decisions and what constitutes discrimination or a risk for society? The European Union provides an initial foundation to answer these questions with the Artificial Intelligence Act. In the future, this Act should give guidelines and make it possible for European companies and researchers to use AI in an ethically justifiable way. In this article, we want to discuss the impact of the AI Act on the insurance industry, which has always been heavily influenced by data and statistical models, and on us actuaries in particular. To clarify this, we will first define the term AI in the sense of the EU Act, describe bias and discrimination, and then briefly outline the EU's classification framework for evaluating AI applications. Finally, we want to illustrate the approach with a short example. **>**

JONAS OFFTERMATT

WHAT IS AI?

Unfortunately, there is no clear definition of the term artificial intelligence. Artificial intelligence is rather understood as procedures that make it possible to support or make a decision similar to that of a human being for selected questions.[1] This involves a wide variety of statistical models, procedures and approaches. Currently, mainly machine learning models are used in this sense.[2] The AI Act includes machine learning systems, knowledge-based systems, reasoning and expert systems, Bayesian estimation systems and, in principle, all software that can produce results such as content, predictions, recommendations or decisions that influence the environment with which it interacts (Article 3, Paragraph 1). This broad definition also shows the problem of classification. For example, linear models, which have been used as a de facto standard in the insurance industry for decades, also fall under this definition. This means that almost all statistically based (simple and complex) analytical procedures in the insurance industry can be subsumed under AI.

BIAS AND DISCRIMINATION

Here, too, there is no clear definition. However, discrimination by algorithms can be understood to mean that one group of people is placed in a worse position than another by an algorithm without any real justification. In many cases, the underlying database is already discriminatory or insufficient. However, the transition between permitted attributes and prohibited ones is also fluid. For example, pricing according to gender in the life sector is prohibited since the unisex rulings of 2011, whereas age is still recognized as an attribute.

Both in the context of the classification of AI applications and potential discrimination, it is crucial to be aware of this area of tension and to defuse it through appropriate controls and measures. The AI Act also operates in this environment and has an impact on actuaries. Especially in the case of explicit or implicit discrimination by models, actuarial expertise is needed to develop suitable control instruments and to detect statistical bias. This is because it still must be ensured, even with complex machine learning models, that gender, for example, is not used for rating.

WHAT IS THE AI ACT?

The AI Act, as already shown above, attempts to provide a definition of AI and to give appropriate measures for the assessment and classification of AI applications. Is the EU Act a detailed guide that clarifies all eventualities? No, it rather creates an overarching framework that requires insurance companies to create their own interpretations and derived measures for documentation and control. The basis here is the classification of AI systems into low, mid and high-risk cases, as well as non-acceptable risks. Non-acceptable risks concern, for example, threats to life or physical conditions or social issues that contradict the values of the EU, such as social scoring. It should be emphasized that use cases from health and life insurance are per se defined by the EU as high-risk cases with the associated documentation requirements. It is important to note that the Act does not prohibit low, medium and high risk cases, but requires standardized documentation and conscious risk assessment. **>**

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[1] cf. Data Science: Grundlagen, Architekturen und Anwendungen (Edition TDWI): Haneke, Uwe, Trahasch, Stephan, Zimmer, Michael, Felden, Carsten, dpunkt.verlag GmbH, 2021 or Actuarial Data Science: Maschinelles Lernen in der Versicherung: Seehafer, Martin, Nörtemann, Stefan, Offtermatt, Jonas, Transchel, Fabian, Kiermaier, Axel, Külheim, René, Weidner, Wiltrud, De Gruyter, 2021.

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[2] This is also the case for this article. It was written in German and then translated into English with DeepL.

MICHAEL ZIMMER

If the model is now extended to make real-time decisions on the conclusion of an insurance policy based on personal data, the use case will probably be rated as high risk because of the autonomous decision. Making this classification and justifying it may well be a future task of actuaries. This is because all use cases may be carried out, depending on the risk classification, but with significantly different requirements for documentation and regulation.

WHAT DOES THE EU ACT MEAN FOR INSURANCE COMPANIES?

The EU Act ensures an initial requirement for the documentation and assessment of AI applications. By explicitly classifying life and health insurance applications as high-risk cases, this will have an impact on the use of artificial intelligence in the insurance industry. For actuaries, this expands the field of tasks. In the future, when selecting statistical models for calculating underwriting risks, the classification according to the AI Act must also be considered and documented.

It is important to note that the Act has not yet been finalized and changes are still possible. Therefore, it is up to insurers and actuaries to deal with the topic, to create their own assessment frameworks and to group use cases sensibly so that they do not have to assess each case individually. If necessary, a pioneering role can also be taken on here, as in the context of the Code of Conduct proposed by the German Insurance Federation, through a Code of AI in the insurance industry. It is up to us, as representatives of the insurance industry, to deal with the topic in order to be well prepared and legally secure for a future with the AI Act. <

EXEMPLARY CLASSIFICATION INTO LOW, MEDIUM AND HIGH RISK

In the context of evaluating analytical use cases, actuaries are also faced with the challenge of evaluating their cases. If we take a fictitious case from motor insurance, different scenarios can be derived. A simple GLM for assessing the probability of a contract being concluded on the basis of general customer groups will probably be defined as a low-risk case, but if additional price factors and personal data points about the customer are added to this use case, it can quickly become a medium risk case. I.e. the use of additional personal data leads to a higher risk assessment.

