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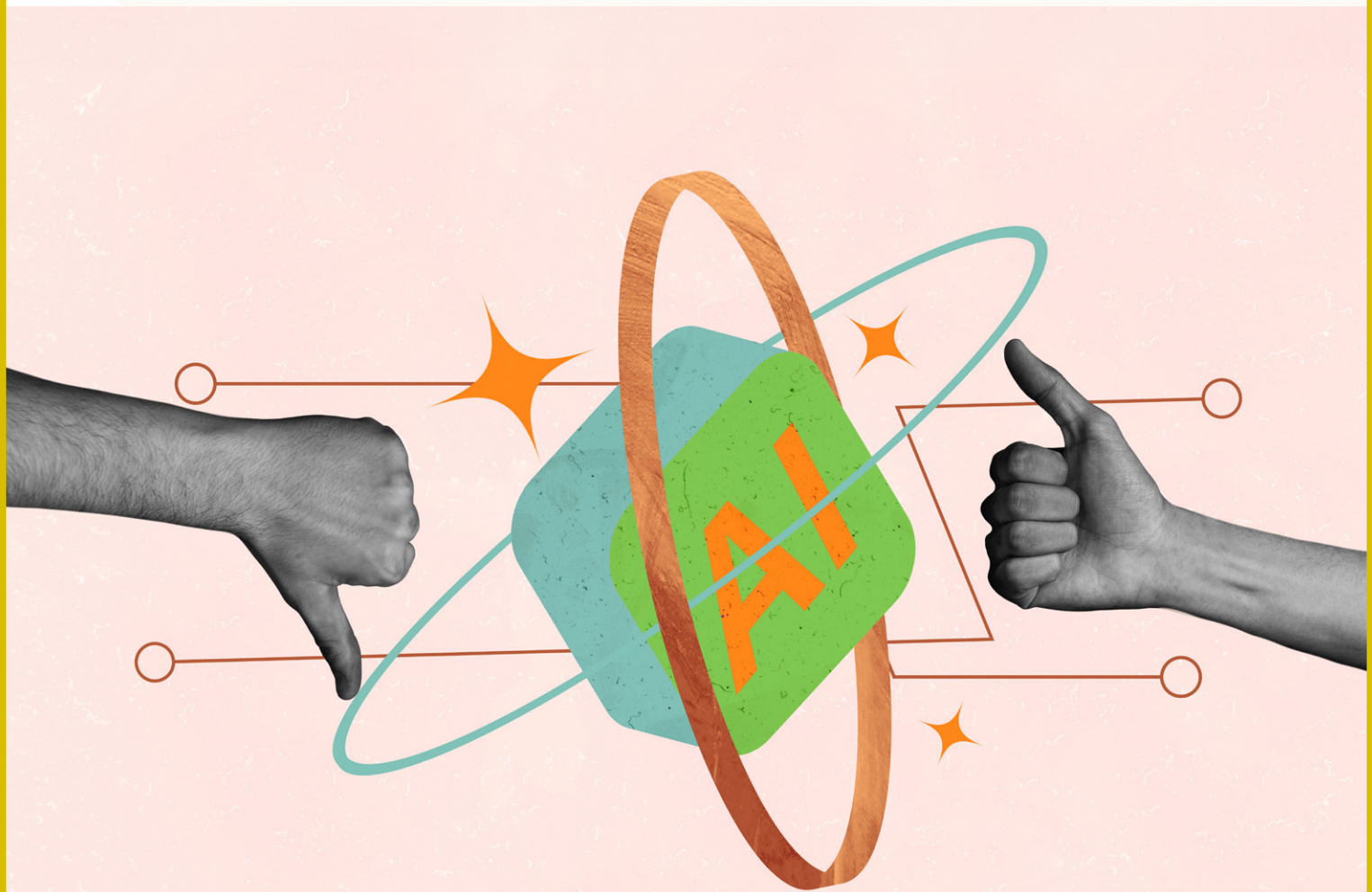
INTERVIEW

BY **JENNIFER BAKER**

ADDRESSING AI RISK IN THE INDUSTRY

Speaking to The European Actuary, Claudio Senatore Reso, Vice Chair of the AAE's data and AI working group, discussed the evolution of AI adoption in the insurance industry. He emphasised the need for updated actuarial standards and guidelines to address AI's rapid evolution and highlighted the importance of explainability, fairness and the need for a proactive approach to AI. >



> ***There is a second trend of AI that is not the tool adoption, it is the change in how you see and shape the risk***

How would you describe the current state of AI adoption within the European actuarial profession?

'When I joined this working group around four years ago, it was definitely smaller because the mega trend of ChatGPT and AI was not there. I also see a difference in terms of interest before and after 2022. Our working group is primarily focused on AI adoption. But not only on adoption. We are also looking at education, use cases, regulation – really 360 degrees of attention on AI. We look at what insurance companies are doing from a more actuarial perspective. We also look at the underwriting world.

What we see are two trends: AI as a tool, sometimes from an external software provider, or in some cases, internally developed.

But in my opinion, there is a second trend of AI that is not the tool adoption, it is the change in how you see and shape the risk. This is conceptually different, because it's not the actuary waiting for the adoption of a new tool. It's the actuary as a figure that goes beyond what he studied at the university, beyond the usual professional courses that he has to do. We, as a profession, need to constantly update. So this second trend is more something based on the individual actuary that wants to push himself beyond the established model.

But this is key because in AI, there might be very, very different models. As actuaries, we need to take this opportunity to view the risk from a different perspective, to be able to shape the risk in a different way, to deconstruct and reconstruct the statistical signal in different ways using these models.'

The AAE has been actively engaging with regulators. What are the key messages actuaries are trying to convey to policymakers on AI governance? You contributed to the AAE's response to EIOPA's Opinion on AI Governance.

'So since the early discussion about the AI Act, there was the observation arising from across Europe that the AI definition adopted in the regulation is so large that to some extent, it covers very well established statistical models that we have used for 30 to 40 years – like the generalised linear models (GLM). Actuaries have been concerned from the very beginning that an additional burden of regulation on these models would not really help the profession.

In fact, in a letter from EIOPA clearly stated that in its opinion, some statistical models, like the GLMs, should not be considered in the AI Act for several reasons. The first is that they are already regulated by many regulations – Solvency II, GDPR, etc. The second is that, although they may fall under the definition of AI, they are not comparable with the complexity of LLM or similar models. We are actively engaged with the open and working group of data and AI, and this is an occasion to revitalise the discussion about this subject.' >

> ***What we are doing on principles is okay. But in our opinion, it's not enough, because we always want to raise the standards.***

In an AI-driven environment, how should responsibility be divided between actuaries, data scientists, and management when it comes to model outcomes?

'That's the $1 million question. Internally, we are doing research about that: Could the actuarial function be responsible for the risk of AI models? How to compute this risk? How to monitor AI models? My personal opinion is that AI is an opportunity for the actuary. It's an opportunity to enlarge the responsibilities of the profession and we are really well equipped to do that, because we know how to deal with risk.

Obviously, this brings pros and cons. The con is that the burden of work, of responsibility, is increasing, but you also have the pro that the exposure of actuaries within a company is increasing. So, it's not just a matter of responsibility, it's also a matter of expanding your influence and that's the point. Think about also to Agentic AI, a single agentic workflow simultaneously involves Model Provider, System Integrator, Deployer no single party sees the full chain. The reality is that the ownership of AI is not a handoff, it is an integration of all C-levels.'

Do current actuarial standards provide sufficient guidance for AI-based models, or is there a need for new professional standards at the European level?

'We did extensive research about Standards Guidelines, and we saw that some organisations have already updated their guidelines. Codes of conduct and guidelines with respect to AI are not easy, for several reasons, among which is the pace at which the AI is evolving. It's moving so fast, that in one week guidelines might be outdated.

In Europe, the principles set out in codes of conduct and professional guidelines – although not always explicitly referring to AI are grounded in such strong ethical, moral, and professional standards that they already encompass many of the key issues and risks associated with artificial intelligence. From this perspective, the foundational principles are sound and sufficiently robust. However, in our view, this is not enough: the objective should not be merely to rely on existing standards, but to continuously strengthen them and raise the level of responsibility and governance in response to the new challenges introduced by AI.'

Supervisors increasingly emphasise explainability. In your view, what level of explainability is realistically achievable for complex machine learning models in insurance?

'Explainability is definitely a key subject. The European Actuarial Association has devoted an entire paper to explainability, and we are talking about thousands of researchers working on that. To us as actuaries, we always have to explain models and functioning to less technical people. We are used to that, but obviously the level of complexity and complexity of the explainability of these models, went up. >

> *I don't think that you could really ever be replaced by AI*

There are already some good standards in the profession in terms of explainability. But we still have different approaches, depending on the country, depending on the regulator. We should aim to have a more standardised approach with respect to explainability across countries, so if you are adopting an LLM in Germany or in France or in Italy, you use the same maximum explainability indicators everywhere. This should simplify work for everyone. Obviously, in parallel, the profession needs to figure out which are the four or five main models. A common reporting framework could also really help on that, but we are not yet there.'

Looking ahead, what are the challenges and what would success look like for the AAE's work on AI over the next five years?

'There are different types of barriers that could make AI adoption more difficult and in some cases not possible. The AI Act is categorising some models as high risk. But this does not mean that it's making AI adoption impossible. From an infrastructure and IT perspective, there are the usual barriers that we had 5 years ago. In many cases, you have really old, fragmented or siloed IT architecture that does not make it easy. But AI definitely gives you a push.

