The only constant is change: opportunities and challenges for actuaries in a changing world

Frank Schiller1 · Jérôme Crugnola-Humbert2

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Abstract
In a world threatened by climate warming and where Environmental, Social and Governance (ESG) issues are gaining increasing prominence, actuaries and other finance professionals need to adapt and support the transition to a more sustainable economy. This article examines how they can contribute to protect financial stability through forward-looking risk management, how they can help the insurance sector play an important role to support climate and environmental sustainability, and how climate protection gaps should be monitored and addressed.

1 Introduction

We currently face a series of changes and upheavals that seem to be unprecedented. Starting with several financial crises in the last 20 years, having now just survived the emergence of COVID-19 with its negative effects on the economy and the public health, we are currently experiencing in Europe a fierce inflation, a potential recession and the increasing physical effects of climate change. Who knows when and how this will end? Especially for climate change, this is just the beginning. Within the next 30 years, researchers worldwide expect the climate situation to worsen materially—not to speak of transitional effects induced by the climate crisis.

To tackle the issue of climate change holistically, we must address the broader sustainability questions that the economy and society are facing.

According to the commonly used definition put forward by the United Nations in their 1987 Brundtland Report [2], sustainability means “meeting the needs of the...
present without compromising the ability of future generations to meet their own needs”. It contains two key concepts:

- The concept of ‘needs’, in particular the essential needs of the world’s poorest, to which priority should be given; and
- The idea of limitations imposed by the state of technology and social organisation on the environment’s ability to meet present and future needs.

This whole topic is not new. Even in the seventies, MIT researchers concluded in their report ‘The Limits to Growth’ commissioned by the Club of Rome (also referred to as the Meadows report [7]) that economic growth is limited and not perpetually sustainable, and they predicted “overshoot and collapse” in the economy, environment and population some time before 2070. The first Climate Conference followed in 1979 and milestone agreements were reached in Kyoto in 1997 (although never ratified by the United States) and in Paris in 2015. Now with clear evidence that human behaviour has been driving climate change and effects that can already be experienced, the urgency to take actions is obvious.

Based on this understanding, the Actuarial Association of Europe wrote a position paper [1] and outlined the most relevant aspects of the roles of actuaries in this context:

1. Financial sustainability:
   - How can we effectively manage the risks posed to insurance and pension systems from the short and long-term policy effects?
2. Climate and social sustainability:
   - How can insurance and pensions contribute to a just and sustainable transition through investments and the provision of insurance to transition projects, while paying out claims for insurable climate-related physical risks?
3. Climate protection gap:
   - For climate risks borne by society which are not currently insurable, or may become non-insurable under current market conditions, how can public policies work with the insurance and pension industries to ensure society is covered in these areas?

With an initial focus on non-life insurance, we would like to discuss the most relevant topics to be addressed by actuaries in the near future.

2 Financial sustainability

Actuaries can play an important role in providing and explaining a comprehensive analysis of the risk situation of insurance companies and capital markets. This will support companies’ management, clients, investors, regulators and policymakers in taking well-informed decisions on business steering, risk management, investment plans and short- to long-term measures.
To avoid contradicting steering signals, it is crucial that all existing capital requirements and approaches remain consistent and balanced. For the Solvency II framework, we emphasize for climate change assessments the basic principle of “same risk—same capital”. If so-called ‘green supporting’ or ‘brown penalising’ factors are introduced into Solvency II capital requirements, they should be science-based and reflect the quality of investments and the inherent risks. If such factors are also introduced on the underwriting side, similar risk-based requirements apply. We also note that changes in capital frameworks alone, while they may be necessary, are unlikely to provide sufficient incentives, and that changes in regulation, tax codes and public investment have a major role to play.

In contrast to currently used approaches in actuarial science and financial economics, consequent forward-looking considerations will have to be applied: (Table 1).

It will be essential to reflect non-linear effects and potential domino effects of irreversible physical tipping points [6] (e.g., the slowdown of the Atlantic circulation affecting the severeness of droughts in rainforests, or the decrease of the Antarctic ice sheet also having negative effects on other climate factors), especially for forward-looking climate scenarios relevant to inform the above-mentioned stakeholders.