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AAE PRIORITIES IN 2023
A STEP ON OUR WAY

BY **LUTZ WILHELMY**

In this article I would like to highlight the goals of the AAE that the board has agreed on for 2023. Moreover, I would like to contextualize our longer-term challenges.

The AAE has three strategic objectives, which include:

1. the deepening of its relationship with European institutions,
2. the promotion of the profession, and
3. the formation of a European community of actuaries.

Regarding the first objective, 2023 is focused on the European Green Deal and the European Digital Agenda. We do not pick and choose these topics - they are dictated by the EU's priorities. Furthermore, the finalization of the Solvency II review, the Recovery and Resolution Directive and the IORP Directive will play a role.

On the second objective, we will be looking at the agreement on the mutual recognition of professional qualifications. We also want to hold a discussion on requirements and proof of 'professional qualifications' ('fit and proper' persons) with the responsible parties concerned at European level. Ultimately, this touches on the question of suitable skills and thus goes beyond purely technical qualifications. However, the latter is an issue that cannot be satisfactorily dealt with within a year and will therefore stays on the agenda for longer.

'*We would like to help to make the profession better known in countries where it is not yet prominent in the public eye.*'

For the third goal, we would like to help to make the profession better known in countries where it is not yet prominent in the public eye. To do this, we propose to establish a European brand that stands for compliance with AAE regulations on training, professionalism, and conduct. >

In addition, with our event and education partner, the European Actuarial Academy (EAA), we plan to host various webinars, round tables, the European Actuarial Day on June 27, and the next European Congress of Actuaries (ECA) in Rome in early summer 2024.

The challenges we have faced in 2022 were clearly the war in Ukraine and the return of inflation after 40 years of comparatively very moderate inflation rates.

Russia's war against Ukraine, which is violating international law, has challenged all actuarial associations worldwide and their umbrella organizations, such as the International Association of Actuaries (IAA) and the AAE, to review their statutes to see if they allow or even suggest condemnation of the military action. Since actuarial associations do not usually speak out on non-actuarial issues, this was uncharted territory. I was deeply impressed by the professionalism and prudence with which the bodies and working groups of our actuarial associations addressed this issue: Where the statutes have a sufficient connection to the welfare of their societies, condemnation is possible and proportionate. Thus, it has been possible for both the IAA and the AAE to issue condemnations. In addition to the political dimension,

there is the actual help for our colleagues in the region, where the national associations in Europe have been quick and effective. This is a reason to be proud!

'Russia's war against Ukraine, which is violating international law, has challenged all actuarial associations worldwide.'

With the war and the aftermath of the pandemic, inflation has returned to Europe. Older colleagues, who were taught their trade by people whose formative years were defined by 1970s high inflation, recalled the difficulties of determining reserves in non-life lines – particularly in liability and especially in non-proportional liability reinsurance, but also in business planning in life insurance. Actuaries, with their good memories, are well prepared to meet these challenges.

Besides these new topics that have entered the stage in 2022, I would like to elaborate a bit more on the topics that have been there in 2022 and will continue to accompany us even beyond 2023. The perennial issues of sustainability and digitalization as well as the

Solvency II Review have kept us busy. On the topic of sustainability, it is not only the uniform scenarios in the ORSA, but also the quantification, comparability, and delimitation of climate risks for future reporting that are relevant to us. How useful these reports are for investors and the general public will be crucial to the success of reporting. There is a risk here that people will not be able to see the wood for the trees. However, our influence on these issues is limited, as this is not insurance-specific regulation, but so-called horizontal regulation, i.e., regulation that concern all sectors and industries.

The situation is very similar in the implementation of the European Union's digital agenda. Here, too, the starting point is cross-sectoral – here, too, the AAE's factual influence is severely limited. It so happens that AI systems to be used for risk assessment and pricing in relation to natural persons in the case of life and health insurance are labeled as high-risk in the current draft of the AI Act (November 25, 2022) without any significant factual expert discourse having taken place on this.

Maybe the upcoming challenges that the actuarial profession is going to face in the future can be structured along the following five dimensions: **>**

- The pace of technological change: The increasing speed of technological change and digitalization is likely to continue to impact the actuarial profession, creating both challenges and opportunities. Actuaries will need to keep pace with these changes in order to remain relevant and continue to add value to their organizations.

- The impact of climate change: The effects of climate change are likely to have significant implications for the insurance industry, as well as for society as a whole. Actuaries will need to take into account the potential impact of climate change when modeling risk and setting prices.

- Changing regulatory landscape: The regulatory environment is constantly evolving, with new rules and regulations being introduced at both national and international levels. Actuaries will need to stay abreast of these changes and adapt their practices accordingly.

- Talent management: As the demand for actuarial expertise increases, attracting and retaining top talent will become increasingly important. This may require organizations to offer competitive compensation packages, as well as flexible work arrangements and opportunities for professional development.

- Globalization: The actuarial profession is becoming increasingly global, with more actuaries working across borders and in different countries. This brings new opportunities for collaboration and innovation, but also requires a deeper understanding of different cultural and regulatory environments.

