"Learning from your neighbours":
Prudential provisions of the EU AI Act for the UK insurance supervisory regime.

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Abstract

This paper focuses on the prudential regulation and supervision of UK re-insurance undertakings, in relation to AI considerations. Specifically, it presents a critical analysis of the prudential provisions of the EU AI Act which could be adjusted and adopted in the UK regulatory regime. The purpose of this paper is to present a critique on the learnings from the EU AI Act in relation to risk management framework and systems for UK financial regulators regarding the prudential supervision of re-insurance undertakings. These are derived from the assessment of the European Insurance and Occupational Pensions Authority (EIOPA) in relation to the governance and risk management of AI to ensure the appropriate regulation and supervision of the risks linked to re-insurance activities. Beyond the EU AI Act, the Insurance Core Principles of the International Association of Insurance Supervisors (IAIS) in relation to risk management systems from a prudential angle are also discussed to complement the recommendations for UK regulators. This legal research analyses the regulatory framework underpinning AI, after critically examining the provisions of the EU AI Act linked to the prudential components related to the Solvency II Directive and Delegated Acts. The contribution of this paper is twofold, providing insights for advances to the regulation and supervision of AI applications within the insurance sector for the UK, based on the EU AI Act and EIOPA's approach. Overall, this research adds to the growing literature about regulatory implications from AI, using the UK (re)insurance industry as a case study, from a prudential angle and based on the transferability and application of the EU AI regulatory regime.

Keywords: Artificial Intelligence, Insurance, Risk Management, Financial Regulation, AI Act.

1. Introduction

There has been a rising number of applications and different uses of Artificial Intelligence (AI) observed in the insurance value chain[1], considering the growing AI capabilities. Recognising that AI is pivotal in the digital transformation of the insurance value chain, with the use of AI systems in pricing, underwriting, claims management and fraud detection (EIOPA, 2025a: par. 2.1). AI comprises of different elements, notably machine learning (ML), deep learning and generative artificial intelligence (GenAI) (IAIS, 2025). Foundation models, large language models, and user interfaces like ChatGPT being interfaces within the GenAI field (HM Government, 2024: 13-4). An AI system refers to a range of software-based technologies, using specific techniques and approaches; machine learning, logic and knowledge-based systems, and statistical approaches (European Parliament, 2024: 3). This paper adopts the Organisation for Economic Co-operation and Development (OECD)'s definition of AI which regards "*an AI system as a machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments*" (OECD, 2024a: 4; 2024b: 12).

The use of AI and digitalisation are transforming insurance, with different AI use cases across the insurance value chain[2], all associated with different benefits and improvements (Noordhoek, 2023). Challenges and benefits from AI applications within insurance have been highlighted (Lamberton et al., 2017), considering the rise and rapid adoption and deployment of AI within UK financial services (BoE, 2025b: 18). An interesting aspect beyond the technical examples of using AI for a range of operations and processes within financial services, and insurance in this case, is the evolving legal and regulatory landscape[3]. Noting the legal and regulatory framework developments to capture AI uses and applications, and especially the prudential approach for the regulation and supervision of AI and its associated risks, based on gaps identified previously (Pantos, 2024). Focusing on the risks of prudential nature within the insurance context[4], such as underwriting and reserving for instance, and their associated risk management activities. Other examples include the use of AI techniques within actuarial work[5], in insurance pricing and the different actuarial models utilised (Davies et al., 2023). The European Insurance and Occupational Pensions Authority (EIOPA) presents examples of AI use cases from the insurance value chain in detail (EIOPA, 2021: Fig. 1) with loss prevention, pricing and underwriting as prudential areas. The Association of British Insurers also listed the AI use cases within insurance looking at the UK industry, segmented into the following categories: product design, pricing and underwriting, claims management, policy administration, asset management, as well as marketing, customer care and distribution (ABI, 2024: 6-7). Underwriting, claims processing, customer and fraud detection are key AI

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[1] Hristozov and Vazov (2025: 167-8) list some specific examples about AI applications within the insurance value chain.

[2] As presented in Noordhoek (2023: 14 Table 1) AI use cases are observed within marketing, product development, sales and distribution, underwriting, claims management, as well as customer service and policy administration.

[3] Please see Comunale and Manera (2024: 14-24) for the key regulatory challenges to AI, and their associated responses.

[4] For a list of scientific papers covering AI applications within insurance please see Table 1, with Table 2 showing the commercial applications of AI uses in insurance (Bhattacharya et al., 2025: 4-5, 9).

[5] Please see Figure 13 for an overview of risks from the use of AI/ML techniques within actuarial work in insurance (Davies et al., 2023: 35).

uses within insurance (Noordhoek, 2023). There are core underwriting challenges[6] linked to AI systems, comprising of the lack of historical data with the dynamic and evolving nature of models and risks (Szpruch et al., 2025). These AI use cases with their associated prudential risks are central to this paper. Especially, considering the role of insurance in managing AI-related risks from its societal benefit of insuring those risks, based on the new risks and associated exposures (Weil et al., 2024). GenAI applications within insurance in particular transform the value chain, with opportunities for pricing, underwriting, and claims management among others (Ricard et al., 2023). GenAI could improve operational efficiencies, enhance customer service, and increase customer satisfaction. Nevertheless, , there are certain risks associated with GenAI solutions, which should be evaluated before roll-out, for their mitigation (Ricard et al., 2023).

This paper captures developments on the prudential regulation and supervision of UK re-insurance undertakings, in relation to AI considerations. Specifically, it presents a critical analysis of the prudential provisions of the European Artificial Intelligence Act (EU AI Act[7]) which could be adjusted and adopted in the UK regulatory and supervisory regime, in line with the Prudential Regulation Authority (PRA)'s approach to insurance supervision (PRA, 2023). The aim of this paper is to discuss learnings from the EU AI Act in relation to risk management systems[8] and risk management[9] for UK financial regulators regarding the prudential supervision of re-insurers. These are linked to the assessment performed by the EIOPA in relation to the governance and risk management of AI to ensure the appropriate regulation and supervision of the risks linked to re-insurance activities (EIOPA, 2025a; b). Effectively capturing how this approach towards the prudent AI governance and risk management framework could be adopted by the PRA, and ultimately how prudential supervision should be adjusted to monitor AI applications and uses (EIOPA, 2025b). Beyond the EU AI Act, the principles from the International Association of Insurance Supervisors (IAIS) in relation to risk management systems from a prudential angle are also discussed to complement the recommendations for UK regulators, in relation to risk management practices and the prudential regulatory expectations (IAIS, 2025). These are linked to the PRA's Rulebook[10], in combination with the Lloyd's of London Principles[11] for the London market (Lloyd's of London, 2024a;b). The focus is placed on the AI considerations within the core prudential components of Solvency II[12] and Delegated Acts[13] for re-insurance undertakings. These are the Own Risk and Solvency Assessment (ORSA), Model Risk Management (MRM), stress and scenario testing (S&ST) with recovery planning (Pantos, 2025). This doctrinal legal research provides insights to the (a) regulation and (b) supervision of AI uses within insurance, oriented for the UK regime, utilising the EU AI Act and EIOPA's opinion with assessment. This is achieved from a critical analysis of the prudential regulatory framework underpinning AI. The economic analysis of regulation constitutes the methodological angle which has been adopted to examine the prudential provisions of the EU AI Act applicable to re-insurers.

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[6] Potential systemic correlated failures, hidden artefacts of the model core, emerging behaviour and benchmark limitations, opacity and attribution failures, information asymmetry and disclosure, correlated and accumulation risks, governance and underwriting signals are also listed as underwriting challenges in the study of Szpruch et al. (2025).

