Institute and Faculty of Actuaries

L-RISK Climate Risk RoundTable
Leuven University, 7 June 2019

Climate Risk for the Insurance Sector

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Institute and Faculty of Actuaries

My background

- 28 years working in the London insurance market
- Fellow of the Institute & Faculty of Actuaries (IFoA)
- Senior pricing actuary for Great Lakes Insurance SE, a wholly owned subsidiary of Munich Re.

Environment-related roles:

- 2009-12 Chair of the IFoA's Environment Research Group
- 2013-15 Chair of the IFoA's Resource & Environment Board
- 2012-14 Chaired the International Actuarial Association's (IAA) Resource & Environment Working Group
- 2014- Member of the IFoA's Research and Thought Leadership Board
- 2017- Member of the Advisory Committee for the Centre for the Understanding of Sustainable Prosperity's (CUSP)

Climate Risk for the Insurance Sector

1. **Risks to the insurance sector from climate change**
2. An insurance actuary's view of global climate change risk
3. The IFoA's investigation of economics

Categories of Climate Change Risks to the Insurance Sector

Can be divided into 3 broad areas*:

1. Physical Risks
2. Transition Risks
3. Liability Risks

- Another way to categorise risks is whether their main impact is on their assets or liabilities.

*From “The Impact of Climate Change on the UK Insurance Sector” Prudential Regulation Authority, September 2015

Physical Risks

- **Droughts and heatwaves.** An increase in the frequency and severity of heatwaves could lead to an increase in damage to infrastructure and the associated business interruption.
- **Heavy rainfall and flooding.** A warmer atmosphere will hold more moisture, which will increase the frequency of extreme precipitation events and associated flooding.
- **Tropical cyclone surge and flooding.** As temperatures rise, glacial ice melts, which raises sea levels and increases the surge risk to coastal properties. E.g, Lloyd's of London estimated that a 20cm rise in sea level increased storm surge losses in New York by 30%, when Hurricane Sandy struck the city in 2012 (Lloyd's, 2014).
- **Extra-Tropical Windstorms**. More energy increases severity of windstorms.
- **Freeze.** Whilst freeze events may be expected to reduce in frequency and severity for many parts of the world, changing climate patterns may introduce more extreme freeze events in some localities.