'*Actuaries, with their good memories, are well prepared to meet these challenges.*'

As the actuarial profession evolves to meet new challenges, it's important for actuaries to not only have the knowledge and technical skills necessary to perform their work, but also the soft skills and attributes needed to succeed in a rapidly changing industry. Competency frameworks can help define and standardize these skills and attributes. Some of our member associations, e.g., the Irish association, are using such competency frameworks to help their members to define focus areas in their formation. Moreover, these frameworks allow self-assessment. It is a material challenge that the competencies outside the knowledge and technical skills space do not lend themselves easily for an objective assessment. But even while lacking the objective assessment, a uniform European framework for competencies would be beneficial, as it would allow for greater consistency and comparability within the profession across different countries and organizations. **<**

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CHATGPT
AND THE
PHILOSOPHERS

BY **JOEL WALMSLEY**

Artificial Intelligence (AI) is rapidly becoming an integral part of many industries, and the field of actuarial science is no exception. One of the most exciting developments in AI is the advent of language models, such as Open AI's ChatGPT. These models have the ability to understand and respond to natural language inputs, making them ideal for use in a variety of applications, including chatbots, virtual assistants, and language translation. In addition to its potential use in the field of actuarial science, ChatGPT is also being used in education to help students improve their language skills and writing abilities.

… Or so the enthusiasts say. The doomsayers, by contrast, are sceptical. In my own field of university education, for example, I've heard many a colleague echoing Socrates, who, in Plato's dialogue *Phaedrus* (370 BC), expresses similar worries about the invention of … wait for it … *writing*. He says: **>**

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'This invention will produce forgetfulness in the minds of those who learn to use it…

Plato

'This invention will produce forgetfulness in the minds of those who learn to use it … you offer your pupils the appearance of wisdom, not true wisdom, for they will read many things without instruction and will therefore seem to know many things, when they are for the most part ignorant and hard to get along with, since they are not wise, but only appear wise.'

Fast forward a couple of millennia and the worry is the same; students will use this new technology to write their essays for them, in ways that escape the notice of standard plagiarism-detection tools, giving rise to a new form of turbo-charged AI-powered cheating.

What's particularly unsettling is that language use has long been regarded as the hallmark of intelligence. The philosopher René Descartes (who you may remember from such lines as 'I think, therefore I am') held that linguistic ability is what distinguishes humans from animals; he thought it was evidence that we have immortal souls whilst they are mere automata. In addition, in his 1637 book *Discourse on the Method*, he famously claimed that 'it is inconceivable that a machine should produce different arrangements of words so as to give an appropriately meaningful answer to whatever is said in its presence, as even the dullest of men can do.' Uncannily enough, nearly 400 years later, such a thing is not only *conceivable: it's actual*.

Despite his general scepticism about AI, Descartes thereby anticipated another famous twentieth century development in the field: the Turing Test. In his landmark 1950 essay entitled 'Computing Machinery and Intelligence' Alan Turing suggested that instead of asking the somewhat nebulous question 'Can a machine think?' we'd be much better off addressing the more concrete issue: 'Could a machine deceive a human interlocutor into thinking that they were conversing with another human?' Turing's idea was that we can never really be certain what, or *that*, another person (or machine) is actually thinking, but that conversational ability is like the tip of an iceberg: a pretty good and generally reliable way of inferring that there's a whole lot more going on beneath the evidence at the surface.

I sometimes joke with my students that the essays and exams that I ask them to write serve much the same purpose as the Turing Test. I can't really be certain that they've learnt and understood *everything* that we've covered, but the 2500 words that they hand in at the end of the semester is like the tip of an iceberg; if I construct the assignment carefully, it gives me a pretty good and generally reliable way of inferring that they've learnt a whole lot more, as a backdrop to the evidence presented in the essay. So the worry I mentioned earlier is that since ChatGPT can clearly pass the Turing Test, then it could also pass university courses – on behalf of cheating students – in the same way.[1] **>**

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[1] See **ChatGPT passes MBA exam given by a Wharton professor** and **ChatGPT passes exams from law and business schools** for example.

... Or could it? Notice that I said *'...if I construct the assignment carefully.'* Many 'standard' paper topics (e.g., 'Describe and explain Philosopher X's idea about Y') are the sorts of prompts for which ChatGPT can produce a perfectly serviceable passing essay in response. But these were never good essay questions, because they encourage exactly what Socrates was worried about: rote learning and boring, formulaic answers. Instead, by finding ways for students to work *with* ChatGPT, we can reduce the likelihood of cheating, make the assignments more interesting, *and* really develop the critical analytic abilities that we were seeking all along.

In one of my classes this term, students must first ask ChatGPT to answer as if it were René Descartes (it refuses to *impersonate* someone, but it responds well if you start with 'Let's play a game...') They must then conduct an interview about its (his?) views on the nature of the mind, using ChatGPT to role-play a dialogue, and then critique the answers based on what they know from the philosophical texts. In another class, I've asked students to conduct an actual Turing Test with ChatGPT, and then to evaluate its performance based both on what they've read in Turing's paper, and on what they know about how ChatGPT works.

So rather than trying to ban the use of ChatGPT, or developing yet more sophisticated plagiarism detection software (and risking precipitating some kind of technological arms race), there is a better way to work with the technology, just as we did with writing (contrary to Socrates). For that reason, on balance and contrary to the doomsayers, I am inclined to side with the slightly more optimistic opening paragraph above, even though it's a sentiment for which, I'm willing to admit, I had a 'co-author': **<**

> Write the first paragraph of an article about AI and chatGPT, in a magazine for actuaries; mention chatGPT in education as well.

