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Climate Scenario Analysis

Chair: Louise Pryor



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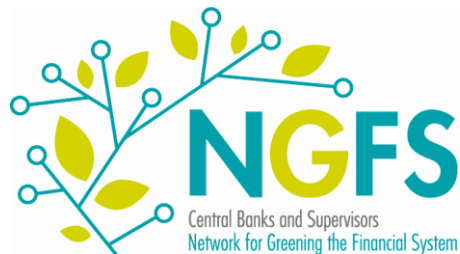
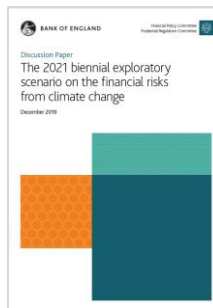
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Introduction

Claire Jones

29 May 2020

Climate change is a material, systemic financial risk. Scenario analysis is an important tool to study it.



“Given the importance of forward-looking assessments of climate-related risk, the Task Force believes that scenario analysis is an important and useful tool”

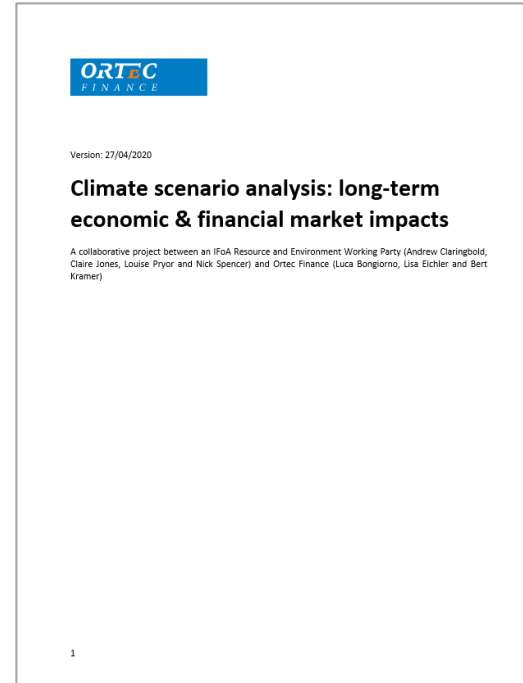
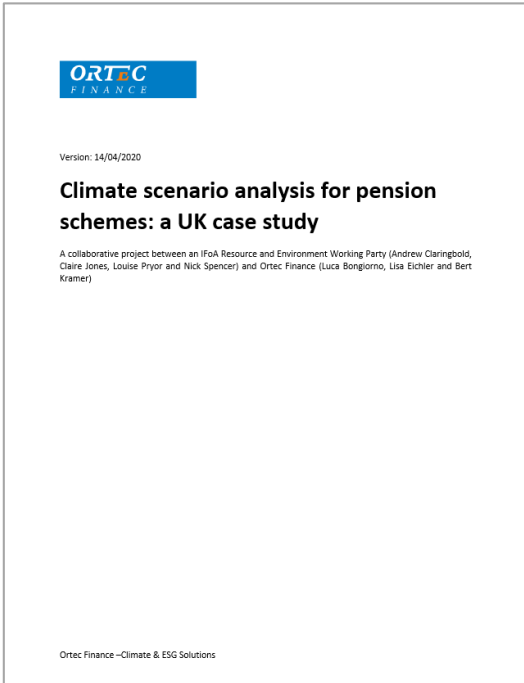


Technical supplement: The use of scenario analysis in disclosure of climate-related risks and opportunities, June 2017



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Two papers to help actuaries and others