[7] Council Regulation (EC) laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) [2024] OJ L2024/1689.

[8] Ibid, Article 65-66.

[9] Ibid, Annex IV, 2.

[10] Referring to the Insurance Rules for insurance firms subject to the Solvency II Directive (Solvency UK) from the PRA's Rulebook.

[11] Primarily the Solvency principles, Capital (#7), Liquidity (#8) and Investments (#9), with the Governance, Risk Management and Reporting principle (#10) (Lloyd's of London, 2024a;b).

[12] Council Directive 2009/138/EC of 25 November 2009 on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II) [2009] OJ L335.

[13] Commission Delegated Regulation (EU) 2015/35 of 10 October 2014 supplementing Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II) [2015] OJ L12.

The paper starts with the UK's approach to AI[14] regulation, with a list of the developments describing the regulatory landscape and legal regime discussed in section 2. This is followed by a brief overview of the EU AI Act in section 3, with the relevant updates from EIOPA for re-insurers. The proposals for updates to the UK approach to prudential regulation and supervision of AI are detailed in section 4 with the regulatory analysis and recommendations. The core components of prudential risk management for re-insurance undertakings are expanded, reflecting on the considerations from AI uses and applications. These are accompanied by the critical reflection on regulatory convergence and alignment of standards, as well as the application of the recommendations to embed the EU AI Act within the UK regime. Before that, risks associated with AI uses and applications within the insurance value chain are described as background context. The concluding remarks are included in the final section 5, ending with certain directions for further research, aimed towards advancing AI regulatory research within insurance.

2. UK AI Regulatory Approach

At UK level, there have been different developments regarding AI regulatory considerations. In 2017, the UK House of Lords Select Committee on AI provided evidence to an AI inquiry, defining five general principles to mitigate the risks associated with AI (House of Lords, 2017). The regulatory implications of AI were highlighted in Kalifa's (2021) review, with recommendations about specific policy initiatives under the development and implementation of a data strategy. In 2022, the UK Government published its National AI strategy[15], shaping its AI regulatory framework, entitled "*Establishing a pro-innovation approach to regulating AI*" (HM Government, 2021; UK Government, 2022). That policy paper shapes the UK's overarching regulatory principles, cascaded down to Uk regulators. The UK Government provided guidance on its pro-innovation approach to AI regulation, setting out cross-sectoral principles for each regulator to interpret and apply accordingly (2024a; b). The principles were initial four, as context-specific, pro-innovation and risk based, coherent, proportionate and adaptable (UK Government, 2022). They were further updated into five principles: (1) safety, security and robustness, (2) appropriate transparency and explainability, (3) fairness, (4) accountability and governance, and (5) contestability and redress (UK Government, 2024a; 2024b: 4). These were horizonal initiatives whereas the focus of this study is on vertical initiatives for financial services, and re-insurance undertakings to be precise (de Castris and Thomas, 2026: 9, 13). The UK Government published also guidance dedicated to GenAI, defining ten common principles[16] for the safe, responsible, and effective use of AI within government organisations (HM Government, 2024). However, these principles could also be transferred to financial services, as practical examples. Note that despite the absence of AI specific UK law[17], there are binding legal requirements from other laws, such as the data protection law (Bhatnagar and Gajjar, 2024). The Law Commission highlighted these laws when completed a review commenting on the legal issues arising from AI (UK Government, 2025: 8). The UK Parliament also published a (generic) paper with the policy implications of AI linked to the legal landscape (Bhatnagar and Gajjar, 2024). Finally, most recently in early

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[14] For the different definitions of AI adopted at UK level, please see Bhatnagar and Gajjar (2024: 3 Table).

[15] The UK's National AI Strategy is graphically depicted in the HM Government (2021: 14) paper, comprising of the vision, impacts, outcomes, and activities. It is based on three pillars, investing in the long-term needs of the AI ecosystem (Pillar 1), ensuring AI benefits all sectors and regions (Pillar 2), and governing AI effectively (Pillar 3) (HM Government, 2021: 14).

[16] The ten principles are: 1) you know what generative AI and what its limitations are, 2) you use generative AI lawfully, ethically and responsibly, 3) you know how to keep generative AI tools secure, 4) you have meaningful human control at the right stage, 5) you understand how to manage the full generative AI lifecycle, 6) you use the right tool for the job, 7) you are open and collaborative, 8) you work with commercial colleagues from the start, 9) you have the skills and expertise that you need to build and use generative AI, and 10) You use these principles alongside your organisation's policies and have the right assurance in place (HM Government, 2024: 8-12).

[17] For international regulatory developments please see the Appendix 2 of DP5/22 (BoE, 2022b). The International Association of Privacy Professionals maintains a tracker of AI laws and policies, capturing UK specific developments (IAPP, 2024: 25). de Castris and Thomas (2026) from the Alan Turing Institute also documented AI governance at UK level, presenting a list of UK regulatory initiatives and developments.

2026, the Treasury Committee of the House of Commons reviewed AI in financial services, flagging concerns about risks from AI within insurance (Treasury Committee, 2026).

The Bank of England (BoE) with the PRA and the Financial Conduct Authority (FCA) have focused on AI within financial services, publishing different reports, policies, and guidance. The BoE conducted a series of surveys of financial institutions to understand more about AI and ML. The surveys BoE and the FCA issued in 2019, 2022, and most recently in 2024 (3rd survey), provided insights into AI uses from regulated financial services firms (BoE, 2024). This was followed by the Artificial Intelligence Consortium established in 2025 by BoE (BoE, 2025a). Before the AI Consortium, the Artificial Intelligence Public-Private Forum (AIPPF) was launched back in 2020, as a joint initiative of the BoE, the PRA and the FCA focusing on AI innovation and its adoption within financial services (AIPPF, 2022). The objectives of the AIPPF were to increase understanding around the practical challenges and risks of AI uses, obtain information and insights on principles, guidance, and good practice about the safe adoption of AI, looking after views from the industry (AIPPF, 2022: 5). The AIPPF issued its final report in 2022, focusing on (i) Governance, (ii) Data, and (iii) Model of AI, with its associated risks (AIPPF, 2022).

The latest BoE publication of regulatory nature is the Financial Policy Committee's Financial Stability in Focus (FSiF) from late 2025 (FPC, 2025). The FPC's FSiF publication documents the approach to monitoring and mitigating risks from AI[18], adapting and adding to the below tools in flexible way, based on risks, focusing especially on operational risks: (a) Survey on AI in UK Financial Services; (b) AI Consortium; (c) Market Intelligence; (d) Supervisory Intelligence; (e) Regulatory and Commercial Data Sources (FPC, 2025: 21). In the FSiF, the systemic risk concerns from the use of AI about financial decision-making are noted, with the rise in operational risks of AI service providers, within an environment with heightened cyber threats (FPC, 2025: 3-4).