The second barrier is the mindset. You have to change the mindset. If you only think about the new risks that AI brings to insurance companies, you will have problems. I see a lot of investment in trying to adopt AI, but not as much in education and people. We need a big investment, because we do need a change in mindset. Change in how you do things, and changing the everyday work of people is something really, really difficult.

But looking ahead, I'm absolutely optimistic. AI expands what you can understand, what you can do. What you would have understood, maybe in two weeks, now you need two hours. So I'm absolutely optimistic with respect to AI. But you need to be proactive in how you leverage it, not just in a passive way. If you leverage it proactively, actively, not lagging behind, then I don't think that you could really ever be replaced by it.' <

CLAUDIO SENATORE

IAA AI TASK FORCE: GITHUB REPOSITORIES ON CASE STUDIES AND TOOLS

BY **SIMON HATZESBERGER** AND **JONAS HIRZ**

The International Actuarial Association's (IAA) AI Task Force has developed a rich and growing set of resources for actuaries interested in artificial intelligence. One of the most valuable hubs for these materials is the Task Force's GitHub account – a central place where actuaries find practical case studies, how-to guides, and tools that help actuaries apply AI in their work.

THE IAA AI TASK FORCE

The IAA is the worldwide association of professional actuarial organisations, with a mission to advance scientific knowledge and the skills of actuaries globally. Launched in 2024, the AI Task Force brings together about 100 volunteers from all over the world. In its 2025/2026 phase, the AI Task Force is organised into four workstreams: 'Engagement and Foundations', 'Research and Advancement', 'Case Studies and Tools', and 'Adoption Framework'. This article offers a closer look at the work of the 'Case Studies and Tools' workstream. More information on the AI Task Force – its workstreams, overall deliverables, and general background – is available on the IAA AI Task Force website.

If you have visited the AIforActuaries platform, you've already encountered one of the AI Task Force's flagship initiatives – a space for learning, discussion, and exchange of AI-related content tailored for actuaries.

To share resources on case studies and tools more broadly, the AI Task Force also maintains a dedicated presence on GitHub, a widely used platform for hosting and collaborating on code, documentation, and project materials. >

The GitHub account features two primary repositories:

- *Actuarial AI Case Studies:* a curated collection of real-world AI examples – including machine learning, generative AI (GenAI), and agentic AI – designed to help actuaries apply these techniques to practical problems.

- *AI Tools for Actuaries:* a comprehensive hub of tutorials and how-to guides on AI tools, ranging from document-to-Markdown conversion to using large language models (LLMs) via API, aimed at enabling actuaries to integrate AI technologies into their workflows.

In the following, we take a closer look at each repository, explaining their purposes and showcasing sample content.

REPOSITORY SPOTLIGHT: 'ACTUARIAL AI CASE STUDIES'

This repository compiles a wide range of actuarial case studies involving AI, covering all skill levels from introductory to expert. Each case study is listed with metadata (e.g., date, topic, complexity level, models used, abstract/summary) and includes links to supporting materials such as articles, websites, and code. The collection primarily compiles existing case studies from the actuarial field; however, for topics where no suitable examples were found, the AI Task Force developed original case studies – complete with implemented code and explanatory documentation.

The repository's purpose is twofold:

1. Demonstrate concrete AI applications to actuarial tasks.

2. Enable actuaries to adapt these solutions for their own work by providing code and practical implementation steps.

To illustrate the repository's value, we highlight two original case studies showing how GenAI streamlines actuarial tasks with complex visual and unstructured data. Both are fully implemented as Jupyter notebooks.

Case Study 1: Car Damage Classification and Localisation with Fine-Tuned Vision-Enabled LLMs

This case study explores how multimodal LLMs, such as OpenAI's GPT-4o, can classify different types of car damage from images. It compares three models: a traditional convolutional neural network (CNN), an off-the-shelf GPT-4o, and a fine-tuned version of GPT-4o trained on a labelled subset of the car damage images. For the given task, the off-the-shelf GPT-4o performed nearly as well as the CNN straight out of the box – benefiting from pre-training and without requiring specialised CNN expertise – while fine-tuning the LLM further raised its accuracy and F1 score above those of the non-fine-tuned GPT-4o.

Notably, GPT-4o can go beyond simple classification by extracting contextual insights, such as the damage location (e.g., 'rear bumper') and additional details like weather conditions or number plates. These capabilities are particularly valuable for automating claims processing and risk assessment.

Case Study 2: GenAI-Driven Market Comparison

This case study applies GenAI to extract and compare key financial and insurance data from insurers' annual reports – documents that are long, unstructured, and highly variable. Using a three-stage pipeline based on retrieval-augmented generation (RAG), the model extracts three specific aspects from the 2025 annual reports of three major European insurers (AXA, Generali, and Zurich): regulatory capital ratios under Solvency II or the Swiss Solvency Test, EUR discount rates for insurance contract liabilities, and insurer financial strength ratings. >

The pipeline first processes and embeds the documents for semantic search, then retrieves relevant text chunks based on the user's query, and finally uses Structured Outputs to ensure the results conform to predefined JSON schemas. Five widely used LLMs are benchmarked on this shared retrieval pipeline, yielding stable, near-deterministic outputs across repeated runs. The approach enables actuaries to efficiently produce standardised comparisons across companies without manually reviewing entire reports – and can be readily adapted to analyse and compare other documents, such as risk reports or insurance tariff details.

REPOSITORY SPOTLIGHT: 'AI TOOLS FOR ACTUARIES'

This repository offers practical tutorials and how-to guides on AI tools designed to support actuaries in their daily tasks. Content is delivered in formats best suited to each tool – whether short instructional videos, interactive notebooks for code-based applications, or other appropriate media. Current examples include a document-to-Markdown conversion toolkit for actuarial workflows, with OCR and office-document support; and a guide to using large language models via API, covering basic prompting alongside more advanced techniques such as Structured Outputs, Function Calling, fine-tuning, and RAG.

The repository's purpose is to raise awareness of relevant AI tools, demonstrate their practical use with best practices, and highlight how these technologies can improve the efficiency and/or quality of actuarial work.

GET INVOLVED: A EUROPEAN INVITATION

We invite you to explore the **IAA AI Task Force GitHub repositories** and discover practical ideas you can adapt to your own work. European actuarial practice is already represented, and we particularly welcome further European contributions – for instance case studies built on EU and EEA data sources, analyses framed against EIOPA guidance and the EU AI Act, GDPR-aware data treatments, or tools developed within European actuarial workflows. If you know of, or have developed, relevant case studies or tools, please share them using the submission guidelines in the repositories or by contacting us directly.

New content is added regularly – stay connected and check back often to discover the latest updates. <

IAA AI Task Force: **https://actuaries.org/council/executive/artificial-intelligence/**
GitHub Repositories: **https://github.com/IAA-AITF/**
AIforActuaries: **www.aiforactuaries.org/**

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ENGAGING WITH EUROPE'S POLICYMAKERS

THE VALUE OF CONSULTATION

BY **STEPHANOS HADJISTYLLIS**

One of the AAE's strategic priorities is to maintain a strong presence in European policymaking. Strategic Objective 1 – 'Enhance relations with European institutions' – commits the AAE to establishing and maintaining relationships with key European institutions so that the AAE can effectively provide them with high-quality professional advice to improve the soundness of decisions from an actuarial perspective.

This includes playing a prominent role in shaping new European legislation and in reviewing and refining existing legislation that affects actuarial work in both traditional and emerging areas. It also means reinforcing relationships with the European Commission, EIOPA, and other European stakeholders.

Public consultations are a key mechanism for achieving these aims. They provide a transparent forum for expert input and allow the AAE to help ensure that policy and regulation are grounded in sound actuarial principles. Each consultation response reflects the profession's expertise and commitment to the public interest.

Our ability to respond effectively relies on the support of our Member Associations and volunteers who contribute time, knowledge, and insight. The AAE thanks all those involved in recent consultation work for their continued dedication and professionalism.

RECENT CONSULTATION RESPONSES

Over the past quarter, the AAE has responded to several European Commission and EIOPA consultations of direct relevance to our profession:

1. EIOPA Guidelines to specify further the qualitative and quantitative indicators in pre-emptive recovery planning
2. EIOPA Guidelines to specify further the range of scenarios in pre-emptive recovery planning
3. EIOPA Consultation on adaptation measures in NatCat insurance under Solvency II
4. European Commission Detailed arrangements on evaluations and proceedings in relation to the Artificial Intelligence Act

Together, these represent our most recent contributions to European consultations. >

1. EIOPA CONSULTATION ON IRRD GUIDELINES FOR SCENARIOS IN PRE-EMPTIVE RECOVERY PLANNING

This consultation focused on draft guidelines governing the range of scenarios to be used in pre-emptive recovery planning under the Insurance Recovery and Resolution Directive. The guidelines addressed how to structure scenarios around slow-moving and fast-moving events, how to design appropriate severity thresholds including breaches of capital requirements, and how to distinguish between system-wide and idiosyncratic events such as market-wide asset movements or concentrated exposures.

Clear guidance in this area matters because it ensures that recovery plans are credible and consistent across the EU without placing disproportionate burdens on smaller firms. It also helps insurers avoid duplicating work by leveraging existing ORSA frameworks while still being able to realistically test their capacity to restore financial positions.