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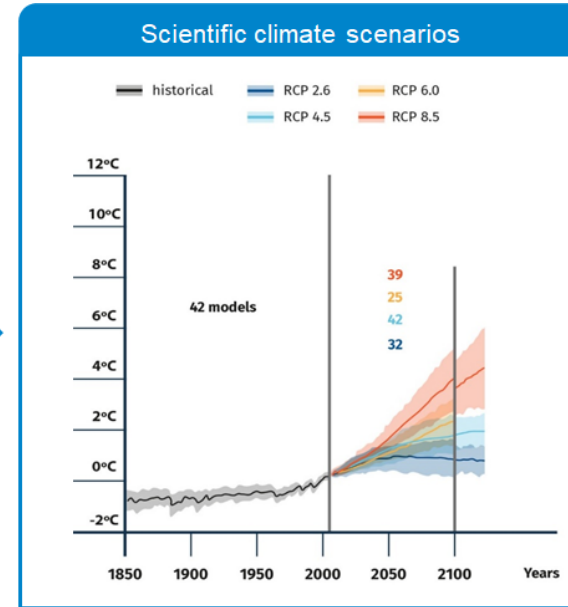
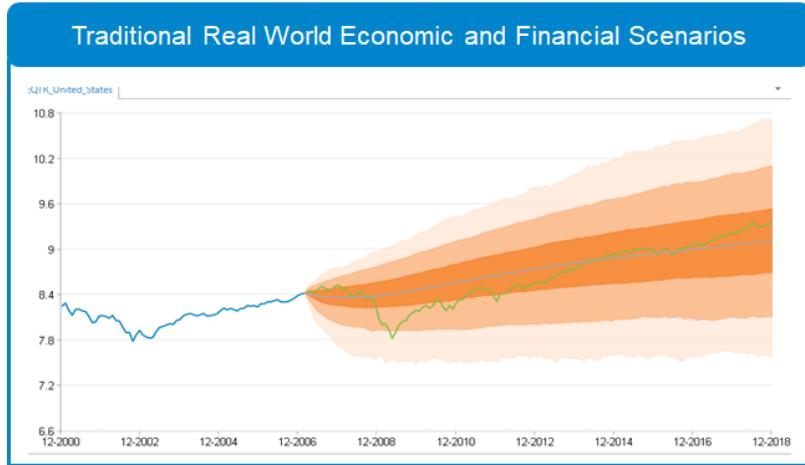
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Model overview