The FCA initial noted in its feedback statement FS23/4 the development of an approach to AI alongside with the BoE and the PRA to support the safe and responsible adoption of AI (FCA, 2023). Then, the FCA published its approach in regulating AI for UK financial services, to promote the safe and responsible use of AI; though not insurance specific (FCA, 2025a). The FCA's approach is based on the UK Government's principles of AI regulation, focusing on (1) safety, security, robustness, (2) appropriate transparency and explainability, (3) fairness, (4) accountability and governance, as well as (5) contestability and redress (FCA, 2025a: par. 3.6). In relation to targeted initiatives, the FCA dedicated the AI Lab to support the understanding of AI risks and opportunities, towards shaping regulatory developments (FCA, 2026a). The first components of the AI Lab were the Supercharged Sandbox, the AI Live Testing, the AI Spotlight, the AI Spring and the AI Input Zone (FCA, 2026a). The AI Live Testing offered clarity on expectations, confidence in AI deployment, targeting best practice (FCA, 2026a). The AI Sprint, covered the opportunities and challenges associated with AI uses in 2 main phases, exploring the next 5 years of AI within financial services and the current regulatory regime (FCA, 2025a). Regulatory clarity with increased understanding of the regulatory framework was highlighted by the participants of the AI Sprint, expecting more support and clarifications (FCA, 2025a). The latest development from the FCA announced in early (January) 2026 was the planned review on advances to AI within retail financial services, to be undertaken by its Executive Director, Sheldon Mills, denoted as "The Mills Review" later this year (FCA, 2026b). The Mills Review building on the FCA's AI Lab, Sprint and previous discussion paper, comprises of four themes: (1) future evolution of AI technology; (2) future impact of AI on markets and firms; (3) future consumer trends; and closely linked to this paper, the (4) future regulatory approach (FCA, 2026b).

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[18] The categorisation of information sources for each AI-related systemic risk source is detailed in Table A of the FPC's FSiF (FPC, 2025: 23).

At UK level, the regulatory approach from financial regulators so far has focused on risk management and model risk management, in alignment with the OECD (2024b: 25-26). BoE's approach to supervision and regulation is technology-agnostic, meaning that its core principles, rules, and regulations are not mandating or prohibiting the use of specific technologies (2025b: 14 Box C). The ultimate objective of regulators is to enable the responsible AI adoption via engaging with innovators (BoE, 2025b: 20). The BoE held a Model Risk Management (MRM) AI and ML roundtable in late (October) 2025, as part of PRA's approach to engage with firms to advance understanding, identification and management of MRM, building on supervisory statement SS1/23 (BoE, 2025a). SS1/23 introduced MRM detailing the five MRM principles which are the model identification and model risk classification (MRM #1), governance (MRM #2), model development, implementation, and use (MRM #3), independent model validation (MRM #4), and model risk mitigants (MRM #5) (BoE, 2023b: par. 3.1). SS1/23 is connected to discussion paper DP5/22 about AI and ML within financial services (BoE, 2022a). DP5/22 documented the benefits and risks related to AI uses, linking them to the AI lifecycle and the interconnected stages, in relation to data, models, and governance (BoE, 2022a: 8). This supports the regulatory and supervisory objectives, clarifying in the existing regulatory framework where AI implications should be considered and called out for clarity (BoE, 2022a: 10).

From a prudential perspective, DP5/22 and the Feedback Statement FS2/23, provided further context and explanation of AI and ML for financial services in general, with some sectoral examples. Supervisory authority objectives and remits, benefits with risks, and regulation of AI, are categorised and documented in the DP5/22 and the FS2/23. The FS2/23 captured in detail the responses received to DP5/22 (BoE, 2023). In both papers, the approach presented is linked to the UK Government's AI regulatory framework. Core part of DP5/22 and FS2/23 linked to prudential risk management regarding AI uses and applications are the paragraphs about safety and soundness, and financial stability with market integrity, mostly linked to MRM. Specifically, the safety and soundness provisions (PRA, 2022a: par. 3.17-8; 4.37-41) with the addition of the financial stability and market integrity (PRA, 2022a: par. 3.23-4; 4.68-9). These provisions are instrumental to (prudential) risk management, with emphasis on MRM (PRA, 2022b). The mapping of proposed UK government principles to DP5/22 by cross-sectoral principles for AI regulation is detailed in the Appendix (PRA, 2022a).

AI is listed in the PRA's insurance supervisory priorities for 2026, considering the risks arising from advanced technologies, amplifying existing risks linked to data management, outsourcing, and cyber (Truran and Khan, 2026). The PRA's approach in supervising AI comprises of MRM roundtables to discuss thematic findings and concerns, complementing the AI Consortium which was established as a public-private platform for engagement to advance the dialogue on AI capabilities, development, deployment, uses, and most importantly associated risks (BoE, 2025a). Despite the PRA and the FCA publications on MRM and AI, there are no specific references to AI from a prudential risk management perspective in either the PRA Rulebook or the FCA Handbook (Pantos, 2024). Prudential risk management is neither listed nor referenced, with the absence of AI references in the relevant parts and chapters of the PRA Rulebook and FCA Handbook noted as an area for development, as initially highlighted by Pantos (2024).

The ABI published a guide as a summary publication of AI uses and risks within insurance, offering practical recommendations, capturing regulations and legislation with AI applications (ABI, 2024: 18). In relation to prudential requirements, the ABI (2024: 24) discusses key requirements, noting the principles for the systems governance under Solvency II, with the role of the 2nd line of defence (2LoD - Risk) to provide support and oversee the use of AI, as well as the need to develop appropriate policies and procedures for AI uses.

3. EU AI Act Insurance Provisions

At European level, EIOPA examined AI within the insurance industry before the EU AI Act was introduced. Initially EIOPA conducted a thematic review on big data analytics in

motor and health insurance, covering AI considerations, as the first analysis on AI systems and applications, describing the AI implications across the insurance value chain (EIOPA, 2019). EIOPA highlighted the data analysis as a fundamental part of insurance business (EIOPA, 2019). This was followed by a detailed report on AI governance principles, compiled by EIOPA's consultative Expert Group on Digital Ethics in insurance (EIOPA, 2021). This report captured the governance principles of AI within the insurance sector (EIOPA, 2021), offering interesting insights for the UK market. In that report, EIOPA introduced the principles of proportionality, fairness and non-discrimination, transparency and explainability, human oversight, data governance of record keeping, robustness and performance (EIOPA, 2021: 8). All could be considered within the UK framework, aligned to the UK Government's approach to regulating AI.

EIOPA underlined that AI is instrumental in the digital transformation of the insurance sector, from the different types of AI uses[19] observed within the insurance value chain (EIOPA, 2024). EIOPA welcomed the AI Act, supporting its objectives and principles, commenting about insurance specific cases highlighted relevance to be identified under Act (EIOPA, 2025a;b). In fact, EIOPA's Chairperson, Petra Hielkema (2022a) in her speech emphasised that, underlining that EIOPA welcomed the AI Act, supporting its objectives and principles, taking into consideration the insurance sector idiosyncrasies. In particular, commenting on the data analysis and modelling angle, central to the insurance business models, for its core functions, such as pricing, underwriting, actuarial, and claims management, with the associated risks identified and addressed by insurance supervisors and re-insurance undertakings (Hielkema, 2022a). As Hielkema (2022a) pointed about the EU AI Act, regulatory and supervisory developments and implementation within the insurance sector should rest with existing authorities. The supervision and regulation of AI within the insurance sector should remain within the existing EU and National Competent Authorities (NCAs) (Hielkema, 2022a). In the areas of governance and risk management, sectoral legislation should extend the AI framework, building on existing requirements for re-insurance undertakings (Hielkema, 2022a). This contributes to regulatory consistency, avoiding overlaps and complexities with existing requirements, such as the Solvency II Directive and the Insurance Distribution Directive (IDD), in the areas of risk management and systems of governance (Hielkema, 2022a). In addition to the EU AI Act, regulatory guidance has also been developed at EU country level[20], however, the need for convergence is highlighted (Parente, 2024).