Our response called for proportionality and consistency above all, urging that guidelines allow cross-referencing to existing Solvency II and ORSA documentation rather than imposing a one-size-fits-all approach. We asked for greater clarity on projection horizons, arguing that slow-moving events should not automatically require multi-year projections where this is not proportionate to the risk. We recommended that fast-moving events be explicitly defined to include derivative margin calls and mass lapse scenarios, and that guidance be provided on whether SCR breaches should be assessed with or without Long-Term Guarantee measures. We also encouraged regulators to consider ownership structures, such as private equity maturity cycles, as relevant idiosyncratic risk drivers, and proposed that reputational risk be treated as a narrative element within scenarios rather than a standalone measurement dimension.

AAE CONSULTATIONS

2. EIOPA CONSULTATION ON IRRD GUIDELINES FOR INDICATORS IN PRE-EMPTIVE RECOVERY PLANNING

This consultation sought to specify the qualitative and quantitative indicators that should trigger the escalation or activation of pre-emptive recovery plans. It covered indicator categories spanning capital, liquidity, asset quality and profitability, as well as market, macroeconomic and operational event indicators, with the aim of ensuring these indicators provide sufficiently early warning of financial distress. >

The stakes are significant. Poorly calibrated indicators can lead either to the inadvertent activation of recovery plans when a firm's viability is not genuinely threatened, or to dangerous inaction until it is too late to respond effectively. Consistency across Member States is equally important to ensure a level playing field in supervisory expectations.

In our response, we emphasised the need to draw a clear distinction between hard recovery triggers and early-warning indicators that require expert judgment, rather than treating all indicators as equivalent. We argued that capital and liquidity should be the primary mandatory indicators, with profitability and asset quality serving a supporting, early-warning function. We called for explicit confirmation that a breach of the Solvency Capital Requirement constitutes the minimum mandatory capital indicator. We also raised concerns about the proposed mandatory use of 2024 EIOPA Stress Test haircuts for liquid asset ratios, which we believe should remain illustrative rather than prescriptive. More broadly, we advocated for treating macroeconomic and operational events as scenario-defining inputs rather than direct triggers, given that management cannot control them, and urged a principles-based approach that allows firms to reflect their own specific risk profiles.

AAE CONSULTATIONS

3. EIOPA CONSULTATION ON NATCAT ADAPTATION MEASURES IN INSURANCE

This consultation examined how the Solvency II standard formula for natural catastrophe risk could be refined to better reflect the benefits of climate adaptation measures such as flood defences and roof hardening. EIOPA assessed a range of prudential treatment options including more frequent reassessment cycles, Undertaking-Specific Parameters and new dedicated parameters, and conducted peril-specific analysis covering windstorm, earthquake and flood. The consultation also considered the distinction between micro-level measures at the property level and macro-level infrastructure interventions.

The policy question here is important: if capital requirements fail to recognise adaptation efforts, insurers have little incentive to pass on the benefits of resilience to policyholders. At the same time, granting capital relief without robust supporting evidence risks undermining solvency standards. This makes the prudential treatment of adaptation a critical bridge between financial regulation and broader climate resilience policy.

Our response supported a combined approach, favouring more frequent reassessment of risk parameters alongside the introduction of new dedicated adaptation parameters. >

We encouraged EIOPA to draw on international evidence, including data from the US FORTIFIED roof hardening programme, to inform European windstorm vulnerability assessments, appropriately adjusted for local conditions. We called for greater geographical granularity in the CRESTA zone structure, potentially down to postal code level, to better capture local risk variations. We advised that Undertaking-Specific Parameters be reserved for larger entities, given their resource intensity, with country-specific parameters offering a more scalable alternative for mid-sized firms. We cautioned against treating physical adaptation as a form of risk mitigation equivalent to reinsurance, as it lacks the contractual and enforceable characteristics that underpin that treatment. Finally, we urged the inclusion of wildfires and heavy snow in the standard formula so that relevant adaptation measures for those perils can also be recognised.

CONSULTATIONS

4. EUROPEAN COMMISSION CONSULTATION ON THE AI ACT IMPLEMENTING REGULATION

This consultation concerned the draft Implementing Regulation setting out the detailed procedural arrangements for the European Commission's evaluation of general-purpose AI (GPAI) models and enforcement proceedings against their providers under the EU AI Act.

The stakes for the actuarial profession are direct: GPAI models are increasingly embedded in insurance pricing, underwriting, reserving and operational risk management. Actuaries and the firms they serve are therefore primary downstream users of the models this Regulation governs, bearing full professional responsibility for outputs regardless of the AI tools employed.

Our response was focused and targeted, recognising that as an implementing act the scope for substantive change is limited. We called for the technical competence criteria for independent expert selection to be addressed in accompanying guidance, ensuring that appointed experts bring statistical expertise, familiarity with uncertainty quantification and model validation, and knowledge of Explainable AI (XAI) methods. We welcomed XAI methodologies as a means of balancing transparency with business confidentiality, and invited further guidance on how they might be incorporated into evaluation practice. >

We raised two specific procedural concerns. First, on the log disablement provision in Article 2(1) – which allows the disablement of access logs during an evaluation – we noted that this departs from standard inspection practice, where maintaining an audit trail is a key safeguard requirement. Second, on the reopening of proceedings under Article 6(2), we observed that tying the trigger to systemic risk developments beyond a provider's conduct materially weakens the legal certainty that a formal closure decision should provide, and suggested a temporal limit or a more conduct-centred threshold.

WORKING TOGETHER FOR BETTER POLICY

These consultations illustrate the breadth of topics where actuarial expertise informs European policymaking – from natural catastrophe adaptation measures in capital requirements, to insurance recovery and resolution, and AI regulation. The AAE's strength lies in the collective knowledge of its members, drawn from 38 actuarial associations across 37 countries.

We are grateful to all volunteers and associations who contributed to drafting, reviewing and refining these responses. Your work ensures that the profession's voice is technically sound and relevant to policymaking.

Looking ahead, the AAE will continue to engage with the European Commission, EIOPA and other stakeholders. As new initiatives emerge – in sustainability, pensions, insurance and artificial intelligence – the profession stands ready to provide independent, evidence-based input.

By participating in the consultation process, the AAE helps ensure that regulation remains proportionate, forward-looking and centred on the long-term interests of citizens and policyholders. That is how the actuarial profession fulfils its public-interest mandate – and how it supports effective regulation.

This article was written on 25 May 2026 and does not include any developments in relation to consultations submitted by the AAE after this date. <

STEPHANOS HADJISTYLLIS is a Senior Actuary at the AAE and a Member of EIOPA's Occupational Pensions Stakeholder Group. The full text of the AAE responses to the consultations referenced above is available on the AAE website.

AI IN THE SERVICE OF RETIREMENT:

BRIDGING PREDICTION WITH INTERPRETABILITY

BY **GEORGIOS SYMEONIDIS**

As demographic shifts pressure EU Member States to strengthen the funded pillars of their pension systems, the need for accurate replacement rate estimation has become critical. A new study proposes a hybrid path, combining the raw power of Deep Learning with the transparency of Fuzzy Logic.

This article has been based on a paper. See end of article for details.

GEORGIOS SYMEONIDIS

Maintaining a standard of living after retirement depends directly on the replacement rate, frequently calculated as the fraction of the first pension amount over the last wage. In an environment characterized by economic uncertainty and incomplete data, traditional deterministic formulas often struggle to incorporate the complexity of modern financial landscapes and the qualitative insights of industry experts.

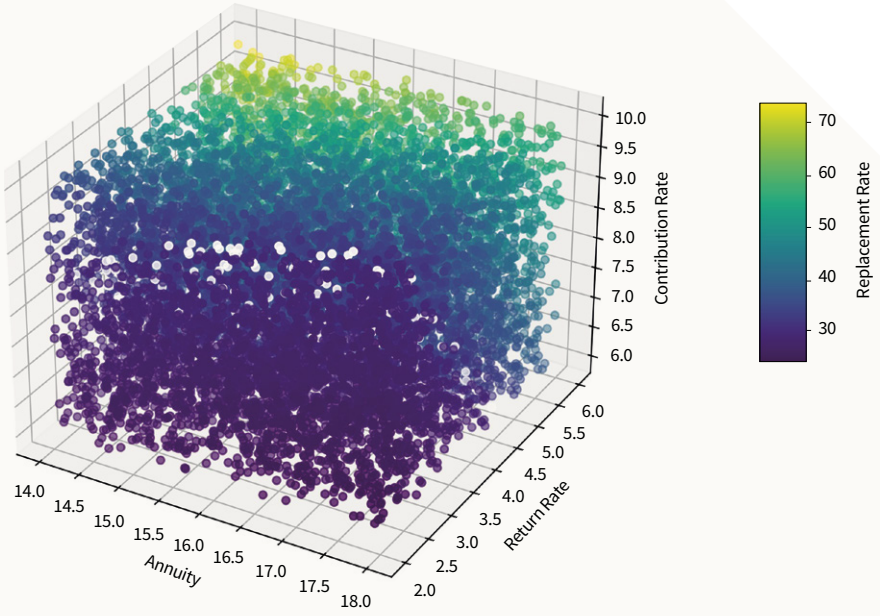
TWO WORLDS, ONE OBJECTIVE

The research evaluated two distinct Artificial Intelligence (AI) methodologies using an extensive synthetic dataset of 500,000 samples, simulating realistic pension planning scenarios based on variables such as annuity values, contribution rates, and investment returns. >

1. **Artificial Neural Networks (ANN):** The deep learning model demonstrated remarkable precision, especially when fine-tuned after a few, less successful, initial efforts. Its ability to identify intricate, non-linear patterns makes it an ideal candidate for large-scale data analysis in pension fund management.