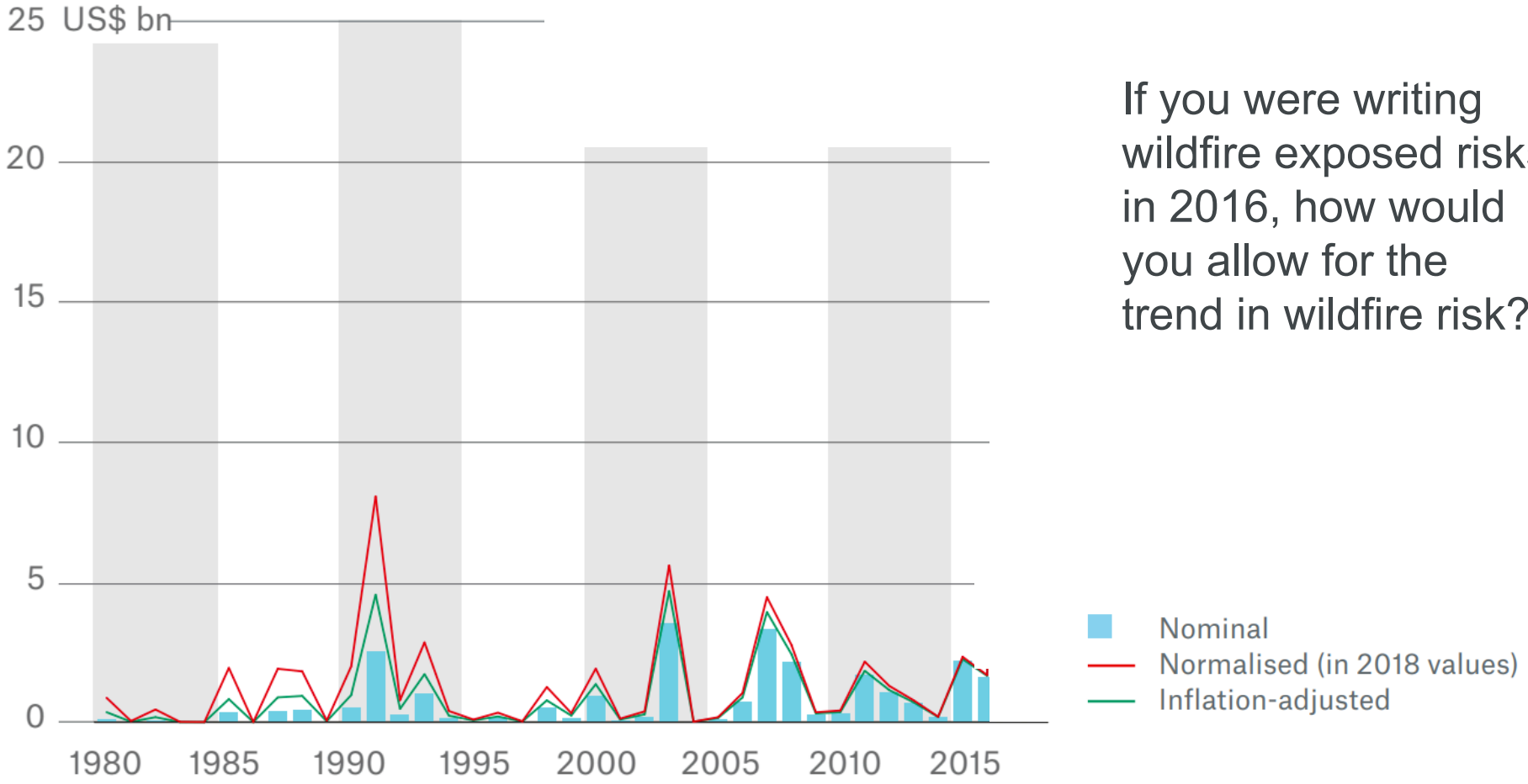
Physical Risks

- Most non-life insurance contracts are 1 year. So can be repriced quickly if risk changes.
- But changing physical risks means that the past is less of a guide to the future.
- This undercuts the insurance business model.