As actuaries cannot be experts in all the relevant research areas like meteorology, biology, chemistry or physics, it will be crucial for actuaries to work closely together with experts in these fields to at least interpret the results of their scenario analyses to be able to derive consistent scenarios for risk assessments of insurers and other financial institutions. In contrast to scenarios derived out of capital market prices for market-consistent valuations, calibration of climate scenarios cannot be based on a single point in time, and the result will not be a single and mathematically well-defined distribution of future random processes. Instead, different scientific sources possibly reflecting extreme non-linear behaviour in the long-term future will need to be used, and relevant financial and insurance-related risk drivers will need to be derived as a basis for these scenarios. In most cases the result will be a series of holistic and exploratory what-if-scenarios rather than a market-consistent stochastic distribution of a random process.

As some of these scenarios might even result in differing prices for insurance products or financial assets compared to those observed in the market (due for example to short-termism in current financial behaviours, and uncertainties about future environmental, political and technological developments), actuaries will need to clearly explain to their stakeholders the effects and base assumptions leading to these differences without implicitly undermining the quality of the analysis. It will be challenging to explain these ambiguities to non-experts.

What increases complexity even more are the not-yet-finalized reporting requirements for sustainability disclosure frameworks. Typically, they are principle-based, leave quite some room for diverging interpretation, and are still under construction with further amendments to be expected in the future. Most of the reporting and classification standards will likely have an effect on the valuation of assets and liabilities of insurance companies and other financial institutions, and, again, these effects are difficult to predict.
### Table 1  The three relevant perspectives actuaries need to consider (authors’ analysis)

| Looking to the … | … Past … | … Present … | … Future … |
|------------------|----------|-------------|------------|
| …, e.g., for …  | … Traditional reserving and pricing | … Market consistent valuation | … Assessment of climate scenarios |
| The philosophy behind this approach: | “The historical development is a valid prediction for the future” | “Today’s financial markets already include all relevant information” | “The future needs to be explored comprehensively from all perspectives” |
| Required expertise and data for its application: | Historical observations and classical statistics | Mark-to-market and market consistent modelling | Forward-looking scenario analysis reflecting various external aspects |
Climate and sustainability disclosures typically feature forward-looking statements (such as future decarbonisation commitments under the umbrella of the Glasgow Financial Alliance for Net-Zero), and whether and how these commitments will be implemented add further uncertainty to the risk landscape.

Actuaries will have to cope with these new ambiguities and approaches needed for the evaluation of risks and they will have to explain these effects transparently to their stakeholders.

3 Environmental and social sustainability

Especially non-life insurers can play a very relevant role during the transition process of climate change in protecting companies against physical losses and providing supporting services for managing environmental (and social) risks. It will become more and more important that underwriting approaches include environmental, societal and governance (ESG) criteria in the assessment of risk exposures and that sustainable solutions are developed that price and manage climate change risks appropriately.

To support this journey, the UN Environment Finance Initiative formulated Principles for Sustainable Insurance (PSI) [8], which were launched in 2012:

*Sustainable insurance is a strategic approach where all activities in the insurance value chain, including interactions with stakeholders, are done in a responsible and forward-looking way by identifying, assessing, managing and monitoring risks and opportunities associated with environmental, social and governance issues. Sustainable insurance aims to reduce risk, develop innovative solutions, improve business performance, and contribute to environmental, social and economic sustainability.*

Sustainable insurance will not only pay out claims when triggered. It will also involve the development of sustainable products and solutions that aim to directly influence and reduce risk exposures, while supporting stakeholders and policyholders to follow these sustainable principles:

- Embed in decision-making the ESG issues relevant to insurance business;
- Work together with clients and business partners to raise awareness of ESG issues, manage risk and develop solutions;
- Work together with governments, regulators and other stakeholders to promote action across society on ESG issues; and
- Demonstrate accountability and transparency in regularly disclosing publicly the progress in implementing the principles.