Arguably there are certain gaps about prudential requirements in relation to AI at UK level. Therefore, examining EU's approach with the AI Act to evaluate the transferability of provisions which could be adopted by UK financial services regulators should be considered. The EU AI Act is currently in place and is live, entered into force in August 2024. It is a horizontal EU legislative instrument, adopting a risk-based approach, classifying AI systems according to level of risk into 4 categories conditional on the level of risk: "Unacceptable" – prohibited AI practice, "High" – high-risk AI systems, "Limited" – transparency risks, and "Minimal risk" – not subject to further obligation beyond relevant legislation. The AI Act as a horizontal legislation has certain implications specific to the insurance sector, in addition to existing sectoral regulatory and supervisory requirements of prudential and conduct nature (Hielkema, 2023). The AI Act is reliant on ex-ante assessment of risks associated with AI applications (Almada, 2025: 103) and has adopted a risk-based approach applied to general-purpose AI models (EC, 2025: par. 63-4). It introduced requirements for general purpose AI systems relevant to financial services, and insurers in this case (Parente, 2024), with specific rules for general purpose AI (GPAI) models, especially for those that pose systemic risks (European Parliament, 2024: 9). The EU AI Act adopts a risk-based approach for proportionate

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[19] EIOPA segments the AI use cases into seven broad categories: underwriting, loss prevention, pricing, claims management, sales and distribution, fraud detection, customer service (EIOPA, 2024: 25). Please see Figure 18 for more detail about the AI examples underpinning those categories (EIOPA, 2024: 25 Table 18).

[20] Please see Vasse et al. (2025: 82) about references to other regulatory guidance at national competent authority level.

regulatory measures against AI systems (Li and Faure, 2025). Its risk-based approach addresses the AI systems' heterogeneity, recognising that not all AI systems are equal in relation to their societal impact (Musch et al., 2023). Conformity assessment and risk mitigation strategies solidify the risk-based approach of the AI Act (Musch et al., 2023). The efficacy of the AI Act's risk-based approach is conditional on the accuracy of the risk assessments of the AI systems (Musch et al., 2023). Nevertheless, this risk-based approach should be broadened, with more detailed classification of risks, while also addressing systemic risks (European Parliament, 2024: 5). Keller et al. (2025) argue that the AI Act does not address the financial systemic risks created or amplified by AI, noting that the regulatory regime should be contributing to its prevention and mitigation.

EIOPA issued a consultation paper *On Opinion on Artificial Intelligence Governance and Risk Management* in 2025, following a principle-based approach for the AI governance and risk management framework (EIOPA, 2025a). EIOPA's Insurance and Reinsurance Stakeholder Group provided feedback to the consultation paper, expanding on those (prudential) risk elements as well (IRGS, 2025). Risk-based approach and proportionality (par. 3.1-6) and risk management system (par. 3.7-10), covering the prudential of AI within insurance, are highlighted by EIOPA (2025a: 5-7). Noting that the vast majority of requirements under the AI Act are applied to high-risk AI models (EIOPA, 2025a). EIOPA noted about leaving further specification of the AI framework to sectorial legislation, building on existing sectorial governance, risk management, conduct of business and product oversight (EIOPA, 2025a;b). The impact assessment of EIOPA's Opinion on AI governance and risk management performed in 2025 covered two policy issues (need for policy action and approach) and two supervisory objectives of (1) mitigating risks arising from AI systems while maximising the benefits, while (2) promoting good supervisory practices and convergence (EIOPA, 2025b: 5-6). EIOPA analysed the different policy options in relation to the need for policy action and approach policy issues (EIOPA, 2025b: 6). Under the need for policy action, developing an opinion on AI Governance and Risk Management is the first option, with the baseline, no intervention being the second option (EIOPA, 2025b: 6). For the approach policy issue, developing an opinion to provide high level guidance based on existing legislation is the first option, against the developing a detailed guidance on specific use cases or issues, as the second option (EIOPA, 2025b: 6). Under both policy options, the first choice is the preferred one for EIOPA (2025b).

The AI governance and risk management framework should be proportionate to nature, scale, and complexity of operations of the re-insurance undertaking (EIOPA, 2025a: par. 3.1). This shapes the identification process of the risks associated with AI systems, developing adequate risk management and governance measures around them (EIOPA, 2025a: par. 3.2). This approach should reflect insurance specific idiosyncrasies, especially considering prudential risks, such as underwriting and reserving (EIOPA, 2025: par. 3.3). These financial risks are important, since as EIOPA highlights should be assessed to understand the prudential considerations from AI systems, such as the Gross Written Premium (GWP) and solvency ratio impact (EIOPA, 2025a: par. 3.4). The overarching risk management system should be developed in a proportionate manner and risk-based, covering fairness and ethics, data governance, documentation and record keeping, transparency and explainability, human oversight, accuracy, robustness, and cybersecurity (EIOPA, 2025a: par. 3.7). In relation to human oversight, the administrative, management or supervisory body members have the responsibility for oversight of AI models, requiring a policy to stipulate how this is conducted (EIOPA, 2025a: par. 3.30). That is where the 2nd and 3rd line of defence functions provide steer with insights, targeting regulatory adherence and compliance, aided by specialist areas for specific risks, referring to the Data Protection Officer (DPO) and the Chief Actuary, for privacy and actuarial risks respectively (EIOPA, 2025a: par. 3.3). EIOPA commented on considering AI within the Solvency II Own Risk and Solvency Assessment (ORSA), in relation to operational risks primarily, but also including AI-related risks in general within that assessment

(EIOPA, 2024). In relation to applications of prudential nature, EIOPA (2024) highlighted AI used pricing, the management of underwriting risks, as well as performing risk assessments. Moreover, about the oversight and governance of AI systems, with their overarching governance (EIOPA, 2024). In particular relying on existing approaches to model governance and the overarching risk management experience, to safeguard AI systems (EIOPA, 2024: 3.1.2). The IRSG[21] proposed a principle-based approach focusing on customer outcomes, with a proportionate, risk-based and outcomes-focused approach for the deployment of responsible AI systems (IRSG, 2025). EIOPA (2025c: section 5.5) in the latest market survey on GenAI highlighted certain risk management approaches[22]. Specifically, the different measures for AI governance principles include proportionality, transparency and explainability, fairness and ethics, data management, human oversight, documentation and record keeping, as well as accuracy, robustness, and cyber-security (EIOPA, 2025c: 27-30).

4. Regulatory Analysis and Recommendations

Following the discussion of the current UK framework about the AI applications and uses within the insurance value chain, together with the EU AI Act, this section explores the recommendations and proposals for the UK AI prudential framework based on EIOPA's publications. However, before doing so, it is also important to comment on the risks associated with AI[23] since they shape the approach to prudential supervision for re-insurers.

4.1 AI Risk Considerations

The ABI detailed a taxonomy of AI risks, providing description and mitigating actions, comprising of the following risk categories[24]: safety, security and robustness; transparency and explainability; fairness; accountability and governance (ABI, 2024: 13-4). Zetzsche et al. (2020) list the risks associated with AI, segmenting the risks of AI within finance into three broad major categories, covering information asymmetry, data dependency, and interdependency. The AI related risks comprise of data risks, related to data dependency, data availability, and the AI interdependency, as well as financial stability risks, cybersecurity, and ethics (Zetzsche et al., 2020). Noordhoek (2023) lists the key risks and concerns related to AI[25], referring to the lack of transparency and explainability, discrimination, bias and lack of fairness, excessive price differentiation, unaffordability and exclusion. The Financial Stability Board (FSB) explains the AI-related vulnerabilities, with monitoring approaches to counter them (FSB, 2024; 2025). These are third-party dependencies and service provider concentration, market correlations, fraud, disinformation, misalignment, cyber, model risk, data quality and governance according to the Financial Stability Board (FSB, 2024; 2025).