Example of a physical risk - Wildfire

Example: Wildfire

Overall losses from US Wildfires 1980-2016

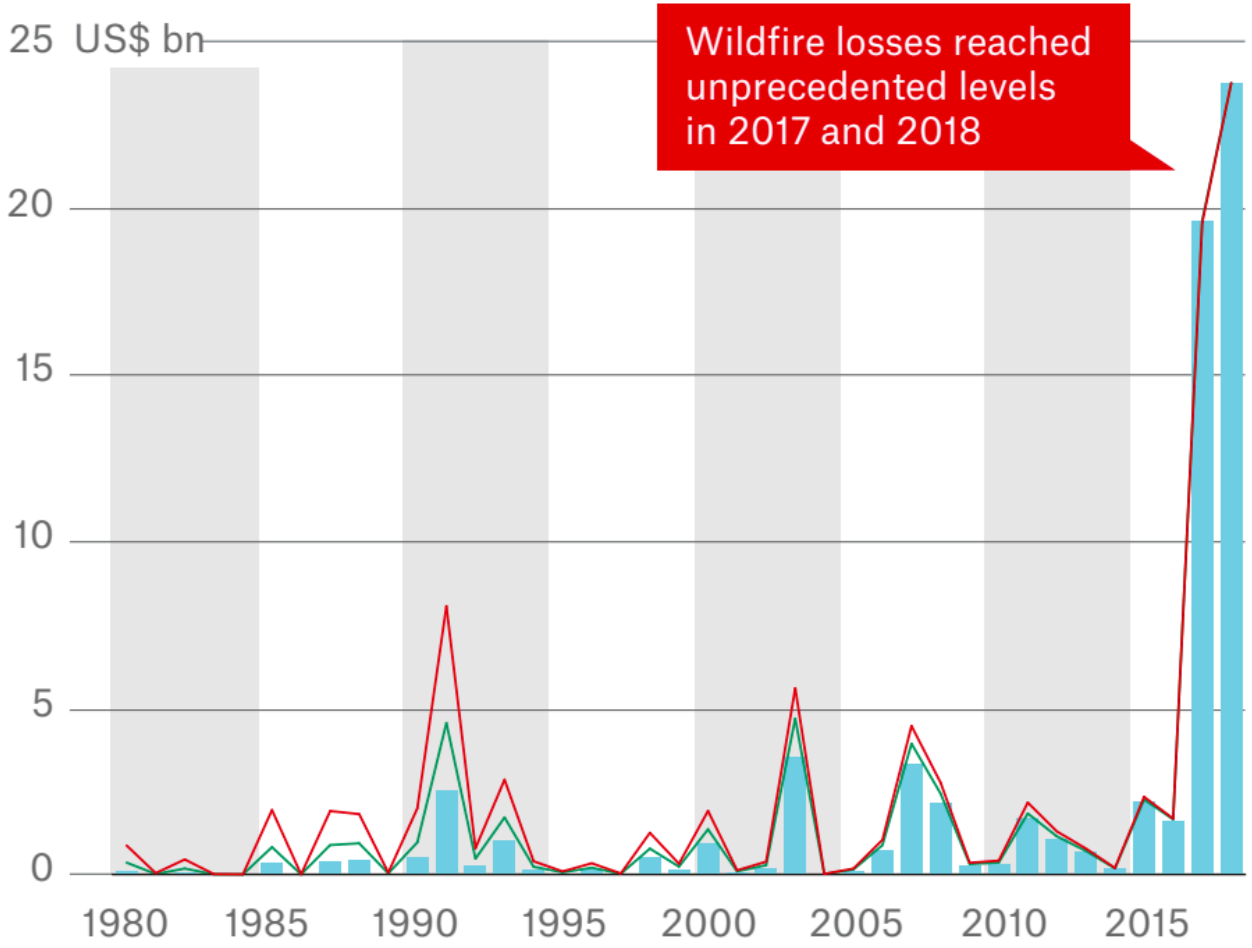


If you were writing wildfire exposed risks in 2016, how would you allow for the trend in wildfire risk?

Source: Munich Re NatCatSERVICE quoted in Munich Re Whitepaper Wildfire and Climate Change 02/04/2019

Example: Wildfire

Overall losses from US Wildfires 1980-2018

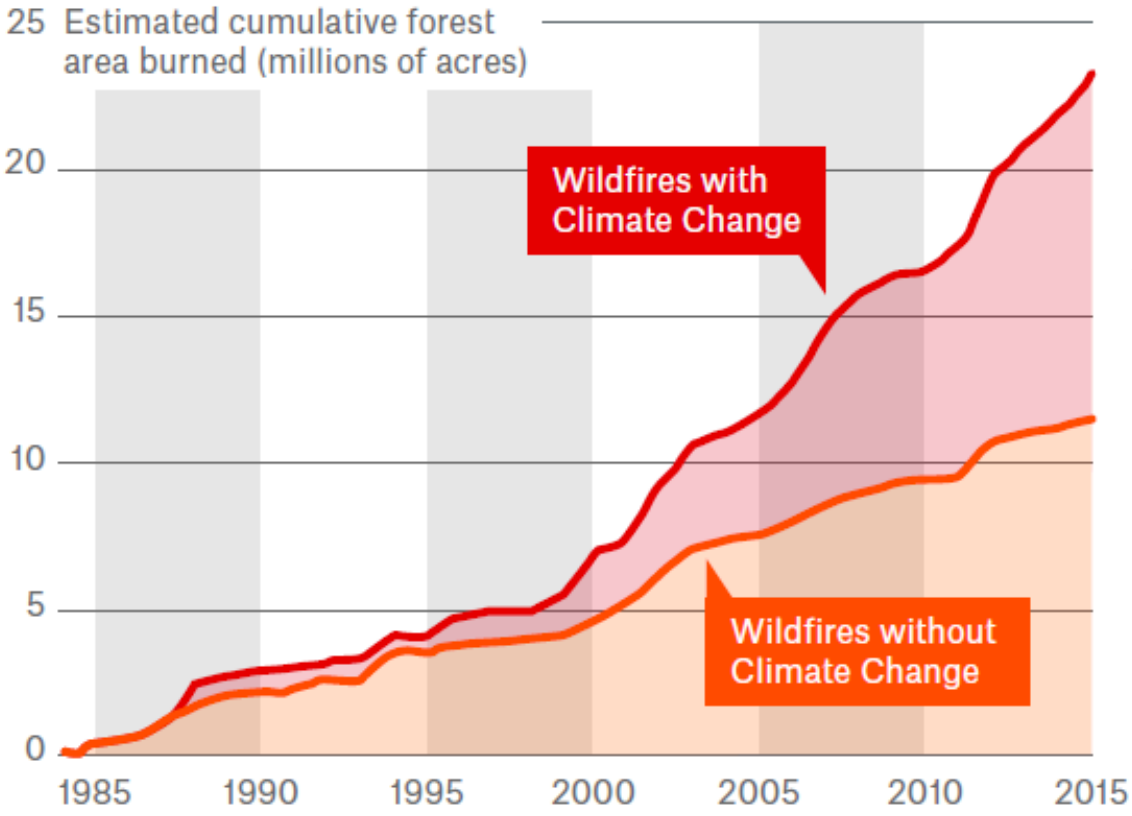


- This does not mean that average annual wildfire loss has jumped to >$20bn.
- However, the risk environment has changed.