> Artificial intelligence (AI) is rapidly becoming an integral part of many industries, and the field of actuarial science is no exception. One of the most exciting developments in AI is the advent of language models, such as OpenAI's ChatGPT. These models have the ability to understand and respond to natural language inputs, making them ideal for use in a variety of applications, including chatbots, virtual assistants, and language translation. In addition to its potential use in the field of actuarial science, ChatGPT is also being used in education to help students improve their language skills and writing abilities.

INSURANCE PRICING:
DISCRIMINATION, CAUSALITY, AND FAIRNESS

BY **MATHIAS LINDHOLM, RONALD RICHMAN, ANDREAS TSANAKAS** AND **MARIO WÜTHRICH**

Over the last decade there has been a surge in applying machine learning techniques in non-life insurance pricing. This is mainly due to cheaper data collection and storage, combined with new analysis methods for unstructured data and increased computational power. In parallel there have been rising concerns about data privacy and hidden implications of using 'black-box' price computations.

An obvious concern when using black-box models for pricing is that of implicit discrimination. As we will see below, this is *always* a potential issue, regardless of the model, and this is regulated in EU-law, see [4]. A related question is that of (algorithmic) fairness, and below it will be seen that these two concepts will often fail to agree.

Further, in order to adjust for implicit discrimination, discriminatory information needs to be collected (more on this below), which is a privacy concern in itself. More generally, this relates to the question of which covariates are suitable to use for pricing. This in turn connects to discussions about covariates' causal effects and risk factors. However, below it will be seen that this is not essential for avoiding implicit discrimination.

THE ACTUARIALLY FAIR PREMIUM AND DISCRIMINATION

Let X denote the covariates (rating factors or policy features), and Y the claim cost that we try to predict. The actuarially fair premium, $\mu(x)$, is defined as $\mu(x) = E[Y|X=x]$ and can be interpreted as the best prediction of the future claim cost Y, given the specific policy features $X=x$. Charging the premium $\mu(x)$ to each policyholder will on average generate a total premium income equal to the expected claim cost.

How will pricing be affected when there are covariates, D, that are considered protected, such as sex or ethnicity? For example, EU regulation [4] stipulates that insurers are not allowed to price insurance policies based on sex, neither directly nor indirectly. *Direct discrimination* occurs when the price explicitly depends on D. Therefore, the actuarially fair, *best-estimate*, premium based on all information, >

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$\mu(x,d) = E[Y|X=x, D=d]$, cannot be used by insurers, since it explicitly depends on D. The definition of indirect discrimination is more complex [4] and can be interpreted as reflecting two distinct ideas:

(i) when using the non-protected covariates X, adjustments should be made to ensure that D is not implicitly proxied by X;

(ii) the effect of the pricing practice should not lead to a disadvantage for either sex.

Property (i) is meant to prevent *proxy discrimination* by requiring that D cannot be learned from X; e.g. for some portfolios a policyholder's ethnicity may be accurately predicted from postcode information. For property (i) one can give a statistical definition [5]. Property (ii) is referred to as *disparate impact*, for which there are multiple alternative (and potentially conflicting) mathematical formulations and which has a specific meaning in US law. For the remainder we focus on property (i), as precisely formulating property (ii) remains in part an open research question.

ADJUSTING FOR POTENTIAL PROXY DISCRIMINATION

The premium $\mu(x)$ does not explicitly use the protected information D, and is hence not subject to direct discrimination. Nonetheless, we cannot be certain that it will not be affected by proxy discrimination. This is because, the calculation of $\mu(x)$ implicitly uses the dependence between D and X. To see this more clearly, consider the situation where $D=0$ ('man') or 1 ('woman'), for which we can write:

$$\mu(x) = \mu(x,d=0)\,p(d=0 \mid x) + \mu(x,d=1)\,p(d=1 \mid x) \quad (1)$$

where $p(d|x)$ denotes the probability of a policyholder having the sex $D=d$, given the non-protected information $X=x$. This illustrates how standard covariates may carry information about the protected covariate D. At the extreme, if we could perfectly predict the sex based on non-protected information, then there would be no practical difference between direct and indirect discrimination.

We can however remove the potential for proxy discrimination, by modifying Eq. (1) to:

$$\mu^*(x) = \mu(x,d=0)\,p^* + \mu(x,d=1)(1-p^*) \quad (2)$$

where p^* is some probability between 0 and 1, the portfolio fraction of $D=0$ is a natural choice. We call the adjusted premium from Eq. (2) the *discrimination-free insurance price (DFIP)*, see also Ref. [5] where the DFIP is discussed in more generality and detail. By using $\mu^*(x)$ any potential dependence between X and D — and hence any proxy discrimination — has been removed, without requiring further assumptions. **>**

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CONCLUSION AND OUTLOOK

Through the pricing method of Eq. (2), we have proposed a way to adjust actuarially fair prices in order to address proxy discrimination. Importantly for practice, the calculation of DFIP is model-agnostic, in the sense that it can be derived as an adjustment to *any* pricing model, from GLMs to complex machine learning models. Nonetheless, in order to determine the DFIP in Eq. (2), it is necessary to have access to the more detailed price $\mu(x,d)$, which can only be estimated using protected data. Thus, to appropriately quantify the materiality of proxy discrimination and correct for it, the collection of protected information is needed. This requirement may raise privacy concerns and a technical solution is discussed in Ref. [6].