AI could destabilise the financial system, creating new tail risks while at the same time amplifying existing ones because of procyclicality according to Daníelsson et al. (2022). The rapid use of AI is threatening the financial stability (Danielsson and Uthemann, 2025a). Guagliano and Mejdahl (2025: 65-6) document the risks to financial stability from AI noting

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[21] For further detail, please see the full response from the Insurance and Reinsurance Stakeholder Group to EIOPA's opinion on AI governance and risk management (IRGS, 2025).

[22] A summary of the insurer's key governance and risk management approaches is captured in Table 3 (EIOPA, 2025c: 28-9), showing the governance principle with its description for traditional vs. generative AI systems.

[23] There are different risks listed under each category the ABI (2024: 13-4) documents. The safety, security and robustness risks are inadequate data quality, internal and external fraud, model drift, data security, and cybersecurity threats. Under transparency and explainability, the risk of interpretability and explainability is noted. AI bias and privacy violations are fairness risks. The accountability and governance risks include the management of third party and suppliers, dependency on third party providers and skills gap (ABI, 2024: 13-4).

[24] Elling (2019: Table 1) presents the potential negative consequences arising from the use of AI, describing each risk segmented by category. These are performance risks (risk of errors, risk of bias, risk of opaqueness/ "black box", risk of explainability, risk of stability of performance), security risks (cyber intrusion risks, privacy risks, open source software risks), control risks (risk of AI going "roque", inability to control malevolent AI), societal risks (autonomous weapons proliferation, risk of "intelligence divide"), economic risks (job displacement risks, "winner-takes-all" risk, liability risk, reputation risk), and ethical risks ("lack of values" risk, value/ goal alignment risk) according to Elling (2019: Table 1). Note that generative AI introduces additional risks but linked to those traditional AI risks and risk categories (Jia et al., 2025a: 12-13).

[25] There are different approaches from insurers in addressing AI risks and concerns. Please see Figure 3 of Noordhoek (2023: 25) for an explanation.

the concentration of AI models; interconnectedness, herding and market correlations; operational risks and cybersecurity; model risk and algorithmic biases; hype around AI companies; and risks amplified by social media. NIST groups the challenges for AI risk management into harm to people, harm to an organisation, and harm to an ecosystem (NIST, 2023a: Fig. 1). Comunale and Maner (2024) comment on the privacy and copyright issues, covering data and privacy protection risks. Because of the complicated interplay of AI models, data protection, big data and bias (Langenbucher, 2025). Hristozov and Vazov (2025: 173) highlight the fairness of AI systems which is required, eliminating bias and discrimination. Misalignment, misuse, or a capability failure could potentially result in AI systems causing harm (Weil et al., 2024). Risks associated with the use of AI should be translated into prudential and conduct risks, embedded into existing supervisory approaches (Hielkema, 2022b). The link between AI insurance, assurance, and model risk management is also highlighted (Szpruch et al., 2025). The amplification of prudential risks from AI, with implications to safety and soundness remain as regulatory concerns, explaining the purpose of this study, as clarified in below (BoE, 2022a: par. 3.17).

4.2 Developing the UK AI Prudential Supervision

According to Vasse et al. (2025: 83) AI impacts financial regulators and supervisors in three key areas: (1) legislation and guidelines, (2) financial institutions supervision, and (3) supervisory activities. The second area, about supervisory approaches, such as model risk management, are linked to this study. There are certain developments to consider in updating the prudential supervisory framework of AI within the insurance industry. Amending relevant and applicable requirements in the PRA Rulebook and FCA Handbook, contributes to building the appropriate regulatory and supervisory framework for AI (BoE, 2025b: 19-20). Therefore, starting with the PRA's Rulebook and the FCA's Handbook, mentioning AI implications, in the areas of governance, data, modelling for risk management systems and frameworks. Clarification of AI uses articulating cross-references should be added. Perhaps the key publication missing is insurance specific guidance, especially in MRM, where previous papers have focused more on banks; to capture insurance idiosyncrasies, like rules for insurers with approved internal models, partial internal models etc. The PRA should consider issuing insurance-specific guidance on MRM, in a similar approach as adopted for banks in SS1/23 and policy statement PS6/23. That should be extended for the London market as well, updating the Lloyd's Principles for Doing Business to capture AI considerations under all Solvency Principles. Building on the Data, Model, Governance of AI, embedding those principles in existing rules regarding prudential provisions, is recommended, to effectively update existing guidance for prudential risk management activities.

Overall, PRA's approach to insurance supervision should be enhanced to reflect AI considerations for prudential risk management activities. These are the Solvency II Own Risk and Solvency Assessment (ORSA), stress and scenario testing (S&ST), recovering planning and MRM (Pantos, 2025). For instance, in the ORSA process and report, how AI risks are considered, managed and mitigated, with updates to the control environment should be captured. AI data, model, and governance requirements should be embedded into existing provisions and supervisory expectations of Solvency UK (i.e., SS19/16). This allows the accurate identification and quantification of AI-generated risks (Selvadurai, 2025). It is also linked to the outcome-based regulation of AI risks (BoE, 2022a: par. 3.24). The risk assessment and categorisation, impact assessment, and risk management are core elements of the risk-based regulation, that the EU AI Act in this case incorporated into the UK regime (Ebers, 2025). This is aligned to the four core pillars of the NIST AI RMF[26] Playbook: Govern, Map, Measure, and Manage (NIST, 2023a;b). Capturing the identification and mapping of the risks based on the context, then assess, analyse or track them for their measurement, to support their

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[26] The AI RMF refers to an AI system as an engineered or machine-based system that can for a given set of objectives generate outputs such as predictions, recommendations, or decisions influencing real or virtual environments (NIST, 2023a).

prioritisation based on the anticipated impact (NIST, 2023a;b). Risk mitigation is key in relation to GenAI, with supervisors understanding and mitigating the risks associated with it (Vasse et al., 2025: 85).

AI impacts existing risks, while also introducing new risks of operational, reputational, and compliance nature, thus requiring updates to risk management principles and frameworks to address them (CMORG, 2025: 8). This explains the focus on risk management principles and frameworks, as also expanded in the guidance of the Cross Market Operational Resilience Group regarding GenAI (CMORG, 2025). Requiring updates to governance and risk frameworks, capturing AI related risks, to align with risk appetite, under industry-wide standards and frameworks for consistency (CMORG, 2025). AI techniques applied to advanced foresight tools could create a cohesive predictive risk management framework (Mokoena, 2025). Standards, principles, and frameworks widely used within the re-insurance industry should be utilised for the adequate management of the AI related risks (CMORG, 2025: 8). Written policies and guidance for the use of AI which are updated regularly and have robust governance in terms of oversight should accompany this framework (Airmic, 2024: 15). These proposals at UK level should complement existing requirements, guidelines, and standards. Specifically, updating actuarial and technical risk standards, for existing governance (i.e., CRO and 3LoD model), risk management guidance and controls, as recommended by the IAIS (2022: 15 par. 4.2.2). Especially considering ICP 8 Risk Management and Internal Controls (IAIS, 2022: 15) with ICP 16 Enterprise Risk Management for Solvency Purposes and ICP 7 Capital Adequacy also linked to AI and MRM considerations (IAIS, 2024). The AIPPF presented in the AI governance hierarchy the application of the 3LoD model (AIPPF, 2022: Fig. 7). Chief Risk Officers should highlight the risks associated to AI, considering liability risks of AI and risks associated to data (Maynard and Goodman, 2020).