Lisa Eichler

29 May 2020

Combining financial- and climate scenario analysis

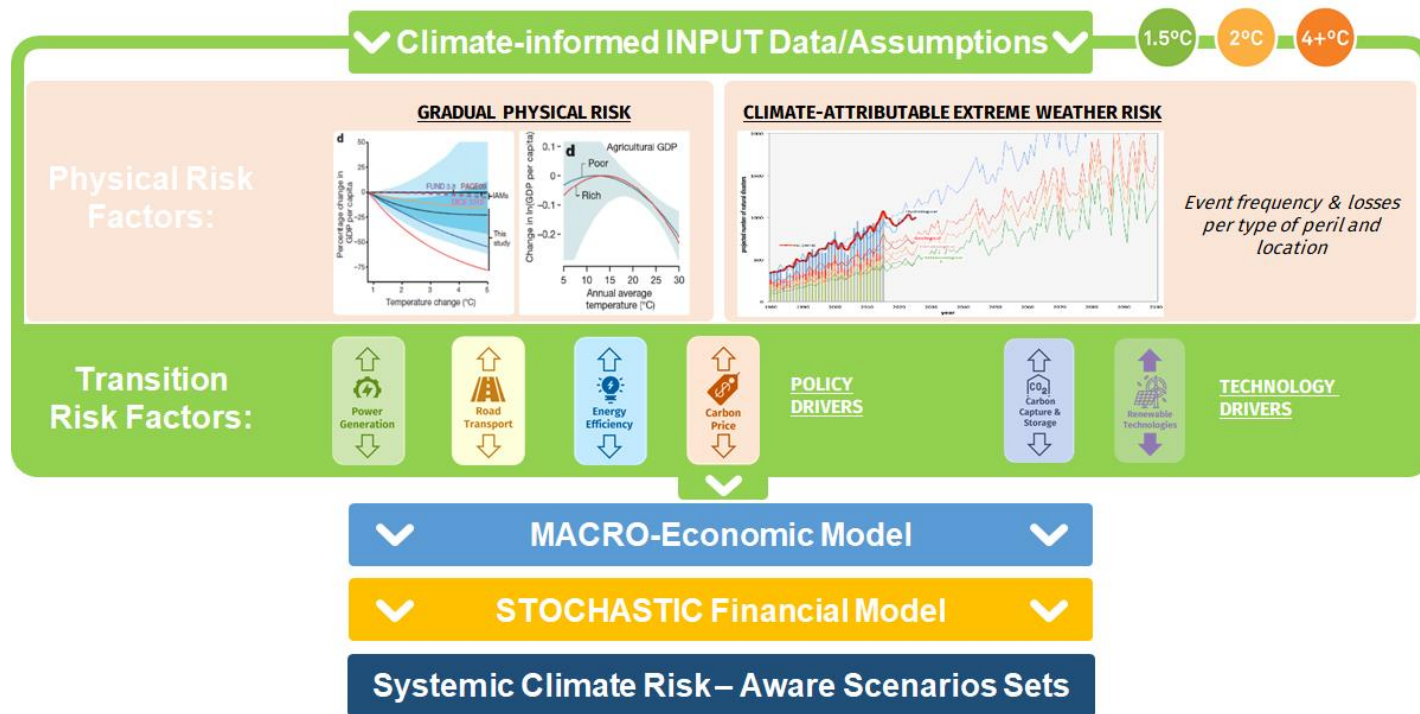


Source: Ortac Finance, 31 March 2020



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Integrating climate risk into financial scenarios



Source: Ortec Finance, 31 March 2020



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Integrating climate risk into financial scenarios

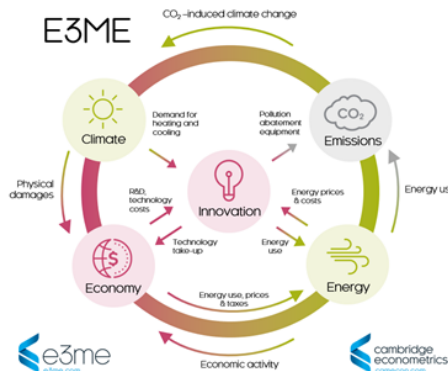
▼ Climate-informed INPUT Data/Assumptions ▼

▼ MACRO-Economic Model ▼

1.5°C

2°C

4+°C



Per country/sector

Climate-informed GDP/output shocks

Per year



STOCHASTIC Financial Model



Systemic Climate Risk – Aware Scenarios Sets

Source: Ortec Finance, 31 March 2020



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Integrating climate risk into financial scenarios

✓ Climate-informed INPUT Data/Assumptions ✓

✓ Macroeconomic Model ✓

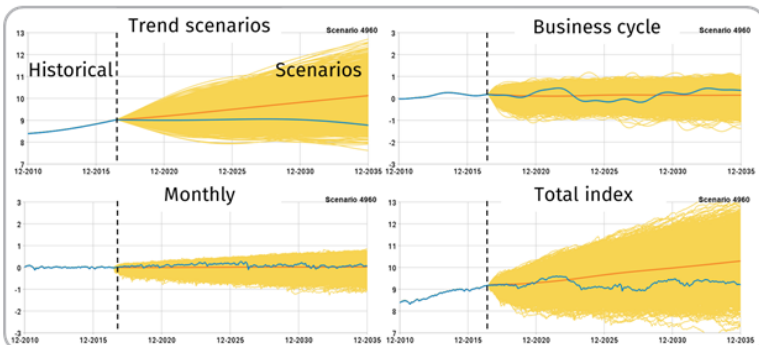
✓ Stochastic Financial Model ✓

1.5°C

2°C

4+°C

An Economic Scenario Generator (ESG) Model



Translates climate-adjusted GDP expectations over time to 600+ financial and economic variables via stylized facts based on historic relations. Per country/sector, per year.

Trend Scenarios
(8 year steps)

Business Cycle
(yearly/ monthly)

Orderly transition impacts

Gradual physical impacts

Extreme weather impacts

Disorderly sentiment shock

Pricing-in dynamics – transition

Pricing-in dynamics – physical risk

Systemic Climate Risk – Aware Scenarios Sets

Source: Ortec Finance, 31 March 2020



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Integrating climate risk into financial scenarios

✓ Climate-informed INPUT Data/Assumptions ✓

✓ Macroeconomic Model ✓

✓ Stochastic Financial Model ✓

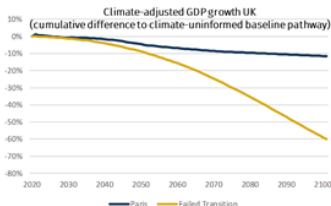
✓ Systemic Climate Risk – Aware Scenarios Sets ✓

1.5°C 2°C 4+°C

Model OUTPUT = climate-adjusted growth expectations & pricing-in dynamics up to 2060 (annual timesteps) for ...