FIGURE 1: Optimized Artificial Neural Network (ANN) Replacement Rate Values

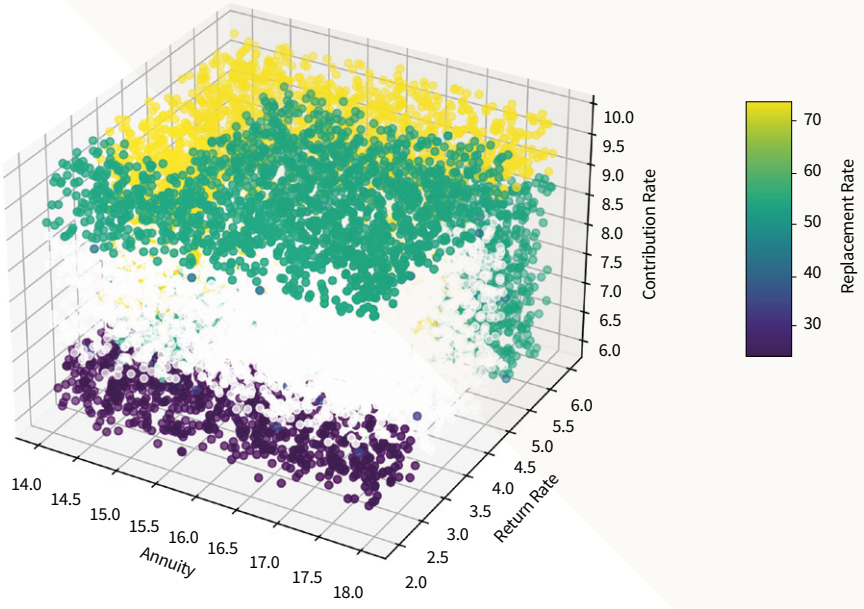
3D Plot with Replacement Rate Color Coding



2. **Mamdani Fuzzy Inference System (FIS):** Unlike the 'black-box' nature of neural networks, the FIS approach is rule-based, mirrors human reasoning and requires expert judgement (e.g., 'If annuity is high and return rate is low, then replacement rate is medium'). While it showed higher fluctuations in predictions compared to ANNs, it offers unparalleled interpretability and transparency. >

FIGURE 2: Optimized Fuzzy Inference System (FIS) Replacement Rate Values

3D Plot with Replacement Rate Color Coding



THE SOLUTION: MULTI-CRITERIA INTEGRATION (AHP)

To bridge the gap between quantitative power and qualitative transparency, the authors recommend the approach of the **Analytic Hierarchy Process (AHP)**. This structured decision-making framework allows actuaries and fund managers to systematically weigh different modeling paradigms based on several key criteria:

- **Accuracy:** Prioritizing the precision of the ANN.
- **Interpretability:** Leveraging the rule-based clarity of the FIS.
- **Stability:** Ensuring consistent outputs under input perturbations.
- **Computational Cost:** Balancing resources against performance.

In this hybrid framework, the ANN provides the predictive 'heavy lifting' while the FIS ensures that the underlying logic is explainable to stakeholders and regulators.

STRATEGIC IMPLICATIONS

For European insurers and pension providers, integrating such AI-driven tools offers a scalable way to process large datasets with minimal human intervention while maintaining the ability to integrate expert knowledge where necessary. Furthermore, the use of explainability tools like SHAP or LIME alongside these models can foster the trust and transparency required for regulatory compliance and stakeholder confidence.

Ultimately, recognizing when to rely on a neural network's precision and when to prioritize a fuzzy system's reasoning may be one of the most valuable contributions AI can make to modern pension governance.

GEORGIOS SYMEONIDIS is an actuarial consultant working mainly in the field of pensions. He holds a PhD in Insurance Economics and is a fully qualified Actuary. He is the Chair of the International Association of Consulting Actuaries (IACA), Section of the International Actuarial Association (IAA), and a member of the Strategic Planning Committee (SPC) of the IAA.

This article is based on the paper **'Introducing AI in Pension Planning: A Comparative Study of Deep Learning and Mamdani Fuzzy Inference Systems for Estimating Replacement Rates'** by Pantelis Z. Lappas and Georgios Symeonidis, published in 'Mathematics' in November 2025. An early version of the paper was submitted to the 1st Joint Colloquium of the Sections of the IAA hosted in Belgium in September 2024. The authors received the Best Paper Award by the Pension Benefits and Social Security Section. <

ACCIDENTS THAT NEVER HAPPENED:

GENERATIVE AI AND FRAUD IN MOTOR INSURANCE

BY **BARTOSZ GAWĘDA** AND **JAN THIEMEN POSTEMA**

For years, motor insurers have treated photographs as a useful anchor of truth. A dented bumper, a cracked headlamp or a damaged door seemed to offer something objective in an otherwise contested claims story. That assumption is now under pressure.

> ***Human performance was roughly at chance level***

Generative AI has made it easy to create convincing images of vehicle damage, edit existing photos or remove damage from pictures taken at policy inception. In practice, motor insurance fraud is shifting. It is no longer only about exaggerating a real loss. It can also involve fabricating a crash event that never took place, or disguising damage that was already there before cover began.

This matters because motor insurance is a high-volume, image-heavy business. Claim journeys are increasingly digital, fast and mobile-first. Historically that has improved customer experience, but now, with generative AI, it can create an opening for synthetic evidence. At the same time, repair costs have risen sharply in recent years. When margins are under strain, even a modest increase in successful fraud can have a material impact on profitability.

Our research looked at this risk from three angles. First, how easy is it to generate fake car damage imagery with widely available tools? Second, how well can humans and off-the-shelf detectors identify those fakes? Third, what should insurers change in their workflows if visual evidence can no longer be taken at face value?

The answer to the first question is uncomfortable. Creating plausible fake images is no longer difficult. With the right prompt, there are tools that are currently available and easily accessible that can generate damage tailored to a vehicle model, colour and age - and they can do so quickly. Some outputs still contain clues such as inconsistent reflections, implausible shadows or distorted text on number plates, but these flaws are not reliable enough to protect an insurer that relies mainly on human review.

To test that point, we ran a quiz with 925 respondents from 27 countries and various backgrounds. Participants were asked to decide whether car damage images were real or AI-generated. The average score was 46.4%. In other words, human performance was roughly at chance level. More importantly, we found no clear respondent characteristics that explained better performance. Experience, role and currently used fraud detection tools did not provide a dependable edge.

That finding has an important actuarial implication. This is not just a training problem. It is a control problem. If even experienced professionals cannot consistently separate real from fake images, insurers need stronger systems rather than more confidence in individual judgement.

Detection tools can help, but they are not a cure-all. Metadata analysis offers some quick wins, especially when it reveals traces of editing software or provenance information. However, metadata can be stripped, altered or absent. More advanced image forensics tools performed better in our testing, with some of the strongest results combining false positive rates of around 5% with a recall above 90%. Performance varied depending on whether watermarks were present and which image generator had been used. Even so, when large insurers process millions of images, a false positive rate at that level can still create substantial operational costs. For that reason, effective pre-selection or triage may be necessary before cases are escalated for further review. >

> ***Generative AI has weakened one of the industry's most trusted forms of evidence***

There is also a second challenge that insurers should not underestimate: privacy and operational resilience. Many web-based detectors require client images to be uploaded to third-party platforms. That raises obvious questions around data protection, usage rights and cross-border processing. Insurers also need confidence that a chosen solution will remain available, supported and stable enough for business use.

For that reason, the most robust response is a layered one. Detection should sit inside a wider, multimodal fraud-control framework, not replace it. In underwriting, insurers can reduce exposure by capturing images at policy inception through a dedicated app or certified inspection point, recording reliable metadata such as timestamp, location and device information. Requiring a full set of high-resolution images, rather than a single photo, also raises the cost of fraud. Reverse image search can identify recycled material already available online.

In claims, insurers should compare submitted photos with those captured at inception and verify whether the visuals match the insured vehicle in make, model, colour and version. Additional evidence can strengthen the case assessment: video statements, repair invoices, police reports, telematics, crash reconstruction and targeted follow-up checks with garages or other third parties. Not every claim needs the same level of scrutiny, but every process should have a credible escalation path when warning signs appear.

For actuaries, this topic goes beyond fraud operations. Synthetic image fraud affects loss ratios, pricing adequacy, claims assumptions and customer fairness. It also raises strategic questions about where controls add most value and how much friction an insurer can introduce without damaging the customer journey. That is a classic actuarial trade-off. The profession is well placed to quantify exposure, test intervention economics and help design controls that are proportionate to risk.

The broader lesson is simple. In motor insurance, a picture is no longer proof. Generative AI has weakened one of the industry's most trusted forms of evidence. Insurers that respond with a combination of better workflow design, technical verification and carefully chosen detection tools will be in a stronger position than those that continue to treat submitted images as inherently credible. The arms race is already under way.