Source: Munich Re NatCatSERVICE quoted in Munich Re Whitepaper Wildfire and Climate Change 02/04/2019

Impact of Climate Change on Wildfire

Area burned in the Western United States since 1984



Source: Abatzoglou/Williams 2016, PNAS 113

"Climate trends also show an increase in wildfire hazard, which is arguably higher now than it ever was in the 20th century." And as the state's Climate continues to change, California will experience a further worsening of these conditions in the medium term."

Source: Munich Re Whitepaper Wildfire and Climate Change 02/04/2019

Transition Risks

- *"The financial risks which could arise for insurance firms from the transition to a lower-carbon economy.* ***For insurance firms, this risk factor is mainly about the potential re-pricing of carbon-intensive financial assets, and the speed at which any such re-pricing might occur****. To a lesser extent, insurers may also need to adapt to potential impacts on the liability side resulting from reductions in insurance premiums in carbon-intensive sectors."* [my emphasis]

(UK Prudential Regulation Authority, 2015)

Transition Risk

- This is mainly a risk on the asset side
- Non-life insurance companies hold most of their assets in liquid investments such as government bonds and cash.
- Life insurers hold more equities and corporate bonds. These are more susceptible to transition risk.

Example of transition risk: Stranded carbon assets

Carbon Tracker Initiative

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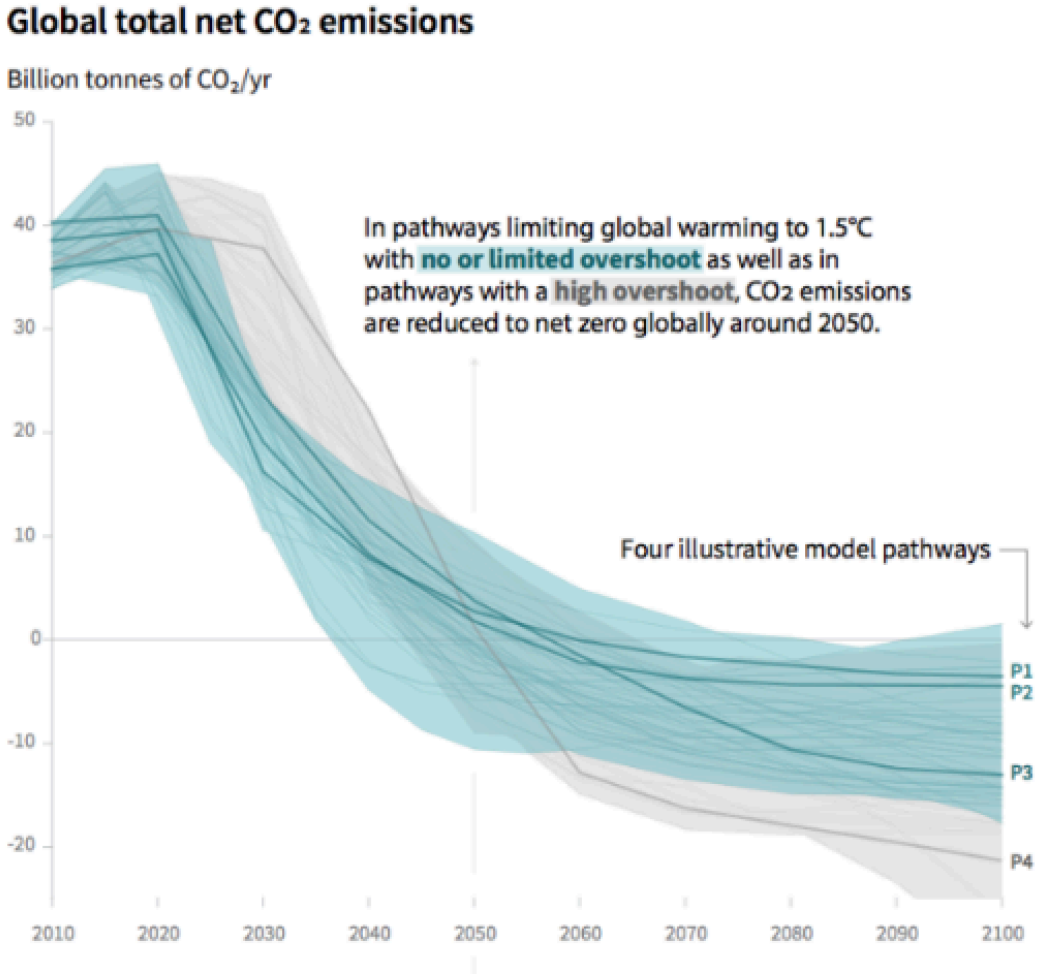
Emissions pathways to keep under 1.5°C warming