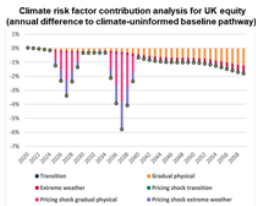
1. Economic variables

- ✓ GDP
- ✓ Inflation
- ✓ Interest Rates



2. Asset Classes

- ✓ Fixed Income
- ✓ Corporate Credit
- ✓ Equities
- ✓ Real Assets
- ✓ Alternatives
- ✓ Commodities
- ✓ Currencies



3. Sectors

- ✓ Energy
- ✓ Consumer Discretionary
- ✓ Consumer Staples
- ✓ Financials
- ✓ Health
- ✓ Industrials
- ✓ IT
- ✓ Materials
- ✓ Real Estate
- ✓ Telecom
- ✓ Utilities (low carbon/other)

Sector/Region Heatmap: cumulative return (diff. to baseline) – Public equities

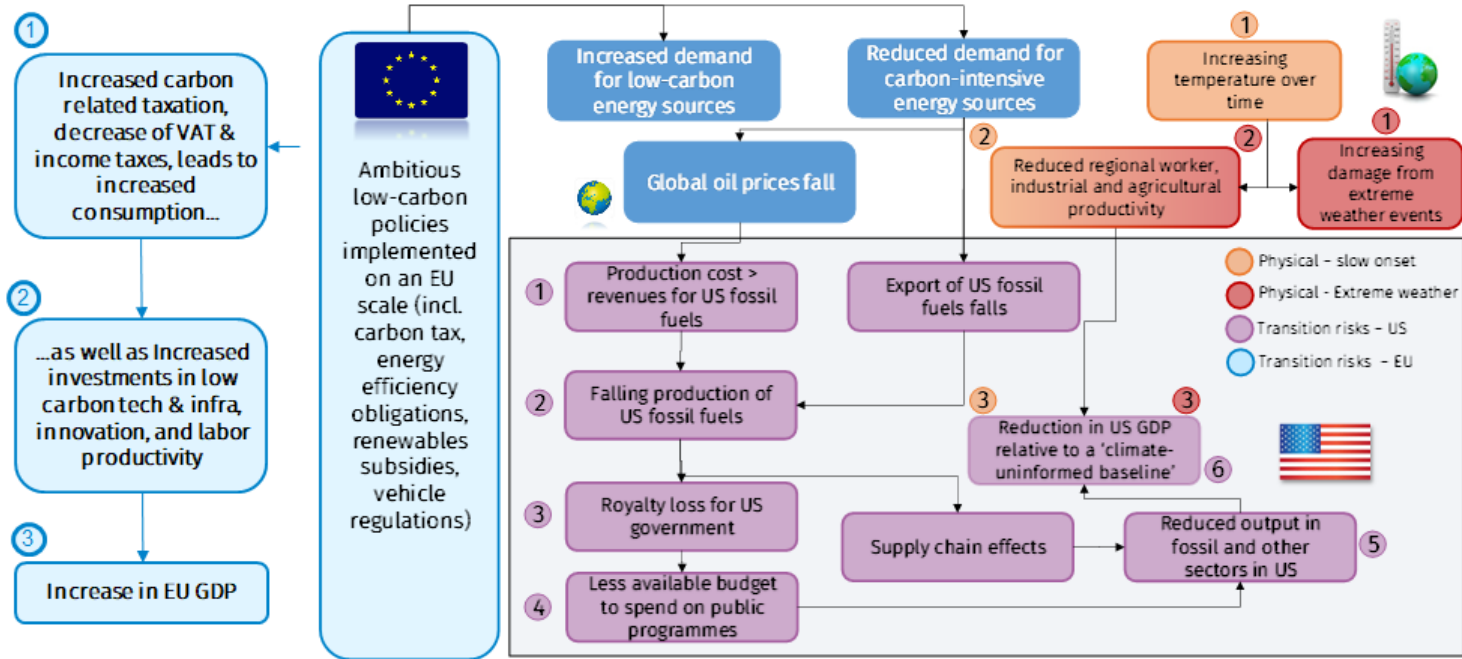
	SYR	Total	Cons Staples	Industrials	Telecom	Energy	IT	Materials	Health	Real Estate	Other utilities	Cons Disc	Low carbon electricity	Financials
WORLD		-8%	-8%	-7%	-6%	-17%	9%	-7%	-5%	-7%	-34%	-7%	17%	-6%
Dev Markets		-6%	-3%	-5%	-6%	-16%	5%	-5%	-4%	-6%	-21%	-5%	17%	-5%
Em Markets		-10%	-10%	-8%	-17%	-22%	9%	-8%	-10%	-9%	-47%	-7%	213%	-8%
TOP 5	Singapore													
	Sweden													
	Japan													
	Denmark													
BOTTOM 5	Switzerland													
	India													
	Indonesia													
	China													
COUNTRY	Italy													
	Canada													