To read the **full research here**.
Note: the image has been AI generated <

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WHO WILL INSURE THE AI **INFRASTRUCTURE BOOM?**

BY **SEKOU DIARRA**

SEKOU DIARRA

The breakneck expansion of artificial intelligence is fueling one of the most rapid infrastructure buildouts in decades. Across the US and Europe, vast data center campuses are rising to meet surging computational demand, backed by heavy capital flows from big tech and global infrastructure investors. Industry analysts estimate that global data center investment could exceed $1tn by the end of the decade as artificial intelligence workloads multiply. Annual spending on these facilities now exceeds $300bn, and the upward trajectory shows little sign of easing.

Amid the race to build, a quieter but increasingly consequential issue is emerging: who will insure the infrastructure that underpins the AI era? >

> ***Insurers today are not merely underwriting buildings; they are underwriting critical nodes of the digital economy.***

For insurers, data centers have shifted from a specialized corner of commercial property to one of the most strategically sensitive exposures on their books. What once appeared to be a straightforward growth sector is turning into a test of underwriting discipline, capital management, and portfolio concentration.

The traditional view of data centers as well engineered property risks is now outdated. Modern facilities are dense, hyper connected operational hubs supporting industries from finance and healthcare to logistics and government. A major failure at a hyperscale site can ripple through supply chains or disrupt essential services across multiple sectors.

This shift has altered the nature of the risk. Losses that once resembled isolated property events now carry the potential to behave like systemic shocks. Assumptions about diversification across geographies, clients or business lines are weakening as digital infrastructure becomes more concentrated and globally interdependent. Insurers today are not merely underwriting buildings; they are underwriting critical nodes of the digital economy.

The capital implications are significant. The construction boom is arriving just as insurers contend with elevated catastrophe losses, stubborn insured value inflation and heightened regulatory scrutiny.

A single hyperscale campus can represent billions of dollars in exposure. Add business interruption, cyber vulnerabilities and grid reliability concerns, and the capital required to support these risks rises sharply.

Individual data center risks now routinely exceed the line sizes insurers once deployed comfortably. As a result, placements are increasingly syndicated, with reinsurers exerting growing influence over how much capacity the primary market can supply. Underwriting decisions cannot be separated from reinsurance availability and portfolio level constraints.

Yet the appeal of the sector is undeniable. Data centers are long lived assets with persistent demand and operators who invest heavily in risk management. The continued digitalization of the global economy ensures the exposure is structurally tied to growth.

The question for insurers, then, is not whether to participate but how to allocate capital with discipline.

Leading carriers are already adjusting. Rather than viewing these facilities through a narrow property lens, they are adopting a portfolio wide perspective that integrates property, cyber and business interruption exposures. Many are prioritizing clients that demonstrate robust redundancy, power continuity and resilience engineering measures that directly influence both loss severity and capital consumption. >

> ***The carriers that succeed will be those that treat data center exposure not as a pursuit of premium growth but as a strategic portfolio decision.***

This evolution is reshaping the insurer–client dynamic. Data center operators are no longer seeking commoditized capacity; they want insurers involved at the design stage, offering engineering input on site selection, power architecture, and operational resilience. For insurers, early engagement is not simply value added, it is a route to more efficient use of scarce capital.

Regional differences compound the complexity. North America remains the world's largest and most capital-intensive market, with facilities expanding rapidly in size and power density. Here, insurers must balance attractive premium growth against aggregation concerns and exposure to natural catastrophes. Europe presents a different set of challenges: stricter environmental regulation, tighter energy constraints and, in some markets, political resistance to the sheer scale of new projects.

These dynamics complicate pricing and require a broader assessment of regulatory and sustainability risks alongside traditional underwriting considerations. Despite the regional contrasts, one question looms across all markets: how much balance sheet capacity should insurers commit to an industry that is expanding quickly, deeply interconnected and increasingly essential?

The answer will shape the insurance industry's role in the digital economy for years to come. Data centers are no longer a niche segment of commercial property insurance; they are embedded components of economic infrastructure and permanent fixtures on insurers' balance sheets.

The carriers that succeed will be those that treat data center exposure not as a pursuit of premium growth but as a strategic portfolio decision, one that demands alignment between risk appetite, capital constraints, and technical expertise. As AI infrastructure proliferates, it will challenge insurers to evolve their risk models and capital frameworks for a more interconnected world. Those that approach the sector with discipline may help stabilize the foundations of the digital economy. <

MR DIARRA is a former investment banker and currently serves as a corporate finance executive at a major insurance company in the United States. He holds an MBA from Duke University and is a member of the French Actuarial Institute.

AI AND SPACE TECHNOLOGY: PREVENTION AND INCLUSION, OR THREAT OF DEMUTUALISATION?

BY **STÉPHANE LOISEL** AND **FABIO MAINOLFI**

Stéphane Loisel:
'Europe's climate insurance protection gap is no longer an abstract macro-risk. It has become a concern and a focus area for EIOPA, ECB, the actuarial profession and academics. In our preprint with Hansjoerg Albrecher (University of Lausanne), we explain what changes with climate change and discuss solutions and 'non-solutions'.

This tension is particularly acute for home insurance. Climate change increases the frequency or severity of floods, wildfires, storms, subsidence and clay shrink-swell phenomena. At the same time, satellite imagery, geospatial data, connected sensors and machine learning can identify vulnerable properties with unprecedented precision. In a purely technical view, this looks like progress: underwriting becomes more granular, tariffs more risk-

'A more constructive question is: what if the same technologies that detect high-risk homes were used to protect them?'

STÉPHANE LOISEL holds a PhD in applied mathematics from University of Lyon, a MSc in actuarial science and finance, and is a fellow and former member of the board of the Institut des Actuaires. He is now chair professor at CNAM in Paris, in charge of the chair in Actuarial Science and Science of Risk, and a member of Lirsa. S. Loisel acknowledges partial support from ACTIONS and IAAA/ADRC research chairs.

reflective, capital more efficiently allocated. But in a social insurance view, the same tools may accelerate exclusion.

A more constructive question is: what if the same technologies that detect high-risk homes were used to protect them? For example, satellite radar interferometry can help monitor ground movement; high-resolution land-use and soil data can support clay shrink-swell risk mapping; AI can prioritise houses where prevention has the highest expected benefit. Instead of telling households that their premium must become unaffordable, insurers and public authorities could identify where drainage works, vegetation management, foundation reinforcement, water retention, firebreaks or flood barriers would most reduce future claims.

Prevention is part of the most promising solutions discussed by Albrecher and Loisel (2026). In the insurance economics literature, Ehrlich and Becker (1972) approach it with the concepts of self insurance and self protection (resp. decreasing claim severity and frequency). Focusing on self protection, in our first paper co-authored with Gauchon, Rullière and Trufin, we extend the classical risk model by allowing the insurer to invest in prevention that reduces claim intensity, and study optimal prevention under different risk indicators. When prevention impact is known in advance and when prevention affects all claims similarly, we show under very mild conditions that a universal prevention effort exists, that it does not depend on the surplus level (that can be interpreted as the Solvency capital requirement coverage ratio), and that it both minimizes risk (measured by ruin probability) and maximizes profit (for example measured by expected dividends paid up to ruin in a model with dividends).

One challenge with prevention is that some risks may not be amenable to efficient prevention techniques, and that its effect remains uncertain for the moment. In a follow-up paper with Gauchon, Rullière and Trufin, we distinguish between small claims and large claims, and model prevention as reducing the intensity of large claims without affecting small ones. We identify conditions under which prevention is worthwhile, and show that optimal prevention effort depends on the surplus level in this framework. Optimal prevention effort is often larger for insurers with higher surplus level than for insurers with small surplus. This suggests that prevention efforts should be undertaken while the insurance company is in good financial health. However, in another preprint with Bou Sakr and Trufin, we show that the conclusion may be reversed when prevention impact is too uncertain. In that stylised model, insurers with a comfortable solvency ratio would be better off implementing less prevention effort than insurers with solvency challenges. These results show that prevention appears to be a necessary tool to mitigate climate change impacts (to be combined with other solutions), and that it is crucial for the society to implement it (thanks to public-private partnerships and other innovative solutions) and to assess its effectiveness before it is too late.

Climate change may make some properties more expensive to insure. It need not make them uninsurable. If AI and satellites are used only to segment, they may narrow the insurance community. If they are used to prevent, prioritise and pool, they can help Europe keep home insurance inclusive. The actuarial profession has a central role in proving, pricing and governing that transition.' >

Fabio Mainolfi:
'Insurance has historically been built on the statistical analysis of past losses. This remains essential, but it is no longer sufficient in a world where climate change, soil instability and infrastructure ageing are changing the geography and dynamics of risk. Satellite Earth Observation offers a complementary layer of evidence. It does not replace actuarial models, but enriches them with physical, spatially consistent and regularly updated observations of the exposed environment.

Another key advantage of satellite data lies in its temporal depth. Earth Observation does not only provide a snapshot of risk at a given point in time. It makes it possible to reconstruct how a territory, an asset or an exposure has evolved over months or years. This dynamic view is particularly valuable for insurance, as natural hazards are becoming more frequent, more severe and less predictable. By combining historical satellite archives with regularly updated observations, insurers can move beyond static risk maps and progressively adapt their models to changing physical conditions.

This is especially relevant for geotechnical and climate-related risks, where slow-moving phenomena may remain invisible until damage becomes apparent. Interferometric SAR, for instance, can detect millimetric ground deformations over large areas and over time. When combined with geological, meteorological, claims and asset data, such observations can support risk scores, early warnings and portfolio-level monitoring. This is the type of approach that platforms such as Deltaforms aim to develop, making complex geospatial signals usable by actuaries, underwriters and risk managers without requiring them to become remote sensing experts.'