- Given the extreme rapidity of decarbonisation needed to stay under 1.5C warming, high carbon firms are exposed to a sudden transition if the world moves more quickly.
- Can the carbon assets currently valued all be used, or will they be stranded?

Source: 2018 IPCC Special Report on Global Warming of 1.5°C

Liability Risks

Liability risks: risks that could arise for insurance firms from parties who have suffered loss and (iii)damage from climate change, and then seek to recover losses from others who they believe may have been responsible. Where such claims are successful, **those parties against whom the claims are made may seek to pass on some or all of the cost to insurance firms under third-party liability contracts** such as professional indemnity or directors' and officers' insurance. [my emphasis]

(UK Prudential Regulation Authority, 2015)

A short history of US liability insurance (and impact on the London Insurance Market)

- 1940s/50s Chemical companies dumped waste with little restriction e.g. E.g. the Love Canal in Niagra Falls, New York State

A short history of US liability insurance (and impact on the London Insurance Market)

- 1960s First pictures of Earth from space; birth of the environmental movement.

A short history of US liability insurance (and impact on the London Insurance Market)

- Asbestos and pollution were not seen as major issues until the 1960s/70s.
- Societal attitudes shifted. Richard Nixon created the Environmental Protection Agency in December 1970.
- 1980 - Superfund Act passed (Comprehensive Environmental Response, Compensation, and Liability Act; CERCLA). Enabled people to claim against responsible parties for cleanup costs.
- 1980s/90s - Asbestos, pollution and health hazard (APH) claims accumulated in the London insurance market. Nearly destroyed Lloyd's of London.

Conclusion

- Legal systems reflect societal norms. If society changes, the law changes (criminal and civil).
- This can create liability where none existed before.
- Insurance can pick up the bill.

Is there evidence for a shift in societal attitude to climate change?

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UK Parliament declares climate change emergency

1 May 2019 Share

In the UK recently – yes.

May 2019 – Extinction Rebellion founder cleared by jury of criminal damage

Roger Hallam argued the damage was a proportional response to the threat of climate breakdown *(PA)*

- Roger Hallam had spray painted the walls of Kings College London to protest against them accepting money from fossil fuel companies.
- He was prosecuted for criminal damage.
- His defence was that his action prevented a greater damage from climate change. He described this to the jury.
- The judge directed the jury to convict him, saying his defence was irrelevant.
- The jury unanimously found him not guilty.
- (Kings College have now divested from fossil fuels.)

The IFoA's Environmental Activities

- Resource & Environment Board, one of 7 practice boards, active since 2013
- Commissioned research into physical limits to growth
- Climate change working parties
- Practical guide to climate change for pensions actuaries
- Practical Guides for Life insurance & General insurance to be published soon
- Further research on economics is being carried out now

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Insurance companies have a duty to protect themselves against accumulation risk from extreme events