A further consideration is about which types of covariates should be used in the first place, when calculating an insurance price. Some policy features may be classified as *risk factors*, if they have a *direct causal effect* on claims, see e.g. [3, 1, 8]. Standard rating factors are not necessarily assumed to causally impact Y; instead they are characterised by *statistical association* with Y. In Ref. [5] it is shown that, following certain causal assumptions, the DFIP from Eq. (2) will coincide with the expected direct causal effect of X on Y. However, in real-world applications it is rarely the case that all risk factors are observed or that their causal interrelations are fully understood. In these situations, the causal effect can

likely not be assessed, and the causal connection to Eq. (2) is lost. Nonetheless, also in such more complex settings, the DFIP will still correctly adjust for proxy discrimination. Furthermore, a requirement to use *only* risk factors with a direct causal effect on claims will likely reduce the number of covariates that are available, see [3]. This, despite its conceptual appeal, will also incur a cost in terms of predictive accuracy.

Finally, arguments around discrimination relate to notions of algorithmic fairness, which has attracted considerable attention in the machine learning literature. For example, there is persistent concern that machine learning algorithms discriminate against sub-populations, in applications ranging from e.g., mortgage lending to facial recognition [2]. Algorithmic fairness is typically defined in terms of statistical properties of predictors. For example, in order to satisfy *demographic parity*, a predictor $\hat{\mu}(X)$ should be independent of D. This means that there should be no statistical association between risk predictions and protected characteristics. This is a very penal requirement, because in situations where there is some statistical association between the non-protected covariates X and the protected covariates D, the prices are not allowed to include *any* information from X. Requiring that prices are statistically independent from protected covariates implies that in some portfolios, e.g. where policyholders from one >

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demographic group are more likely to engage in high risk behaviours (e.g. smoking), it becomes impossible to apply risk-based pricing that quantifies propensity to claims. We note that this is not the case with the DFIP, which allows risk-based pricing based on non-protected covariates, only adjusting for their proxying effect. More generally, this illustrates potential conflicts between adjusting for proxy discrimination, while trying to satisfy common algorithmic fairness conditions. For more examples, see Ref. [7].

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THE IFRS 17 IDENTITY

BY **SERVAAS HOUBEN**

Do not judge a book by its cover: although many actuaries might consider IFRS 17 yet 'another IFRS accounting standard', and hence a feast for accountants, this new insurance standard still provides lots of opportunities for actuaries. Servaas Houben provides in this article some examples of IFRS 17 challenges for which actuaries with their numerical skills can be effective, and where the creative skills actuaries possess can let this principle-based standard come alive.

INTRO

IFRS 17 replaces the current IFRS 4 framework. The latter consisted of different reporting approaches (like US GAAP) making it challenging to compare results between countries or within a group based in different geographies. While the US GAAP approach was more towards the rule-based side of reporting frameworks, other IFRS 4 consistent frameworks provided more leeway for expert judgment or management's own perspective. IFRS 17 tries to overcome this spectrum of interpretations and tries to align differences in size and geographies to ensure more consistency between financial statements. **>**

SERVAAS HOUBEN

However IFRS 17 is a market consistent framework and as a result its implementation is not all that straightforward across all geographies: for geographies used with market-based valuation, like Solvency II, risk-based capital and others, the switch from IFRS 4 to IFRS 17 might be intuitive as one can use the valuation metrics of other market based valuation frameworks. For other geographies which based their IFRS 4 reporting on historical/pricing assumptions, and not used to valuation of options and guarantees, the introduction of IFRS 17 might be an entirely different challenge.

Fortunately, the IFRS 17 framework is principle based and therefore provides leeway: the phrase '**without undue cost and effort**' is repeated multiple times in the legislation and thus the standard is aware of differences in size and resources between companies which result in various levels of finesse. However the drawback of a principle-based framework is that in can result in inconsistency between or within companies. Using quantitative assessments instead can result in a more robust and consistent application of the standard within companies and across time.

QUANTITATIVE IMPACT

IFRS 17 provides areas where a quantitative assessment can be applied:

- **Classification/measurement approach:** IFRS 17 Appendix A specifies three conditions which need to be fulfilled for groups of contracts to be VFA classified. Two of the three conditions refer to the word '**substantial**' which is not defined under IFRS. To avoid inconsistency between, one could consider applying a numerical threshold (e.g. based on historical profit sharing) when assessing if groups of contracts fulfill the VFA criteria.

- **Allocation underlying items to VFA portfolios:** IFRS 17.110 requires entities to describe the composition of underlying items (i.e. assets) for VFA contracts. IFRS 17 does not prescribe how an entity should allocate its assets to the IFRS 17 portfolios. The allocation choice therefore impacts the size of CSM and equity at transition and during subsequent measurement. Actuaries can apply different allocation methods like using ratios, assigning assets on an individual basis, or grouping assets considering both the asset and liability characteristics to limit volatility in CSM and equity figures going forward.

- **Reconciliation other reporting frameworks:** for benchmarking and explanation towards other stakeholders, it is common to compare IFRS 17 cash flows with SII equivalents.

As creating these waterfalls usually requires an analysis of change involving performing multiple runs, actuaries can provide insights in the similarities and differences between reporting frameworks.