Cited papers are available on S. Loisel's webpage. <

'Satellite Earth Observation offers a complementary layer of evidence. It does not replace actuarial models, but enriches them with physical, spatially consistent and regularly updated observations of the exposed environment.'

FABIO MAINOLFI is the co-founder and COO of Deltaforms, a space-tech startup founded in 2025. Deltaforms develops a new layer of risk intelligence based on satellite-measured ground deformation and environmental data, translated into decision-ready indicators for insurance and infrastructure risk assessment.

SECURITISATION ASSETS FOR EUROPEAN LIFE INSURERS:
NICHE BUT INCREASINGLY RELEVANT

BY **FLORIN GINGHINA**

WHY SECURITISATIONS MATTER FOR EUROPEAN INSURERS

European (including UK) life and retirement markets face familiar pressures: long-dated guarantees, high annuity demand and a need for stable investment income in an environment of tightening investment-grade bond spreads. Banks, meanwhile, continue to manage capital and balancesheet constraints, particularly for mortgages, small and medium enterprise (SME) lending and consumer credit. Securitisations sit at this intersection by turning granular pools of loans into tradeable bonds, channelling funding from long-term investors to households and businesses.[1]

Securitisations will not replace insurers' core fixed income holdings in sovereigns and corporate bonds. They can, however, help address the 'low spread, long liability' challenge, offering diversified credit exposure, structural credit enhancement and additional spread over equivalent corporate bonds. Whilst insurers also play a wider role as providers of credit protection on securitisation tranches, this article focuses on their role as investors rather than guarantors.

BUSINESS CASE: WHAT ARE INSURERS INVESTING IN?

Although securitisations currently account for only around 1% of European insurers' assets,[2] the overall market is sizeable and stable. Placed issuance across Europe and UK is approximately €100 – €150 billion per annum, below pre2008 peaks but at scale and consistent over recent years. >

[1] European Insurance and Occupational Pensions Authority. (23 February 2024). Insurance regulatory framework for securitisation, contribution to the Eurofi Magazine. Retrieved 20 May 2026 from https://www.eiopa.europa.eu/publications/insurance-regulatory-framework-securitisation_en.

[2] Association for Financial Markets in Europe. (n.d.). Myth busting – EU insurance appetite for securitisation. Retrieved 20 May 2026 from https://www.afme.eu/media/oczmj0ju/siifull.pdf.

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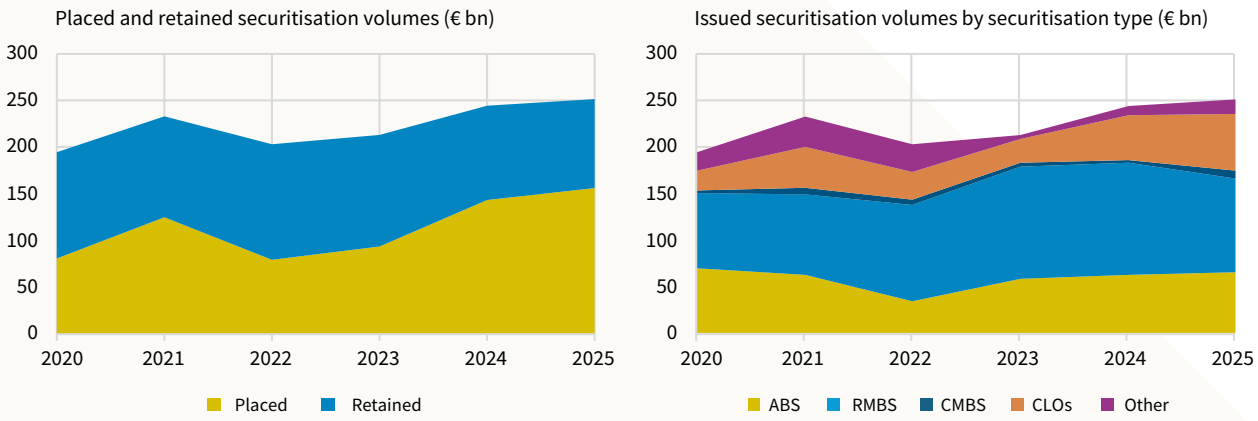
FIGURE 1: Issued (placed and retained) European securitisation volumes (2020-2025) (€ bn)



- AFME defines placed issuance as tranches with at least 50% by euro amount reported placed.
- Placed issuance is often considered the most relevant metric for securitisation markets. It measures bonds sold to investors, reflecting true market demand and liquidity rather than originator intentions.[3]

Source: Association for Financial Markets in Europe (AFME). (2026). Securitisation data snapshots (2020–2025). Retrieved 20 May 2026 from https://www.afme.eu/publications/data-research/

The main securitisation structures and backing assets are:

- **Residential MortgageBacked Securities (RMBS):** pools of home loans, such as UK or Dutch prime mortgages. These are usually exposed primarily to borrower credit risk and prepayment risk, with performance also influenced by house prices, unemployment and interest-rate movements. They often include structural credit enhancement, such as subordination, excess spread and reserve accounts.

- **Commercial MortgageBacked Securities (CMBS):** loans secured on commercial property, such as offices, logistics assets or retail property. Performance is driven largely by property cash flow, lease maturity profiles, refinance risk and tenant or vacancy trends. These deals can be more concentrated than RMBS and therefore more sensitive to borrower- and sector-specific risk.

- **AssetBacked Securities (ABS):** pools of consumer loans, auto loans, credit card receivables or SME loans. The main risks depend on the asset class, but usually include credit deterioration, delinquencies, recoveries and, in some cases, prepayment or early amortisation risk. Some structures are revolving for a period before amortising, which can affect cash-flow timing. They are typically supported by subordination, excess spread, overcollateralisation and reserve funds.

- **Collateralised loan obligations (CLOs):** mainly portfolios of senior secured corporate or leveraged loans. These are primarily exposed to corporate default and recovery risk, along with spread, reinvestment and >

[3] HM Treasury. (December 2021). Review of the securitisation regulation: Report and call for evidence response. Retrieved 20 May 2026 from https://assets.publishing.service.gov.uk/media/61b370f38fa8f503816404eb/Securitisation_Regulation_Review.pdf.

downgrade risk. CLOs are usually floating-rate structures. Structural protections often include overcollateralisation and interest coverage tests, which can redirect cash flows if performance weakens.

These instruments provide exposure to pools of a large number of loans via single securities, making them useful for 'bigger ticket' allocations and avoiding exposure to individual debtors. They also offer structural features that help absorb losses before they reach more senior investors.

In Europe, RMBS, CMBS and simpler ABS (auto/consumer loans) can qualify for Simple, Transparent, Standardised (STS) status under EU/UK rules.[4] This helps reduce Solvency II/UK capital charges for insurers (discussed later in this article). CLOs rarely qualify due to their complexity. European securitisations mainly use pay-through structures (tranching, waterfalls, reinvestment) rather than pass-throughs (pro-rata payments, no tranching), which dominate US Agency RMBS.

INSURERS' INVESTMENT RATIONALE: SPREAD AND DIVERSIFICATION

The investment case rests on additional spread, diversification and structure. High-quality European RMBS and CLO tranches provide spreads tens of basis points above equally rated covered or senior corporate bonds. [5] This spread pickup is supported by:

- Structural credit enhancement (subordination, reserves, excess spread)
- Diversification across many borrowers, and sectors and geographies for some securitisations, such as CLOs, where managers seek global exposure to lower correlation and meet diversification tests
- Flexibility in maturity and amortisation profiles to better align with liability needs

These features enhance insurer pricing and returns, provided risk and capital are rigorously assessed.

CAPITAL AND MATCHING ADJUSTMENT: TAILORED BENEFITS FOR SOME INSURERS, BUT NOT FOR EVERYONE

The Solvency II/Solvency UK Standard Formula uses a dedicated spread module for securitisations, with shocks depending on credit quality step, duration and STS status. For example, at five years, A-rated corporate bonds face spread shocks around 7%, A-rated senior STS around 8%, while A-rated nonsenior STS are in the low 20% range, and non-STS and resecuritisations quickly approach very high charges. Reforms expected from 2027 aim to reduce capital for senior STS tranches (towards covered-bond levels) and introduce more nuance across non-STS and mezzanine risk.[6]

Matching Adjustment (MA) offers a further potential benefit through liability discounting. MA only applies where firms have explicit regulatory approval and a dedicated MA portfolio structure; it is not automatic, and many firms either do not use MA or are in the process of applying. >

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[4] European Securities and Market Authority. (n.d.). Securitisation. Retrieved 20 May 2026 from https://www.esma.europa.eu/esmas-activities/markets-and-infrastructure/securitisation.

[5] Vannier, H. (15 December 2025). European securitisation reforms: Strategic investment insights for insurers. Amundi Investment Solutions. Retrieved 20 May 2026 from https://research-center.amundi.com/article/european-securitisation-reforms-strategic-investment-insights-insurers.

[6] European Commission. (29 October 2025). Commission Delegated Regulation amending Delegated Regulation (EU) 2015/35. Retrieved 20 May 2026 from https://ec.europa.eu/finance/docs/level-2-measures/solvency2-delegated-regulation-2025-7206_en.pdf.