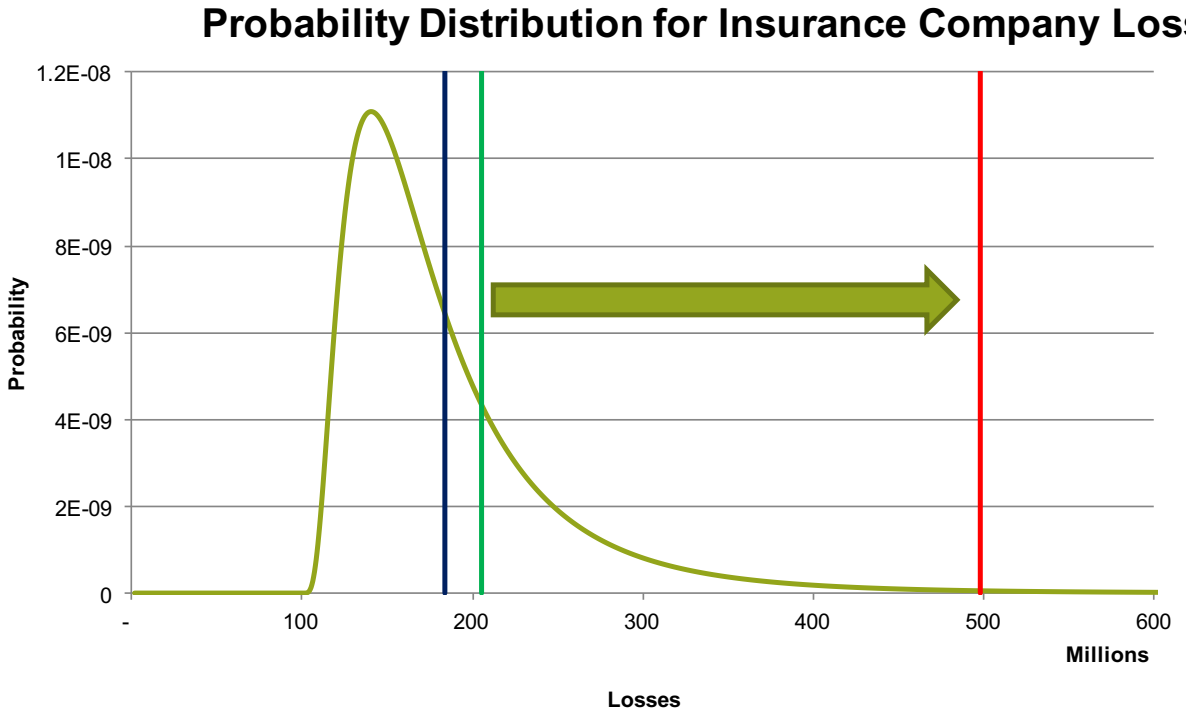
e.g. Man made catastrophes

Hurricanes

Wildfires

Solvency II regulation requires companies to hold sufficient capital so that they are protected from ruin (insolvency) at a **1 in 200 year level**.

Regulation of Insurance Companies under Solvency II
What does the 1 in 200 year level look like?



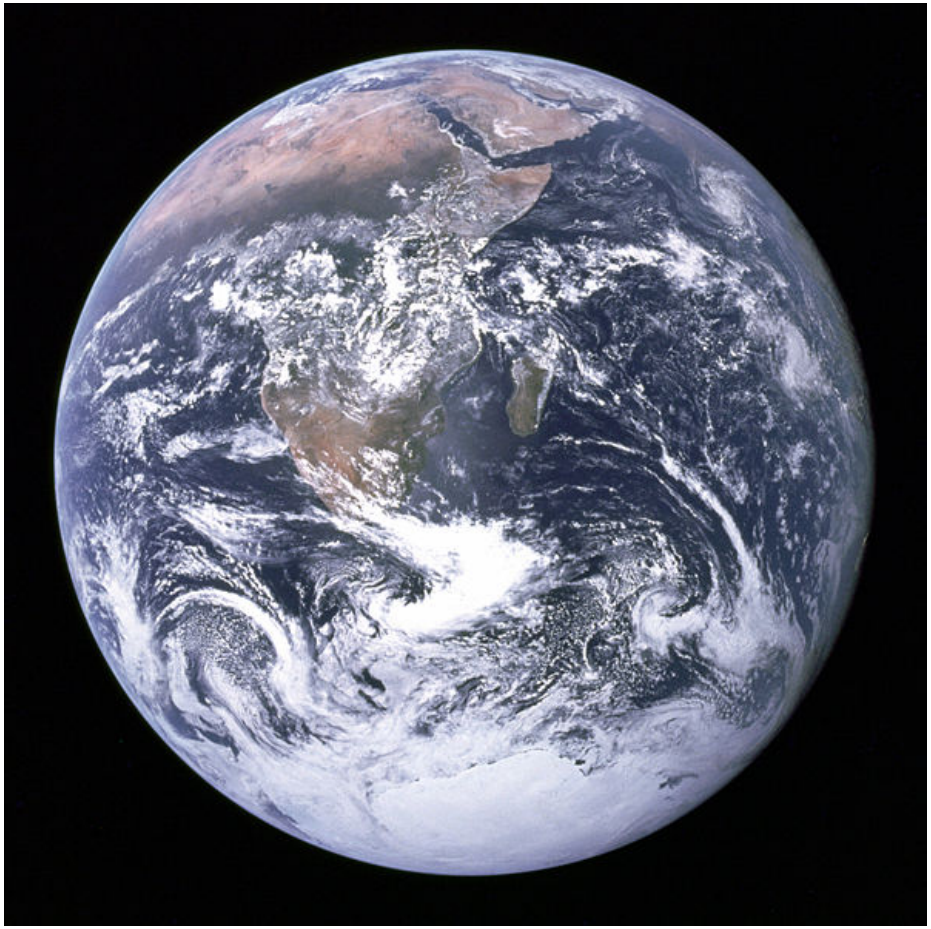
- Insurance companies must hold capital so that they are protected from insolvency from any amount of claims, up to the size that would occur 1 in 200 years.
- Time horizon is one year.
- Insolvency is defined as excess of liabilities over assets i.e. the company is ruined.