- **Risk adjustment:** while under SII standard formula, the risk margin is predefined, IFRS 17 allows for room of interpretation which the company can use to reflect their own perspective on the risks involved in cash flows (like SII ORSA). Changing in risk preference over time, changes in cost of capital over time, or different correlation assumptions are therefore allowed under IFRS 17.

- **Inflation:** although inflation has been a hot topic during 2022, IFRS 17 has been quiet on the topic except that, when possible, a market/current rate should be applied when possible. The standard therefore allows for different inflation perspectives, and inflation assumptions (wage, price, other)

- **Sensitivity testing:** IFRS 17.128 requires sensitivity testing of insurance and market risks, however, does not prescribe which sensitivities should be applied. Either the standard SII shocks could be considered, or other more company specific scenarios instead. **>**

- **Yield curves:** IFRS 17.B81 allows companies to derive the yield curve based on a reference portfolio (top down). As these reference portfolios can be company specific and the IFRS 17 group of contracts might not be a 1-1 match with the SII homogenous risk groups, quantitative derivation of sensible yield curves is an opportunity.

- **ALM matching/accounting mismatch:** the standard allows to reduce accounting mismatches between asset and liability classifications (e.g. IFRS 89(b), risk mitigation IFSR 17.B115). As reducing these mismatches requires alignment between assets and liabilities actuaries can provide insights in liability sensitivities and ALM matching.

- **Capital optimization:** as insurance companies have several metrics to steer their business (return on (SII) capital, (IFRS) earnings, ratings, internal capital models), optimization of capital might become a daunting task. As actuaries are familiar with optimization methods and familiar with different steering metrics, they can add value in providing insights how business strategy and ALM choices affect each of the reporting metrics and what tradeoffs to consider.

QUALITATIVE IMPACT

Besides using their quantitative skills actuaries are also well suited to use their qualitative creative skills to make an impact:

- **Interaction with accountants:** IFRS 17 is not a separate accounting standard which can be implemented in isolation. Especially the interaction with IFRS 9 when it comes to avoiding mismatching between OCI and P&L is prevalent within the IFRS 17 standard. Therefore cooperation with accountants, controllers, and asset managers is essential to avoid IFRS 17 to become the spanner in the works. As actuaries have a broad experience involving asset management, accounting, and balance sheet management they can cooperate and retain the overview of IFRS 17 and its interaction with other IFRS standards and departments.

- **Governance:** IFRS 17 disclosure and governance has similarities with Solvency II. The preference to use market-based assumptions before expert or company judgment, the valuation of options and guarantees, and the requirement of sensitivity testing are in line with Solvency II principles which are common to actuaries.

- **CSM concept:** the introduction of CSM as a representation of future profits, is remarkably like other valuation techniques

like Embedded Value and hence feel much more intuitive to actuaries than past accounting frameworks which allowed for a day one gain or profit.

- **Capital and dividend management:** so far, most investor days published by insurance companies have indicated that IFRS 17 is considered as a change in accounting policy which will not impact capital and dividend management. Stakeholders still need to get used to the standard, or companies do not have around assessing the impact on capital and dividend policies. In the past, there was a clear link between income and dividends. Actuaries could help optimizing capital and balance sheet management across different reporting frameworks and capital and dividend management seems to still unexplored territory.

CONCLUSION

Although IFRS 17 is a principle-based framework which requires substantial judgement and interpretation, and therefore can be an ideal playground for (creative) actuaries. **<**

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RETIREMENT ON A DC PENSION

SIMILARITIES, DIFFERENCES, AND IMPROVEMENTS IN NL AND UK

BY **GIJS CREMERS** AND **HANNAH ENGLISH**

Both in The Netherlands and the UK, workplace pensions have been transitioning from Defined Benefit (DB) schemes, towards Defined Contribution (DC) schemes. As a result, members of a scheme will directly bear the risk regarding their income after retirement. The way the transition from DB to DC is handled in both countries varies. The Dutch pension system attempts to mitigate some of the risk to members, using a collective 'solidarity' system, whereas the British pension system allows members to make more flexible individual choices.

We have investigated the Dutch and British DC workplace pension system looking for similarities, differences and improvements. This article provides a summary of a research paper on the decumulation phase of DC pensions. Another research paper regarding the accumulation phase will be published soon.

DUTCH AND UK SYSTEMS AT A GLANCE

Both in the UK and in The Netherlands, pensions are moving from DB to DC systems. Currently, most pension schemes in The Netherlands are either a DB scheme or a collective defined benefit (Dutch CDC) scheme. In both schemes, the accrued pension rights form the basis for premium/contribution and investment policies. New legislation in the Netherlands means many existing DB rights will instantly be transformed into DC capital sums. In the UK a trend in moving from DB scheme contributions to DC scheme contributions has been increasing significantly over the past 10 – 15 years.

In the UK there are many options for participants at retirement, including purchasing a fixed annuity, drawdown, taking a lumpsum (25% tax free) or keep saving. In the accumulation phase this means lifecycles are more tailored towards individuals. For example, interest rate hedging varies for individuals targeting buying an annuity versus taking a lumpsum.

The Dutch system uses individual DC capitals that are collectively managed. Choice at retirement is limited to either a fixed or flexible annuity combined with the option of a small (10%) taxable lumpsum. Default lifecycles in The Netherlands are therefore much more focused on one single retirement choice (for example a fixed annuity) with lower cash allocation and a designated interest rate risk hedge. In the accumulation phase lifecycles need to be 'tailored to the **>**

UK System

+ Individual freedom to use a part of the pension capital to reduce one's mortgage, cover health expenses, etc.