In stress and scenario testing, it is important to explain whether AI is used for the calibration, forecasting, or quantification, to provide a framework effectively for testing. Establishing a governance framework, in conjunction with risk management frameworks and risk management systems, is instrumental to the regulatory and supervisory approach, with a focus on prudential risks, such as how AI is used within underwriting and reserving. In particular, developments about S&STs are in-sync with the recommendation to conduct AI-specific stress testing from the BoE and the FCA (Treasury Committee, 2026: 10 par. 23). Therefore, this will allow preparing for future regulatory prescribed stress tests, capturing AI risks. Moreover, the PRA should consider introducing requirements (under DP5/22) for AI Policy and Governance Framework at entity level, with detailed processes and procedures for each use and application. Currently, AI is not reflected in the latest versions of the Lloyd's Principles (Lloyd's of London, 2024a;b). The principles for doing business in Lloyd's of London should be enhanced beyond underwriting profitability and the solvency principles[27] to capture AI considerations, in line with CMORG's AI guidance review of 2025 (Lloyd's of London, 2024a;b; CMORG, 2025).

The three main pillars (data, model and governance) of UK's approach to AI regulation as reflected in the AIPPF's report (2022) are key to the AI Insurance Prudential Risk Management Components. Data is the starting point of AI, with data quality considered as key for AI models, complex in nature, associated by challenges and risks (AIPPF, 2022). Monitoring and oversight of AI models, in terms of data input and output thus is of high importance, evaluating reporting and explaining the model results (AIPPF, 2022). This process describes the governance requirements, based on existing frameworks, with modifications to incorporate the risks of AI systems, tailored to use cases and materiality (AIPPF, 2022). AI models within insurance should adhere to the MRM principles in a proportional manner, even if these have been

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[27] The 3 solvency principles: #7 Capital, #8 Investments, #9 Liquidity Operational: #10 Governance, Risk Management and Reporting, #12 Operational Resilience (Lloyd's of London, 2024a).

developed for banks – at least until insurance specific MRM principles are provided by the PRA (BoE, 2023b: par. 3.1, 3.3).

These recommendations are graphically depicted in the figure below, joining the ORSA, MRM and S&STs, the core elements of prudential risk management with the Data, Model, and Governance of AI based on its applications and uses. AI in insurance is already regulated, with existing risk frameworks providing a strong foundation as argued by the Institute of International Finance in their response to EIOPA's consultation (IIF, 2025). This justifies the components of the figure (Figure 1) below, with the existing prudential requirements under Solvency II (IIF, 2025: 2), the ORSA, MRM, and S&STs which could be enhanced to incorporate AI and associated risks.
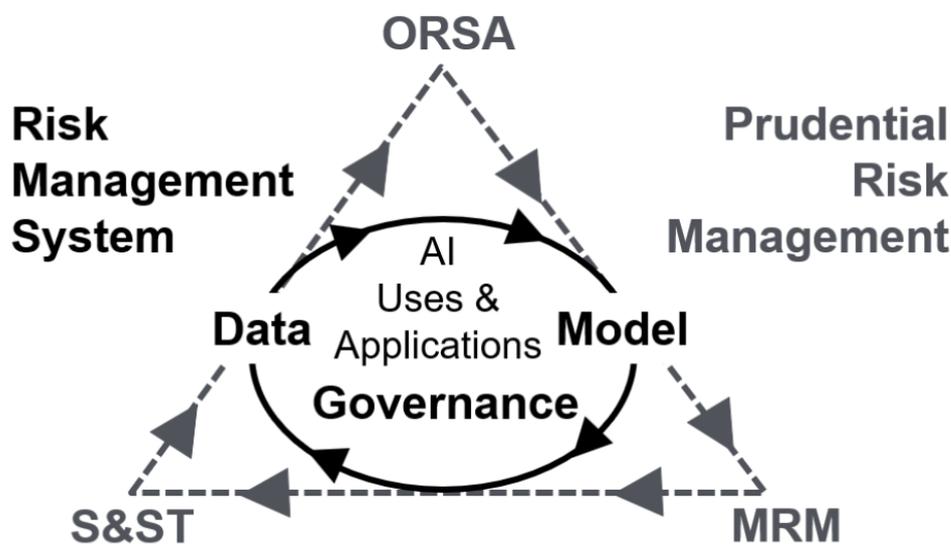

Figure 1 AI Insurance Prudential Risk Management Components

As a starting point, the PRA and the FCA could perform an impact assessment, replicating EIOPA's approach and develop detailed guidance on specific use cases of prudential (financial) risks from insurance value chain by sub-sector (life vs. general insurance) for AI governance and risk management. They could focus on developing guidance with different publications about AI cases and uses within insurance but from a prudential risk angle, in a similar manner as they have done for other risks (i.e., climate change). Developing guidance on specific AI use cases embedded in the prudential requirements and existing Solvency legislation (policy option 2.2) is proposed (EIOPA, 2025b: 6). This stems from an insurance specific opinion on AI governance and risk management (policy option 1.1) which should be completed replicating EIOPA's assessment, combined with an opinion providing high-level guidance based on existing prudential requirements (i.e., ORSA, S&STs) (policy option 2.1) (EIOPA, 2025b:6). Additionally, to understand how the UK framework could be aligned to the EU AI Act, for instance on the risk level classification, different components could be embedded in the PRA Rulebook and the FCA Handbook, to ease this transition. To evaluate options for alignment with EU AI Act, provisions on risk management systems in PRA Rulebook and associated guidance could be adjusted. This approach should not result to increased complexity and overlap with other existing requirements. Especially regarding the regulatory consistency with other risk management provisions, where this challenge lies, such as for operational risks, with operational resilience requirements and the Digital and Operational Resilience Act (DORA).

4.3 The UK AI Integrated Regulatory Framework

The key question remains on how the EU AI Act and EIOPA's opinion for insurance applications could be combined with the PRA's AI requirements about Data, Model, and Governance. Exploring the integration of EU AI Act based on EIOPA's opinion with PRA's Data, Model, Governance requirements; assess combination of risk-based approach (4 levels

of risks from EU AI Act) and principles-based approach (data, model, governance requirements) for AI insurance prudential risk cases. The answer lies with the AI prudential risk management framework, as presented in the figure (Figure 2) below. Starting with the AI uses within the insurance value chain, with the risk determined following the EU AI Act, shaping Data and Model requirements. These then create the level of Governance required. A dynamic approach is required conditional on the stages of AI lifecycle, with the interlinkage of data, model, and governance (BoE, 2022a: Fig. 1). The figure below is consistent with the IA governance landscape introduced at UK level, capturing AI specific risks (UK Government, 2024a). This framework in effect is linked to the governance angle of the AI act, overlapping with existing insurance legislation.
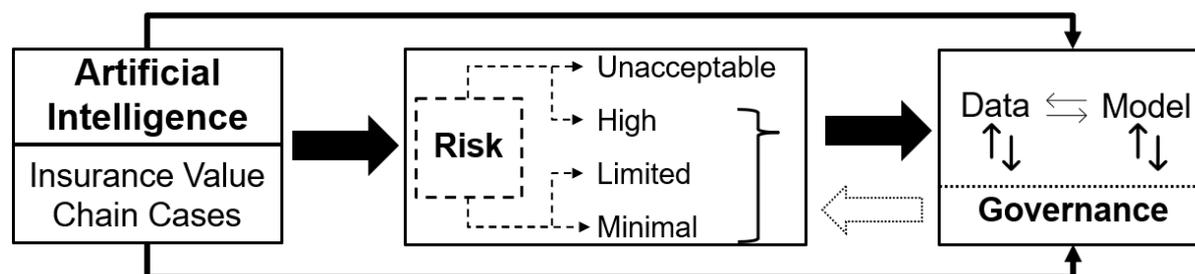