Source: Ortec Finance, 31 March 2020



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Zoom-in: How do systemic climate risk factors work through the model?



Source: Ortec Finance, 31 March 2020



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Narratives at a glance

Global Warming Pathways Modeled

Paris Orderly Transition

- **Large transition impact** due to policy measures & technology drivers
- Transition is assumed to occur as smoothly as possible
- **Market pricing-in** dynamics occur smoothed out over 2020-2024 period
- **Physical impacts** occur up to 1.5/2°C which are greater than today but much less than under a Failed Transition

In line with:

Emissions ~ IPCC RCP 2.6
Median climate sensitivity
Leading to global warming
below 2°C by 2100 with a
probability of 75%

Paris Disorderly Transition

- **Large transition impact** due to policy measures & technology drivers
- Transition has disruptive effect on financial markets with **repricing** taking place in 2024 followed by a sudden **sentiment shock** and stranded assets in 2025
- **Physical impacts** occur up to 1.5/2°C which are greater than today but much less than under a Failed Transition

In line with:

Emissions ~ IPCC RCP 2.6
Median climate sensitivity
Leading to global warming below
2°C by 2100 with a probability of
75%

Failed Transition

- **Limited transition impact** because economies follow the business-as-usual track without additional new policy measures
- **Severe physical impacts** occur increasing over time as temperatures rise – both gradual physical changes such as agricultural and worker productivity, as well as more frequent and severe extreme weather events
- **Markets price in physical risks** up to 2050 by end of this decade and post-2050 physical impacts from the mid-2030s

In line with:

Emissions ~ IPCC RCP 6.0
High climate sensitivity
Leading to global warming of appr.
4°C by 2100

Timeframe:
2060 (annual timesteps)

Geographic coverage:
29 countries

Sector coverage:
11 sectors



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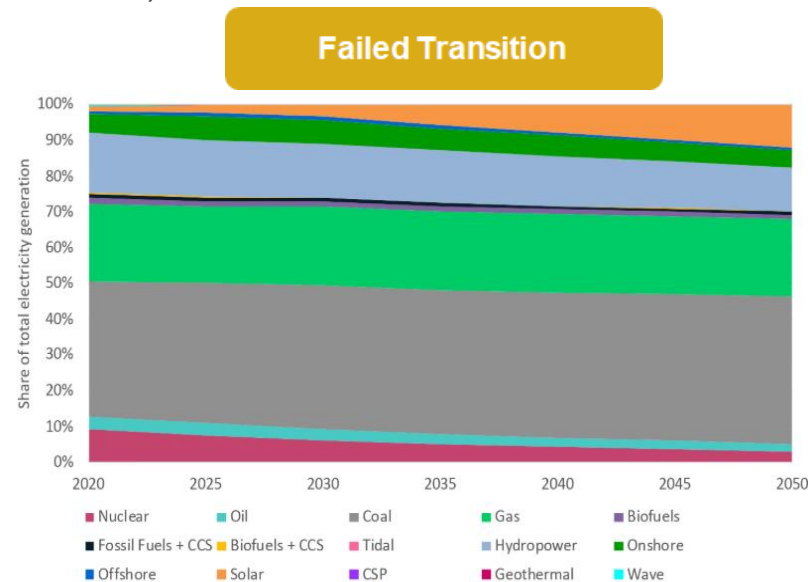
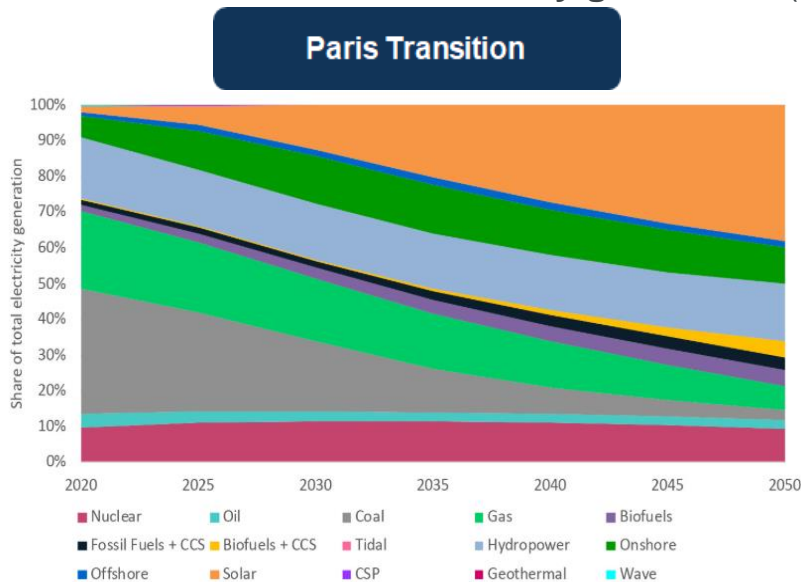
Source: Orttec Finance, 31 March 2020