+ Capital after death still belongs to participant (falls to estate)

- Micro longevity risk: if you live longer than expected, members may run out of money

- Investment risk is not shared over multiple years or generations, resulting in (theoretical) lower allocation to risky assets

Dutch System

+ Sharing longevity risk and spreading investment risk means less fluctuations in pension payments

- Buffer capital may be required to facilitate risk sharing

- After death, remaining capital does not belong to individuals' estate

- Limited individual choice with respect to investment mix and retirement options

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collective' meaning that studies amongst participants with respect to risk attitude are required.

Both the Dutch system and the UK system have their benefits and drawbacks.

THE WISDOM OF COMPROMISE?

Whereas the UK system may suffer from a lack of risk sharing, the Dutch system strongly limits individual choice. A possible improvement in the UK is to introduce an element of pooling of risk amongst individuals. Currently, pooled solutions are being investigated in the UK. Making a pooling product available to members in retirement will provide members in the UK with an option to invest some (or all) of their pension savings in a product that provides protection against longevity and investment risks. An important consideration will be how assets are transitioned from an individual pot to a pooled 'collective' and when or how frequently this should occur. Introducing this as an option to sit

alongside un-pooled solutions would allow members to continue to access some the flexibilities that are currently present in the UK system.

Similarly, introducing an option to split the pension pot may benefit the Dutch system. An extra degree of choice (for instance increasing the lumpsum possibility to more than 10%) or a partial drawdown will give members more options to tailor their pension to their personal situation. A key issue is that members would need to make an advised choice as to what option (or combination of options) is best for their situation. In The Netherlands, by law there is a certain degree of obligation to inform members about the choices they have. The more choices they have, the more difficult it will be to enable members to make the right choices. Education is needed to support members to make the right choices.

A combination of Dutch Solidarity and British Freedom, where members can split the pension capital into a collective part

(with risk sharing) and individual part (flexible individual choices) could present an optimal range of options to members in retirement. **<**

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INSURABILITY
AND ARTIFICIAL INTELLIGENCE

BY **BOGDAN TAUTAN**

BOGDAN TAUTAN is Reinsurance Analyst and Non-Life Actuary at Achmea Reinsurance, The Netherlands. He has co-authored, together with **ESKO KIVISAARI, PHILIPP MIEHE, CLAUDIO SENATORE** and **FRANCESCO TORALDO** the recently published paper by AAE's Artificial Intelligence and Data Science Working Group: '*AI and the opportunity and challenges it presents to insurability*'. This article has been peer reviewed by **CLAUDIO SENATORE** and **JONAS HIRZ**.

INSURABILITY AND RISK

Actuaries and risk professionals aim at understanding the risk affecting the policyholders and estimating accurately the premiums charged. In order to deal with insurability, actuaries use advanced actuarial risk models, data collection, and statistical methods while relying on regulations and market conditions continuously. The aim of this paper is to frame the concept of insurability when challenged by artificial intelligence (AI) tools, as discussed by the recently published paper '**AI and the opportunity and challenges it presents to insurability**'.

Insurability is conceptually defined by elements such as the understanding of the risks that affect the individuals that are to be insured, the premium level that corresponds to their risk level and the compensation they receive for the losses that might occur. A risk is insurable when it meets different criteria, such as being part of an insurance pool containing a **large number of similar exposure unit**, has a d**efinite and calculable loss**, is **affordable** in **premium** terms and it is **limited of catastrophically large losses**. However, insurability can always be threatened by moral hazard, adverse selection and insurance fraud.

THE CONTEXT OF AI

Various research shows that AI has been so far largely positive for the society, reshaping the way financial institutions work, while focusing on data usage and process optimization. For example, M. Eling et. al. (2019)[1] show that most common forms of AI are applicable to image detection, fraud detection, claims management, natural language processing and predictive analytics using actuarial pricing models. **>**

The High-Level Expert Group, set up by the European Commission, states that:

' Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals.'

Software based AI systems commonly include applications under the name of machine learning. Where human intervention is needed, we call them **supervised learning techniques**. If no human intervention is required, they will be referred as **unsupervised learning** and **reinforced learning**. Hardware embedded AI systems are to be found in autonomous cars, robots or Internet-Of-Things applications.

AI tools achieve a certain degree of rationality by perceiving the environment they are part of, processing information and deciding the best course of action. AI has become an important tool in the value chain of insurance companies, specifically the AI systems that are implemented to execute specific tasks, helping customer interaction, product development, underwriting

and claims management. Some examples of InsureTech companies include Lemonade, Wefox, among others, which use AI within the property and casualty insurance space, providing improved claims analysis and more dynamic and customer-centred product propositions. It is hoped that this article will contribute to an understanding of how the behaviour of AI systems can impact the insurability landscape.

HOW AI CAN IMPACT INSURABILITY

Insurance companies assume to a certain extent that the risks they group are independent but similar, acting by the way of **law of large numbers**. We believe AI applications are capable to assess the risks with more accuracy on an individual level, assigning bespoke risk-based premiums. This insurability criteria will be challenged once AI will capture the dependency between risks better and will help insurers distribute the premium levels specifically to individual's needs.