Figure 2 UK AI Integrated Regulatory Framework

The four pillars of risk-based supervision and proportionality of IAIS[28] describe the proposed approach for the UK framework (IAIS, 2025: Table 1). Governance and accountability are reflected in the RHS component of Figure 2, with the oversight and monitoring of the AI model and the underpinning data. The rest pillars are embedded within the governance, since it involves the monitoring, checks, and tests about AI model characteristics, standards, and conditions, aligned to the IAIS's proportional and risk-based supervision (IAIS, 2025: 11). It should be noted that regulation of AI models remains continuous, covering the entire life-cycle of AI design, application, and obsolescence, as highlighted by Selvadurai (2025). The framework from Figure 2 above accounts for that "longevity", since its dimensions encompass the evolution of AI systems, products, and services (Selvadurai, 2025). Figure 2 with the feedback loop covers the AI actors across the AI lifecycle stages covering the application context, data and input, the AI model, and task with output (NIST, 2023a: 11 Fig. 3). The recommendations on AI OECD initially proposed when conducted the review on AI and big data within insurance are incorporated into the proposals reflected in Figures 1 and 2 (OECD, 2020: 20 Box 5). In particular about the recommendation for the continuous assessment and management of risks (OECD, 2020: 20 Box 5). Human intervention in automated decision-making is highlighted as the future direction of regulatory developments (Bhatnagar and Gajjar, 2024). Strong governance, human oversight, coupled with operational ethical safeguards targeting customer trust are essential for insurers to realise generative AI benefits (Jia et al. 2025b). Human oversight for the safe and responsible AI is of high importance, with controls at high-level explanation and criteria proposed (Zhu et al., 2025). Control, contestability, and competence are key for the effective oversight of AI models, with human understand, control and accountability (Zhu et al., 2025). Oversight of AI systems should meet the four agency conditions of individuality, source of action, goal-directedness, and adaptivity according to Zhu et al. (2025).

4.4 Implementing the Framework and Embedding the Approach

UK financial services regulators have different institutional design options when examining the adoption of the EU AI Act (Novelli et al., 2025). Considering the focus on

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[28] These are the (1) governance and accountability, (2) robustness, safety and security, (3) transparency and explainability, as well as (4) fairness, ethics and redress (IAIS, 2025: Table 1).

prudential provisions for re-insurance undertakings, a decentralised institutional design incorporating AI-related tasks at the PRA, the FCA, and Lloyd's of London could be attempted (Novelli et al., 2025). The implementation of the prudential provisions of the EU AI Act within the insurance regulatory and supervisory approach in the UK consists of different steps and components[29], in a structured manner for its enforcement (Novelli et al., 2025). The risk-based approach to implement the EU AI Act comprises of the normative implementation, referring to the adoption of specific legal provisions, and the administrative implementation, with the interpretation, application and enforcement by authorities (Ebers, 2025).

The proposed UK AI integrated regulatory framework should be implemented utilising the framework of Thomas and Beddard (2026). Its core elements are three; activities for AI regulation, capabilities for AI regulation, and good practice for AI regulation (Thomas and Beddard, 2026: 17). In terms of AI regulation activities[30], within the prudential content for re-insurance undertakings, these involve the existing requirements of the ORSA, MRM, and S&STs, as depicted in Figure 1. The AI regulation capabilities cover the risk management systems and prudential risk management angles from Figure 1 above, for each level of regulatory capability (system, organisation, individual). A dynamic approach with a blend of rigid and flexible capabilities[31] is proposed in embedding the framework from Figure 2 within UK's approach to AI prudential regulation and supervision for re-insurance undertakings. To adopt the AI Integrated Regulatory Framework from Figure 2, internal guidelines and policies should be established, based on an appropriate governance structure conditional to the relevant AI risks, supported by testing and training (Keller, 2020: 5). Adjusting the implementation tiers of the NIST AI Risk Management Framework, covering the design and development, testing and evaluation, deployment, and pre-design (NIST, 2023a;b). Governance is a core component, as demonstrated by Figure 2 too from above, with the mapping, measurement, and management of the AI associated risks within the insurance value chain and the exact applications (NIST, 2023a;b). The process to implement the approach from Figure 2 for re-insurance undertakings follows the steps of AI use case assessment[32], with implementation of governance measures, to evaluate the ethics and trustworthiness from a conduct risk perspective, and then of prudential risks (EIOPA, 2021: 18).

The recommendations in developing the UK regulatory framework for re-insurance undertakings based on the EU AI Act are aligned to the four-step integrated model of AI regulation as proposed by Selvadurai (2025). The four-step model of integrated regulation of Selvadurai (2025) comprises of the following four steps: (1) mapping and gap analysis; (2) calibrating safety and innovation; (3) determining the appropriate combination of general sector-specific AI regulation; (4) determining the appropriate combination of regulation, self-regulation, technical standards, and technical controls. In relation to the 3rd step, this involves developing insurance specific guidance with rules reflected in the PRA Rulebook and the FCA Handbook for re-insurance undertakings under (and outside) Solvency II. As Selvadurai (2025) argues about the two tiers of AI regulation, the foundational applied to all AI development and deployment, and the sector-specific AI regulation, where in this case detailed requirements for the insurance specific uses of AI applications within the insurance value chain should be published by financial services regulators. Supervisory approach to re-insurance undertakings should target controlling the AI uses and developed, with re-insurers required to explain how

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[29] The key aspects for the implementation and enforcement of the AI Act which could be considered for the UK regime are the procedures, guidelines, classification, prohibited systems, harmonised standards with high-risk obligations, information and transparency, and finally the enforcement (Novelli et al., 2025: Table 1).

[30] The six stages from Thomas and Beddard (2026: 18-9) are the following: (1) agenda and objective setting, (2) formulating rules, norms, and guidance, (3) regulatory engagement and uptake, (4) information gathering and compliance monitoring, (5) responding to non-compliance, and (6) evaluating and updating policy.

[31] Thomas and Beddard (2026: 19-20) discuss the regulatory capability factors on a spectrum, ranging from rigid to flexible, incorporating the following: legal, regulatory, and administrative; financial resource; infrastructure, tools, and technology; research development, and intelligence; experience, skills, and expertise; leadership, culture, and communication.

[32] For the impact assessment, EIOPA offers guidance on the risk dimensions, in terms of severity and likelihood, and impact, on consumers (conduct) and the insurer (prudential) (EIOPA, 2021: Fig. 5).

AI works and makes decisions (Danielsson and Uthemann, 2025b). This should cover both prudential and conduct risks and uses, aligned to the FCA's initiative about a joint AI regulatory and supervisory approach (FCA, 2023: 8).