What would the World look like?

Paris versus Failed Transition scenario sets

Comparison of Technology Trends

World share of electricity generation (change over time)



Source: Ortac Finance, 31 March 2020

PERITIUM

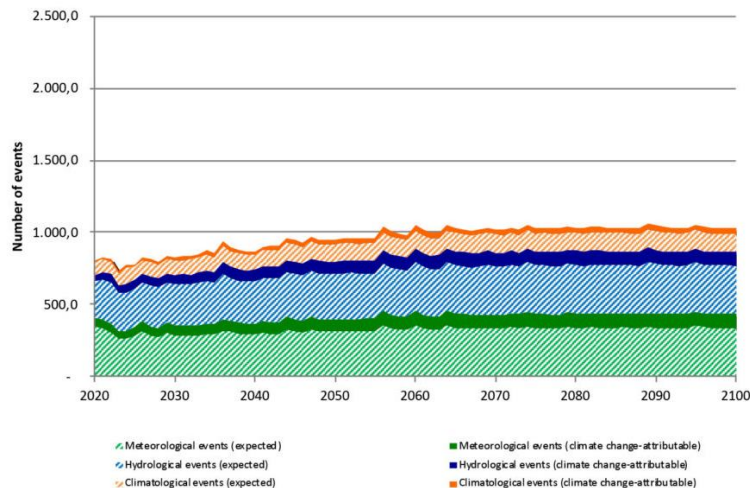
What would the World look like?

Paris versus Failed Transition scenario sets

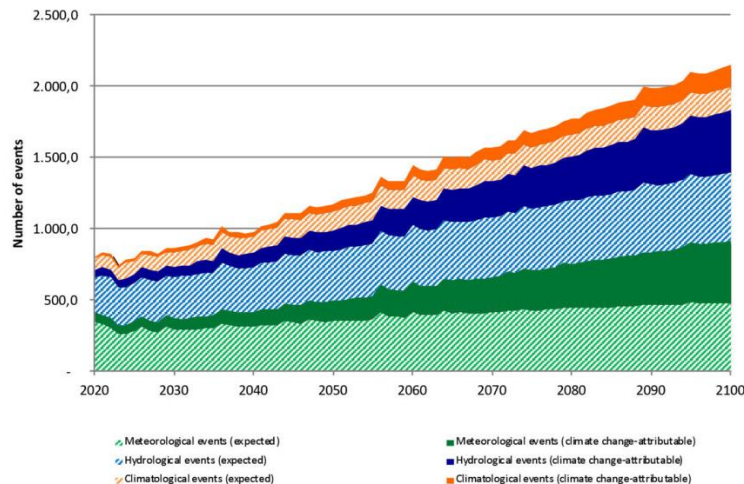
Comparison of Extreme Weather Risk Levels

☞ Total number of extreme weather events (change over time)