The **affordability of the premium**, should, however, be kept. The perception of risk from the policyholders is totally different than from an insurer's perspective. When generalizing and pooling risk together the premium may not represent the underlying risk of the

insured. AI can help in dealing with premium optimization problems. Policyholder's may face risks that are unbearable from the insurance value perspective. In such a case, a disproportionally high premium will be in place. This will challenge the AI systems by creating and isolating risks that are uninsurable.

Claim frequency and severity is another part where AI will add value through better predictions. The **loss definition** will change, once the AI systems will be able to predict claims and help design new insurance products. The products could be transactionally more efficient, more cost effective and cover risks that were previously uninsurable. However, an accurate loss prediction and definition might be at the expense of the policyholder, with insurance companies taking advantage when designing the policies and the risk cover in place. This will also help insurers transfer their risks more adequately when potential **large catastrophic losses** are identified.

With good intentions and a sustainable risk governance, insurers have the opportunity to create customer profiles using large amounts of data, identify insurance gaps, and provide adequate risk cover. They will have the opportunity to enrich previously available **>**

data with more society related insights, for example, by making use of natural language processing techniques or availability of web data (**Common Crawl**[2]). High costs of data administration and claims handling may also push them to adopt concepts like the **Pan-European Personal Pension Product** , reducing costs, providing a higher insurance access.

However, threats such as adverse selection, moral hazard and insurance fraud will remain.

FURTHER ASPECTS TO CONSIDER

AI can pose some problems when it comes to risk exclusion. With a better risk differentiation, some insurers might tend to be selective in covering certain risks, socially excluding policyholders. Another important aspect of AI which has to be monitored is the transparency of the systems. The algorithms behind a new technology are not understood well from the beginning by all involved, creating the so called 'black-box' effect. To overcome this technical barrier of AI, to begin with, any financial institution should make use of validation techniques, document and benchmark the algorithms against traditional methods (see Henckaerts et. al. (2019)[3] and Molnar[4]). Actuaries should consider developing

the models in a responsible manner, test them by avoiding methodological and technical errors and make sure they will not cause any harm to vulnerable groups, respecting social inclusion.

AI will also bring a new light on the organisational complexity of an insurance company. While the policyholder will benefit the reduced complexity and costs of an insurance product, the organisations may face different challenges. There will be a higher need of interdisciplinary work, covering key specialism functions from different departments at the same time. The skills of the actuaries, IT professionals, data scientists, underwriters etc., will be collectively involved. Effectively designing AI systems will help in reducing miscommunication between departments and the human-error factor when handling data-flows within the organisation.
This will help reduce existent operational risks and provide transparency on data usage. Undoubtedly, the failures of IT infrastructures, algorithmic liability or performance issues involving risk predictive algorithms will have to be considered.

With a cooperative and healthy governance landscape, up-to-date actuarial education and optimised business operations, AI will help improve insurability

and provide new covers for risks that were previously uninsurable. **<**

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[1] M. Eling et. al., 'The impact of artificial intelligence along the insurance value chain and on the insurability of risks', 2019, The Geneva Papers on Risk and Insurance - Issues and Practice.

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[2] **Common Crawl,** offers high-quality crawl data by collecting huge amounts of web data centrally and making it freely available to the public.

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[3] Roel Henckaerts, Marie-Pier Cote, Katrien Antonio, Roel Verbelen, 2020, Boosting insights in insurance tariff plans with tree-based machine learning methods.

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[4] Christoph Molnar, **Interpretable Machine Learning.**

COLUMN

ARTIFICIAL INTELLIGENCE

Characteristic to my early actuarial career were simple models based on age and gender, often together with the assumption of a fixed interest rate. We knew these models could be improved with better data. Data was however expensive even when it was available and its manipulation was slow, and also expensive. Furthermore it was impossible to be certain of the validity of the data. As we knew the models were lacking we needed to have safety margins here and there together with restrictive underwriting criteria in order not to sacrifice the solvency of our employer.

This has changed with the advent of Big Data and Artificial Intelligence (AI), and the progress is expected to go forward. The amount of digital data increasing with steps measured in zettabytes, and the still valid Moore's law guarantees that mushrooming amounts of data can be utilised in an efficient manner. AI holds the promise that our modelling capabilities will improve continuosly.

All this means huge opportunities for actuaries and their employers. The Actuarial Association of Europe has recently published a paper on AI and insurability where these opportunities are discussed more in depth. I can only say that I see a lot of possibilities in this area. Better tools do not mean that insurance becomes obsolete – while we are better able to forecast the future, actual outcomes remain stochastic and sharing of risks is needed as a central tool to manage uncertainty. Or, instead of remaining a central tool one can say its role increases with new technology. One can also say that there are chances of insuring risks of lower socioeconomic groups that were earlier uninsurable.

These opportunies must be adopted responsibly as together with opportunities there are threats. Earlier actuarial practice resembled to some extent practices in civil aviation where safety margins allow us travelling without dangers.

Military aviation differs from civil aviation. Fighter jets are often inherently unstable. They can be like spinning tops turned upside down needing constant monitoring.

Big Data and AI can introduce similar behaviour to insurance with razor thin margins and machine learning models adapting practices continuosly. The financial crisis of 2008 must not be forgotten with its origin in failed models utilised by many banks. My hope is that actuaries are involved in the use of AI and Big Data since we have in the history of the profession already done nearly all possible mistakes. We need to be trusted so that the mistakes will not be repeated.

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