The values on this chart are all hypothetical, but they are to scale for this probability distribution.

1 in 200 years is very remote!

Applying the capital modelling view to the world

- Capital modelling for insurance companies is part of the regulatory regime to protect policyholders.
- The regulatory regime for climate change should be designed to protect citizens.
- It would be strange if the level of protection of policyholders against insurance company failure was higher than the protection of society from climate change.



What is the risk of global climate ruin?

Climatic Change (2017) 140:109–118
DOI 10.1007/s10584-016-1846-3

ESSAY

The risk of climate ruin

Oliver D. Bettis[1] · Simon Dietz[2] · Nick G. Silver[1]

Received: 13 April 2016 / Accepted: 21 October 2016 / Published online: 19 November 2016

Abstract
How large a risk is society prepared to run with the climate system? This is a question of the utmost difficulty and it admits a variety of perspectives. In this paper we draw an analogy with the management and regulation of insurance companies, which are required to hold capital against the risk of their own financial ruin. Accordingly, we suggest that discussions about how much to reduce global emissions of greenhouse gases could be framed in terms of managing the risk of 'climate ruin'. This shifts the focus towards deciding upon an acceptable risk of the very worst-case scenario, and away from how "avoiding dangerous anthropogenic interference with the climate system" has come to be framed politically. Moreover it leads to the conclusion that, in terms of greenhouse gas emissions today and in the future, the world is running a higher risk with the climate system than insurance companies run with their own solvency.

What is a “climate ruin” scenario?

Source:
http://climatechange.worldbank.org/sites/default/files/Turn_Down_the_heat_Why_a_4_degree_centrigrade_warmer_world_must_be_avoided.pdf

- Given uncertainty about the full nature and scale of impacts, there is no certainty that adaptation to a 4°C world is possible.
- Given current trends, 4°C or more of global average temperature rise is not very unlikely.