To be MA-eligible, securitisations must deliver fixed and highly predictable cash flows matching liability profiles. While not all securitisations qualify, some senior tranches with strong call protection and bond-like amortisation can meet this bar. Once MA-eligible, these tranches are treated like corporate bonds for credit risk deductions: the Fundamental Spread (FS) captures expected credit losses, with residual spread earned through the MA. In the UK, tranches with highly predictable (not strictly fixed) cash flows also attract an FS addition, which may erode some MA. Higher securitisation spreads versus same-rated corporates thus amplify MA benefit.

INTERNAL MODELS, BANKING BENCHMARKS AND THE PRUDENT PERSON PRINCIPLE

Internal models push actuaries to think more like bank risk modellers. Under Basel rules, banks already apply detailed framework calibrations for securitisations – for example, supervisory formula approaches and tranchelevel capital – based on empirical analysis on default, recovery and tranche behaviour.[7] These banking standards are a useful benchmark for understanding risk drivers and highlight the conservatism of the insurance Standard Formula.[8]

However, internal models are not 'free options'; they require significant up-front and ongoing expenditure on data, modelling, systems and governance, viable only for meaningful securitisation allocations.

Under Solvency II/Solvency UK, the Prudent Person Principle[9, 10] requires insurers to invest only in assets whose risks they can properly identify, measure, monitor, manage, control and report. For securitisations, this demands a complete risk quantification framework, depicted as follows:

- **Risk identification** – understanding the originator, servicer, collateral, jurisdiction, cashflow drivers and structural protections
- **Modelling and calibration** – building pool-level default and prepayment models; projecting through waterfalls; and calibrating default probabilities, loss-given-default and correlations using data, expert judgement and benchmarks
- **Implementation for capital and MA** – embedding models into internal models and MA processes, including validation, backtesting and governance >

[7] Bank for International Settlements. (27 March 2020). Basel Committee on Banking Supervision, Basel Framework, CRE 44 – Securitisation: Internal-ratings-based approach. Retrieved 20 May 2026 from https://www.bis.org/basel_framework/chapter/CRE/44.htm?inforce=20230101&published=20200327.

[8] European Insurance and Occupational Pensions Authority. (2 May 2024). EIOPA recommends improvements in the supervision of the 'Prudent Person Principle' following peer review. Retrieved 20 May 2026 from https://www.eiopa.europa.eu/eiopa-recommends-improvements-supervision-prudent-person-principle-following-peer-review-2024-05-02_en.

[9] In the EU: European Insurance and Occupational Pensions Authority. (3 May 2021). Directive 138/2009/EC (Solvency II Directive), Article 132: Prudent Person Principle. Retrieved 20 May 2026 from https://www.eiopa.europa.eu/rulebook/solvency-ii-single-rulebook/article-2219_en.

[10] In the UK: Bank of England. (27 May 2020). Supervisory Statement 1/20 – Solvency II: Prudent Person Principle. Retrieved 20 May 2026 from https://www.bankofengland.co.uk/prudential-regulation/publication/2020/solvency-ii-prudent-person-principle-ss.

THE MAIN RISK DIMENSIONS OF SECURITISATIONS – AND TREATMENT OF CORRELATION

From an actuarial perspective, the core risk dimensions for a securitisation are similar as for a corporate credit book, but layered:

- **Default risk** at loan level (marginal default probabilities over time)
- **Idiosyncratic risk** from individual borrowers or sectors
- **Systemic/macro risk** that impacts jointly across all loans in bad states
- **Correlation/dependence** linking individual defaults to systemic shocks
- **Structural risk** from the tranche waterfall and protections

Equity tranches are affected quickly by default levels and idiosyncratic behaviour, whereas mezzanine and senior tranches are mainly exposed when many defaults arrive together in systemic scenarios – which is largely a question of dependence and clustering, not just PDs. Correlation matters most for tail risk: Higher correlations give more 'all-at-once' defaults and deeper portfolio losses in bad states, which is where senior and mezzanine layers live.

This is where issues like the 'correlation smile'[11] – a limitation of single factor models exposed during the pre-global financial crisis synthetic collateralised debt obligations (CDOs) era – come in, not as a problem actuaries must solve in isolation, but as a way to illustrate how tranche structure, default behaviour and dependence interact in practice. Correlation smile arises because standard credit models assume uniform 'asset correlation' across portfolios (common in insurance/banking), yet this fails to capture tranched securitisations, where implied correlations (derived from tranche spreads) vary significantly by tranche.[12]

A POSITIVE AGENDA FOR THE ACTUARIAL PROFESSION

The direction of travel is favourable. In the EU, Solvency II reforms from January 2027 are expected to improve the treatment of senior STS securitisations and refine spread-risk calibrations, whilst in the UK, regulators are reviewing the securitisation framework,[13] aiming to simplify rules while maintaining safeguards. Together, these reviews aim to recognise the improved resilience and transparency of postcrisis European securitisations, making the asset class more investible for insurers.

For the actuarial profession, our objective is clear. As these regulatory tailwinds develop and insurers become significant securitisation investors, actuaries must be ready – **technically**, regarding risk identification and modelling; **professionally**, in terms of governance and balanced assessments; and **strategically**, articulating how and when securitisations can appropriately support longterm guarantees. The opportunity is to ensure that, when insurers do step up as bigger players in this market, we fully understand and manage the risks. <

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[11] Hager, S., & Schöbel, R. (2005): A note on the correlation smile. Tübinger Diskussionsbeiträge, 297. Retrieved 20 May 2026 from https://www.econstor.eu/bitstream/10419/40330/1/517736365.pdf.

[12] Consider a diversified loan pool divided into equity, mezzanine and senior tranches: Low default rates primarily affect equity through idiosyncratic borrower events (low correlation); higher defaults impact mezzanine and senior tranches through systemic economic factors (sharply higher correlation). This produces the correlation smile: Equity spreads imply low correlation, while mezzanine/senior spreads require elevated correlation levels to match observed pricing – revealing dependence that intensifies across the loss distribution, precisely as tranche spreads reflect for tail risk assessment.

[13] Bank of England. (17 February 2026). Consultation Paper 2/26 – Reform to securitisation requirements. Retrieved 20 May 2026 from https://www.bankofengland.co.uk/prudential-regulation/publication/2026/february/reforms-to-securitisation-requirements-consultation-paper.

THE CASE FOR MATCHING ADJUSTMENT IN EUROPE: UNTAPPED POTENTIAL AND INSIGHTS FROM THE UK

BY **MATTHEW FORD** AND **FLORIN GINGHINA**

Europe faces a major funding gap, with high infrastructure investment needs and constrained public finances. As part of the Capital Markets Union action plan, Action 4[1], the European Commission aims to ensure prudential regulation does not unnecessarily restrict investment by banks and insurers. Life insurers, with long-dated liabilities and significant investment capacity, are well placed to support productive long-term investment under the right capital framework.

The Long-Term Guarantee (LTG)[2] measures under Solvency II are designed to support long-term investment, particularly for retirement and other long-duration products. By reducing the impact of short-term market volatility on insurers' balance sheets, they help limit pressure for premature asset sales and support continued investment in long-dated, illiquid assets.

The LTG toolkit includes five mechanisms, with the Matching Adjustment (MA) as a central element. The MA applies an uplift to the risk-free discount rate for eligible long-term liabilities whose cash flows are closely matched by assets held to maturity.

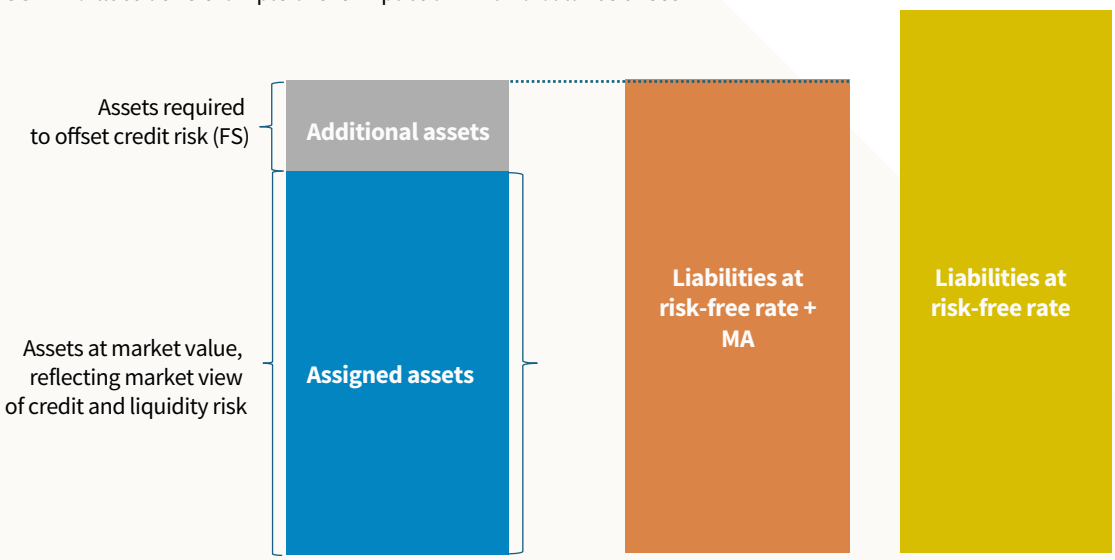
The case for MA is strongest where illiquid, long-duration liabilities are backed by long-duration credit assets. It reflects a simple principle: where liabilities are predictable and assets are intended to be held to maturity, liability valuation should recognise the illiquidity premium. This can create a more stable and economically realistic balance sheet, reduce technical provisions and make solvency positions less sensitive to short-term spread movements.