An example for such a new feature of a sustainable product and service could be “build back better”. Instead of simply paying to the client the amount of the insurance cover after a house has been damaged during a heavy flood, the insurance company could help the client to decrease the vulnerability of the house to future flooding, could join forces with the local government to finance risk mitigation measures
(such as flood-proofing the walls) or could perhaps even support the client in finding a new and lesser exposed place to relocate. The objective always is that after the intervention of the insurer, a new solution will be found that is effectively more sustainable, i.e., less risky and more resilient, than the initial situation. Such risk mitigation mechanisms and incentives are also encouraged by leading supervisory authorities, such as EIOPA (under the name ‘impact underwriting’ [5]) and the California Department of Insurance (for example with its Climate Smart database of sustainable insurance products [3]).

To judge the sustainable effectiveness of such products and solutions, the Sustainable Development Goals (SDG) of the UN [9] might provide a helpful mapping framework. The following process can be undergone for the assessment:

1. Identify SDGs that are affected by the product (positively and negatively);
2. Describe the effects in detail and analyse risks and opportunities for better or worse effects; and
3. Set up a monitoring and reporting process for internal measurement of the effects and public disclosure.

Again, actuaries will have to work with more stakeholders and include a broader spectrum of perspectives than they may be used to, to effectively succeed in developing new sustainable products and services. It does not only involve calculating the right price, but they also should envision how to innovate and deliver with a sustainable product and service a positive effect on the sustainability targets of the company and society as whole.

4 Climate protection gap

With limited capital and increasing physical risks due to climate change, insurers may need to significantly increase their premiums or even decline insurance coverage in the future, as can already be seen in some US States where flood insurance against hurricanes can be difficult and expensive to purchase. Consumers may also simply decide against buying insurance cover, either because they judge their personal risk to be low or because the effort or cost of obtaining such a cover are too high. Such protection gaps need to be identified as early as possible and solutions need to be found to understand and address their drivers. Growing climate protection gaps might increase the vulnerability of society and the economy. Governmental actions may be needed to provide adequate stability and underwriting capacity to the insurance market (e.g., setting up state-backed insurance solutions or mandating coverage for certain risks).

In Europe for example, EIOPA has started a programme to identify and manage climate protection gaps [4]. The ultimate objectives of this programme include:

1. Understanding drivers for existing protection gaps
2. Analysing measures for mitigating gaps:
• Reducing vulnerabilities;
• Identifying proactive prevention measures; and
• Improving cross-border cooperation.

3. Understanding possibilities to establish public–private partnerships or public schemes and private protection to close such gaps.

In the context of new regulatory and governmental solutions for solving the future climate protection gap issue, actuaries will be needed to analyse current and future risks and find adequate structures to provide sufficient cover for society and economy in the years to come. Like with sustainable products and services, the complexity of the issues that need to be tackled for such solutions is extremely high and, again, finding a suitable solution will involve all the areas and stakeholders mentioned above.

5 Conclusion

Managing the risks associated with the climate crisis will require global solutions, and the financial system has an important role to play. Actuaries should cooperate globally in this field to ensure that there are no inconsistencies or local regulatory loopholes that can be exploited by market participants optimising only their individual and short-term earnings. Actuaries can notably support the creation of new accounting and valuation approaches (incorporating for instance the pricing of carbon emissions and other environmental externalities linked to biodiversity), as well as the development of adequate disclosure frameworks to help make any remaining loopholes more transparent.

To cover all the aspects above, actuaries involved in assessing sustainability risks or developing sustainable products and services will need to apply new forward-looking techniques. They will have a broader group of stakeholders to consider and will need to cope with an even more quickly evolving environment than today. Developing and implementing new quantitative approaches for valuation and pricing (incorporating notably the latest advances in climate science from the Intergovernmental Panel on Climate Change, the International Energy Agency and the Network for the Greening of the Financial System) is a topic that should play to the modelling strengths of the actuarial profession. Building a network with other groups of experts and including new stakeholders in their considerations might take more time, so actuaries must start expanding their perspective right now.

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