4.5 Alignment and Reflections

Adopting the EU AI Act provisions within the re-insurance prudential regime is aligned to the cross-sectoral principles[33] for AI regulation the BoE initially highlighted in DP5/22 (BoE, 2022b). The recommendations to the UK framework build on the next steps highlighted in the report of the AIPPF (AIPPF, 2022: par. 18-21). They are consistent with the UK Government's principles of pro-innovation approach to AI regulation (UK Government, 2024b: 4), and the cross-sectoral principles tailored to AI characteristics (UK Government, 2022). They are also aligned to the recommendations the Treasury Committee made in early 2026 (Treasury Committee, 2026: 9-10, par. 21-24). For instance, clarifying the application of existing rules to the use of AI could be connected to the use of stress testing for AI (Treasury Committee, 2026: 9-10, par. 21-24). Plus, in agreement to OECD's recommendation about AI rules and guidance, in relation to tech neutrality, proportionality and risk-based supervision (OECD, 2024b: 37-38). Clarifications on existing regulatory requirements, in an outcomes-based approach, with regulatory alignment between insurance supervisors (AIPPF, 2022: par. 20-1). These proposals remain consistent with BoE's technology-agnostic approach to supervision and regulation (2025b). The principle of proportionality maintains a central place to these proposals for the UK regime, targeting proportional regulation and supervision of AI within insurance, in a similar manner to what Hielkema (2022b) argued for EIOPA's role on the EU AI Act. Incorporating the prudential provisions of the EU AI Act at UK level aims to harmonise requirements. Based on regulatory collaboration and international standards (FCA, 2025a: par. 4.6) towards an international harmonization of AI regulatory and supervisory approaches for re-insurance undertakings (Lancieri et al., 2024). Alignment with global standards, such as the Insurance Core Principles of the IAIS which is an extension of the EU AI Act. Effectively, ensuring alignment with IAIS proposals for supervision of AI, with adherence to relevant ICPs (e.g., #8). Additional technical standards[34], such as the ISO/IEC 42001 AI Management System Standard, and the ISO/IEC 22989 AI Concepts and Terminology should also be considered (UK Government, 2024b: 12).

The EU AI Act is applied horizontally, incorporating new requirements into existing financial services supervisory procedures (Almada, 2025: 109-10). Embedding the prudential provisions of the EU AI Act for UK re-insurers as described above, allows to address the concerns around overregulation, implementation challenges and risk assessment accuracy (Musch et al., 2023). Risk-based cross-sectoral regulation of AI related risks impacting re-insurance undertakings should be captured in specific provisions, complementing the AI Act (Guagliano and Mejdahl, 2025: 72). Similar to the FCA's approach, the proposal of this study entails building on existing foundations and requirements (FCA, 2025a: par. 4.3-4). A tailored and coordinated regulatory and supervisory approach to AI, recognising the implications from AI models in relation to prudential risks is recommended (Prenio and Yong, 2021: par. 56). The tailored approach to AI uses and applications within insurance value chain, is divided into customer-facing, either low or high impact, vs. non-customer-facing which either requires supervisory approval or not (Prenio and Yong, 2021: 19). These recommendations touch the reliability and soundness principles of regulatory expectations related to AI, considering the focus on prudential requirements (Prenio and Yong, 2021: 7). They are linked to existing insurance laws and regulatory standards, such as the ICPs, and specifically ICP 8, 16 and 17 (Prenio and Yong, 2021:11). In particular, ICP 16 about models for risk measurement, and ICP

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[33] Ensuring that AI is technically secure and functions as designed, making sure that AI is appropriately transparent and explainable, embedding considerations of fairness into AI, defining legal persons' responsibility for AI governance, clarifying routes to redress or contestability (BoE, 2022b: 3).
[34] Plus, the ISO/IEC 23894:2023, ISO/IEC CD TS 8200, ISO/IEC TR 5469:2024, ISO/IEC TR 29119-11:2020 (UK Government, 2024b: 14).

17 covering the use of models for regulatory capital management (Prenio and Yong, 2021: par. 22). Aligned to the supervisory approaches and governance measures of IAIS in relation to MRM (2022: par. 4.2.2). These comprise of a top-down approach with cross-sectional AI regulations or extensions of existing MRM principles and guidelines, a bottom-up approach with self-regulatory guidance, as well as standard measures targeting governance and control mechanisms considering AI development stages (IAIS, 2022: 15). Overall, the recommendations adhere to the application paper of supervisory approaches to AI from the IAIS, recognising the amplification of existing risks from AI, building on existing ICPs (IAIS, 2025: par. 5).

5. Conclusion

Regulating and supervising AI applications within the UK insurance industry is of high importance, linked to AI uses and the inherent purpose of insurance. In particular referring to the growth and capacity of the insurance market, with wider applications of AI, and the insurability of risks, with the case of under-insurance and protection gap, towards affordability via increased accuracy of risks and improved underwriting, both outcomes of prudential activities. This is quite timely, considering that AI is listed for the first time in the 2026 "*Dear CEO*" letter of the PRA, with the supervisory priorities for insurers (Truran and Khan, 2026). Especially considering the fourth theme of the Mills Review currently ongoing from the FCA about the "future regulatory approach" (FCA, 2026b). Also, it is quite topical since insurance could address the risks of generative AI (Jia et al., 2025a).

This research adds to the growing literature on AI about the regulatory implications from its use and applications, based on a case study from the UK insurance industry. In particular, commenting on the EU regulatory regime (EC, 2020), from a prudential lens, on how this could be utilised to shape UK practice and policy (Bhatnagar and Gajjar, 2024). The case study of UK re-insurance sector, inclusive of Lloyd's of London, for the UK AI regulatory and supervisory approach of prudential nature linked to Solvency II provisions: ORSA, MRM, S&ST is presented. The contribution of this paper is twofold, providing insights for advances to the regulation and supervision of AI applications within the insurance sector for the UK, based on the EU AI Act and EIOPA's approach. The proposals discussed above are aligned to the recommendation of Noordhoek (2023) for policymakers and regulators, in applying existing regulations, embracing principles-based regulation, while considering the specific characteristics of AI in insurance. The recommendations incorporate the unique features of AI with the associated challenges in designing effective regulation (Selvadurai, 2025).

5.1 Extensions and Further Research

There are different directions for further research, extending this study on the prudential regulation and supervision of AI within insurance. A quantitative study based on the macroeconomic effects and dynamics of AI (Acemoglu, 2025) could be considered. Considering the focus on re-insurance undertakings, moving within the insurance ecosystem, and examining the implications of AI to insurance intermediation (Hielkema, 2025). Linked to that, potentially extending this study with more granular analysis of the AI related risks, of operational risk nature, with their implications to existing requirements, such as operational resilience and third-party risk management (BoE, 2022a: par. 3.23). In relation to risk management activities, looking at the Guidici's et al. (2024) integrated risk management model for AI applications with the SAFEty (sustainability, accuracy, fairness, explainability) statistical principles and the Key Artificial Intelligence Risk Indicators. Then, incorporating the interaction of AI with the management of other risks, such as ESG as highlighted in Sciascia (2025). In relation to the technical AI angle, assessing GenAI and Frontier AI models. Extending this study to incorporate the three pillars about GenAI introduced by Wicker et al. (2025) about utilising the MRM principles, covering (i) governance and tiering, (ii) design standards, and (iii) testing and monitoring. Expanding the model monitoring and testing components, for the validation and embedding of the approach described by Wicker et al. (2025), applied to insurance undertakings extending MRM principles. Differently, for the

regulation of Frontier AI models[35], conducting thorough risk assessments, apply independent scrutiny to models, monitor and respond to new information on model capabilities (Anderljung et al., 2023), with enhanced auditing scope and risk focus areas (Brundage et al., 2026: Fig. 5).

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[35] Frontier AI models are high capable models which could pose dangerous capabilities sufficient to pose severe risks to public safety (Anderljung et al., 2023).

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