In practice, the MA allows insurers to discount eligible liabilities using a rate derived from matched fixed-income assets, less expected credit risk through the fundamental spread (FS). Its use is subject to detailed Solvency II and >

[1] European Commission, Capital Markets Union, 2020 action plan. Retrieved from https://finance.ec.europa.eu/financial-markets/financial-markets-policy/capital-markets-union/capital-markets-union-2020-action-plan/action-4-encouraging-more-long-term-and-equity-financing-institutional-investors_en. [Accesses May 2026].

[2] EIOPA, Report on long-term guarantees measures and measures on equity risk 2020, Retrieved from https://www.eiopa.europa.eu/publications/report-long-term-guarantees-measures-and-measures-equity-risk-2020_en. [Accessed May 2026].

FIGURE 1: Illustrative example of the impact of MA on a balance sheet



Assigned assets are those whose risk-adjusted cash flows match expected liability cash flows (per Article 77b (1) (a), Solvency II Directive[3] in the EU, PRA Rulebook – Matching Adjustment[4] and Supervisory Statement 7/18 Solvency II: Matching Adjustment[5] in the UK).

Additional assets are those needed, with assigned assets, to cover best estimate liabilities discounted at the risk-free rate plus the MA.

Solvency UK requirements, including supervisory approval and ongoing asset-liability matching.

MA ADOPTION ACROSS EUROPE: EXPERIENCE IN SPAIN AND THE UK

MA is permitted under Solvency II, but in practice it has only been widely used in the UK and Spain. As a result, the MA landscape remains limited, even though the framework exists across the wider Solvency II regime.

In the UK, MA use has been significant. Seventeen insurers had MA permission as at 31 December 2024, with the regime contributing a substantial increase in eligible own funds and a material reduction in SCR. In other words, the MA has been a powerful balance sheet and capital management tool for UK life insurers.

Spain has adopted MA more cautiously. Twelve entities had MA permission at the same date, and the overall balance sheet impact was much smaller, with only a modest increase in eligible own funds. SCR increased marginally, reflecting the fact that Spanish life insurers using MA calculate SCR under the Standard Formula, where the benefit of MA under stress is lower than under an Internal Model approach, as is more commonly seen in the UK. >

[3] European Commission, Solvency II Directive, Article 77b Matching adjustment to the relevant risk-free interest rate term structure. Retrieved from https://www.eiopa.europa.eu/rulebook/solvency-ii-single-rulebook/article-2162_en. [Accessed May 2026]

[4] Bank of England, PRA Rulebook – Matching Adjustment. Retrieved from https://www.prarulebook.co.uk/pra-rules/matching-adjustment/19-05-2026. [Accessed May 2026].

[5] Bank of England, Supervisory Statement 7/18 – Solvency II: Matching adjustment. Retrieved from https://www.bankofengland.co.uk/prudential-regulation/publication/2018/solvency-2-matching-adjustment-ss. [Accessed May 2026].

TABLE 1. MA impact for Spain and UK, year-end 2024

As of 31 December 2024	Spain	UK
No. insurers with MA permission	12	17
Impact on eligible Own Funds	+ €3.3bn	+ £34.7bn
Impact on SCR	+ €0.5bn	- £43.4bn
Impact on life insurer solvency ratios	+ 15%	+ 119%

Source: Solvency II Wire.

INSIGHTS FROM THE UK

The UK experience highlights two important themes in an MA journey: the **initial application** stage and **ongoing development**. The MA framework in the UK is now well established, particularly for bulk annuities and other long-term retirement business, although the extent to which insurers can benefit from it will depend on the nature of their liabilities and portfolio mix. Recent Bank of England reforms[6] have made it more practical and flexible by widening asset eligibility including assets with highly predictable cash flows, removing the cap applied to MA for sub-investment grade assets (known as 'BBB cliff'), and implementing the MA investment accelerator, while preserving the core principles of strong asset-liability matching and sound governance.

Both stages are important. Initial MA approval is a formal supervisory process requiring firms to demonstrate eligibility, close matching, ring-fencing, and credible governance and monitoring. Once in place, MA can support better pricing, improved capital efficiency and more deliberate risk selection.

Initial MA application: engage early with stakeholders

One clear takeaway from the UK is that success at an initial MA application depends on early preparation, disciplined messaging and alignment across actuarial, investment, risk and regulatory stakeholders. Regulatory engagement is especially important in markets where MA is still relatively new. Insurers need to explain not only what MA is, but also why it matters and how it supports their broader balance sheet strategy.

Communication should be clear, well prepared and technically robust. Firms need to set out the rationale, expected benefits and implementation plan, while also showing a strong understanding of the eligibility criteria, cash-flow matching requirements and governance expectations that underpin approval. As the regulatory framework for an MA application[7] makes clear, an MA application is a strategic decision for risk management and capital planning. >

[6] Bank of England, PS10/24 – Review of Solvency II: Reform of the Matching Adjustment. Retrieved from https://www.bankofengland.co.uk/prudential-regulation/publication/2024/june/review-of-solvency-ii-reform-of-the-matching-adjustment-policy-statement. [Accessed May 2026].

[7] European Commission, Commission Implementing Regulation (EU) 2015/500, Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015R0500. [Accessed May 2026].

Continuous development and sophistication: be ready to expand

Another important takeaway from the UK is that MA should be viewed as an evolving framework rather than a one-off regulatory approval. A well-optimised MA approach can support better matching and asset selection, improving pricing discipline, profitability and capital efficiency.

Once approved, MA becomes part of ongoing portfolio management, pricing and capital strategy. As portfolios and markets evolve, MA portfolios need regular review as assets, spreads and liability profiles change, linking MA closely to broader asset-liability and liquidity management.

FIGURE 2: Impact of MA across insurers' business models

The UK experience also shows that MA requires firms to reassess risk appetite and risk management through a cash-flow matching lens, including how exposures within MA portfolios should be hedged. As portfolios become more complex, firms may need more sophisticated risk measurement, governance and calibration, particularly where MA feeds into Solvency II or Solvency UK internal models. In that sense, initial adoption is often just the start of a broader balance sheet management journey.

IN SUMMARY

MA reflects the illiquidity premium in credit assets, helping insurers better align asset and liability valuation and support a more realistic balance sheet. It can also encourage long-term productive investment by making it more efficient to hold long-dated credit assets.

Interest in MA is growing across Europe as insurers increasingly recognise its strategic value. As the UK experience suggests, realising those benefits requires early planning, commercial discipline and operational readiness, together with clear communication and strong alignment across investment, actuarial, risk and regulatory functions. Ongoing refinement and strong governance also remain important once the framework is in place. <

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COLUMN

RISK WITHOUT BORDERS: ACTUARIAL, MEDICAL AND SPACE PERSPECTIVES

A strategic synergy between the Actuarial Association of Europe (AAE), the European Medicines Agency (EMA), and the European Space Agency (ESA) became apparent at the latest webinar organised by the AI-DS working group. Our shared lineage – tracing back to Edmond Halley's 1693 fusion of astronomy knowledge and survival probabilities, widely regarded as the inception of actuarial science – reminds us that complex risk architecture has always been interdisciplinary. Aligning risk practices across medicine, space, and the sectors in which actuaries operate proves highly beneficial, fostering ideas and approaches that advance societal resilience. The primary catalyst for this collaboration is the rapid evolution of artificial intelligence and the fragility it exposes in our governance frameworks.

AI governance is shifting focus from static, point-in-time frameworks towards continuous, real-time monitoring. Classical AI is becoming better understood, but agentic AI introduces a new dimension: the orchestration of multiple autonomous agents. As these systems grow in autonomy, the space for human decision-making shrinks, making human-in-the-loop oversight a structural requirement rather than a preference. For actuaries, a pressing concern remains whether our models are classified as 'high-risk' or 'out-of-scope' under the AI Act.

Technical risks are borderless – no sector can manage them in isolation, and cross-sector intelligence benefits everyone. Collaboration also allows actuaries to showcase the professional standards and conduct they uphold daily. EMA applies rigorous risk management to regulatory dossiers, ensuring consistency across decisions. Large language models support their work by instantly searching decades of assessment reports and clinical decisions, delivering significant efficiency gains – without crossing the threshold into autonomous decision-making. ESA, meanwhile, uses AI to coordinate satellite navigation programmes, supported operationally by the EU Agency for the Space Programme. From an actuarial perspective, satellite-derived earth observation data offers a compelling opportunity: quantifying climate hazards and bridging protection gaps for currently uninsurable risks. Operating largely in an AI Act 'safe harbour' for research and development, ESA continues to push the boundaries of orbital mechanics and signal processing.

Maintaining trustworthy AI means prioritising transparency, human oversight, and rigorous data quality throughout the model lifecycle. Actuaries are increasingly called upon to embrace interdisciplinary work and act as guarantors of truth in opaque ecosystems. Adapting the three-lines-of-defence framework to integrate ML and LLM operations – while preserving human accountability – remains essential. Regardless of sector, our duty is to ensure technology serves society with professional integrity and absolute transparency.

Bogdan Tautan, Chairperson of the Risk Management Committee at the Actuarial Association of Europe (AAE)

COLOPHON

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