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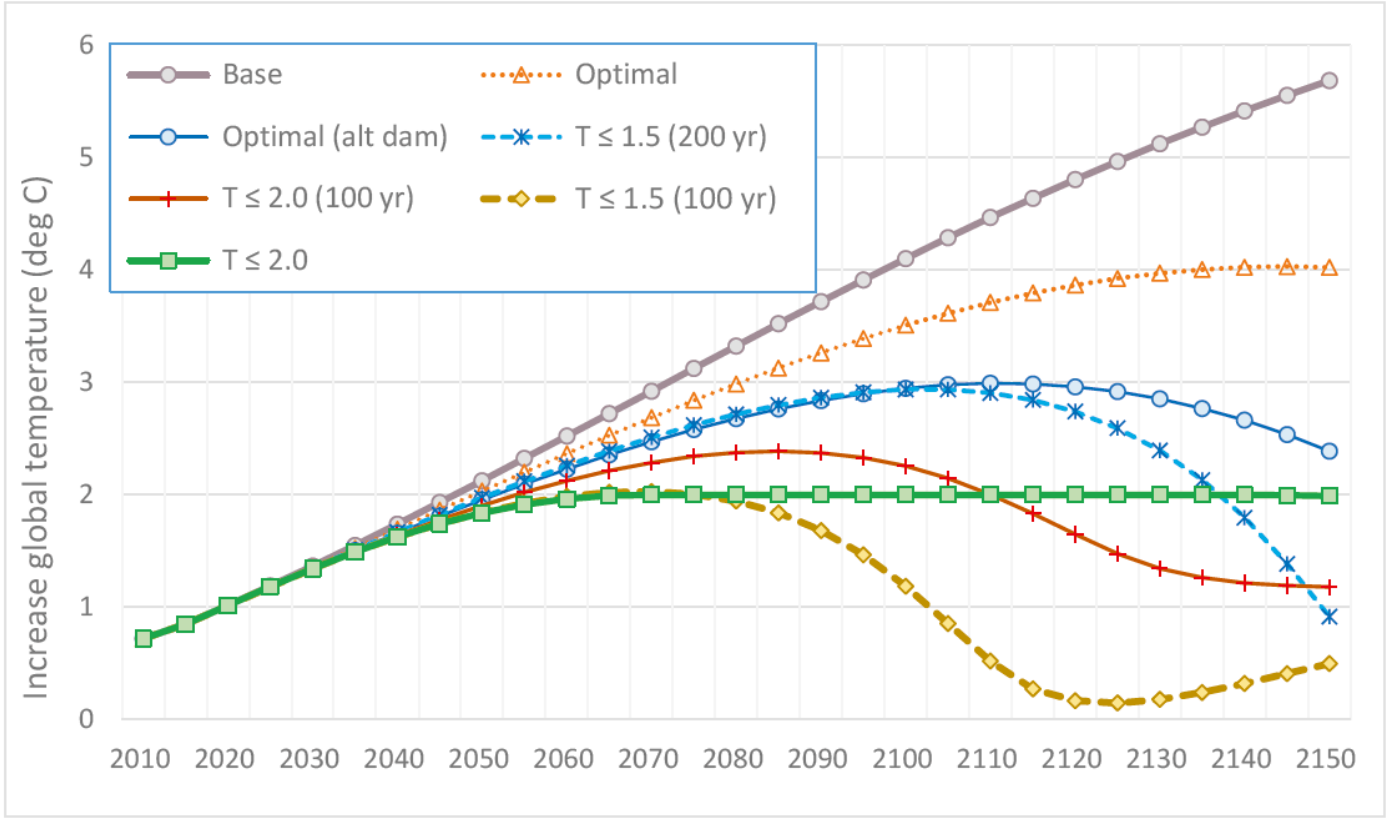
Climate change is an economic issue

- The primary cause of greenhouse gas emissions is the economy.
- More rapid economic growth generates more carbon emissions.
- Decarbonising the economy reduces emissions. This has a benefit of reducing damage from climate change damage, and in the short term, also a cost which partially offsets the benefit.
- Some economists have looked at costs versus benefits of climate change mitigation.

Example of a climate change economic model output



- In 2018 William Nordhaus won the prize for Economics in memorium of Alfred Nobel.
- He won it for his work on climate change economics.
- His DICE model compares costs vs benefits of climate change mitigation

Source: "Climate Change:The Ultimate Challenge for Economics" William D. Nordhaus, Yale University Nobel Lecture in Economic Sciences, 8th December 2018

Economic Models vs IPCC recommendation

- Nordhaus's model ('DICE') suggests that 4°C warming could be the "optimal" level, where benefits most exceed costs.
- In 2018 the IPCC reduced their recommended safe limit for warming from 2°C to 1.5°C.
- Others, e.g. report for the World Bank, have suggested that 4°C warming could destroy the global economy.

?

Economics today

- Many have noticed issues with economics, particularly since the 2008 financial crisis. E.g. two Nobel prize winning economists:
- Paul Romer "*For more than three decades, macroeconomics has gone backwards.*". He is critiquing rational expectations, which is a key foundation of financial economics.

https://paulromer.net/the-trouble-with-macro/

- Joseph Stiglitz has called for a revolution in economics comparable to the change from the Ptolemaic to Copernican view of the universe.

Some of the groups investing economics

The following organisations/initiatives have sprung up since 2008

- Institute for New Economic Thinking
- OECD New Approaches for Economic Challenges
- ESRC Rebuilding Macroeconomics Network Plus
- Rethinking Economics
- Promoting Economic Pluralism
- Prime Economics

What research is the IFoA doing in economics?

- "On Economic Thought and Actuarial Practice" a survey of the actuarial profession's use of economic theory - will be published soon.
- *"…now I think they [actuaries] know almost too much about economics, in the sense that, as it seems to me, they've taken a whole pile of stuff from financial economics on board, as if it were kind of some established truth..."* John Kay
- We are commissioning a review and analysis on methods to better estimate long-term investment returns.
- We are scoping for a larger research project on this topic of long-term investment returns.

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Questions or comments?

The views expressed in this presentation are those of the presenter.