Paris Transition



Failed Transition



Source: Ortec Finance, 31 March 2020



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Modelling results

Nick Spencer

29 May 2020

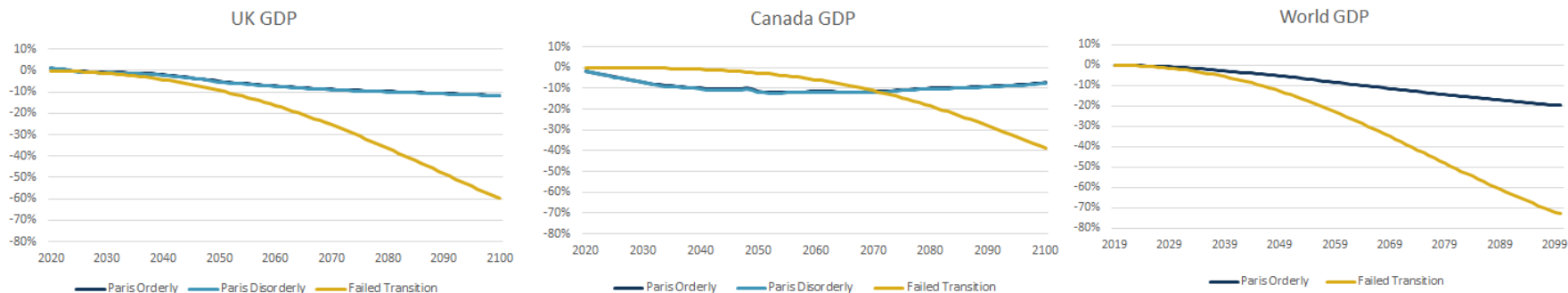
Key Features of macroeconomic & financial results

- Results are presented relative to "uninformed" baseline
 - Focuses on impact of climate pathways
 - "First-order" of macro-economic & financial assumptions drop out
- GDP projected to 2100 but Financial Markets to 2060
- Climate impacts are divided between transition, gradual physical and extreme weather
 - Plus for financial markets: the pricing shock when longer term impacts priced in
 - Plus for disorderly transition: a financial sentiment shock (and GDP shock)
- Asset classes show %return vs baseline & the impact attribution



Climate Impacts on GDP

Figure 4: Climate-adjusted GDP growth across regions and climate pathways
(cumulative difference to climate-uninformed baseline pathway)



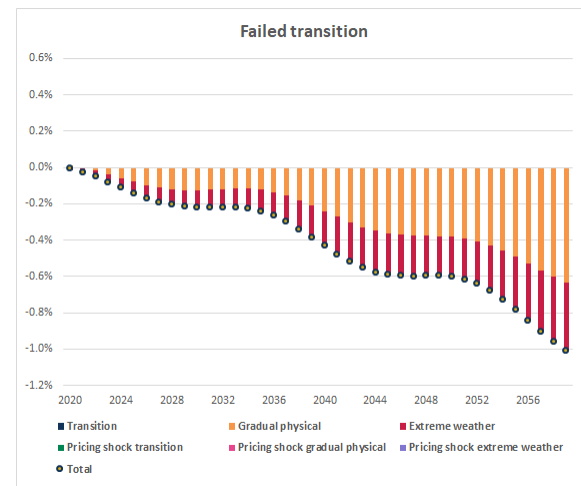
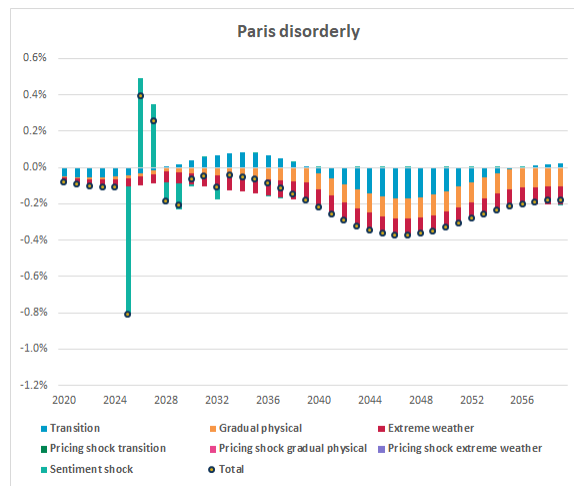
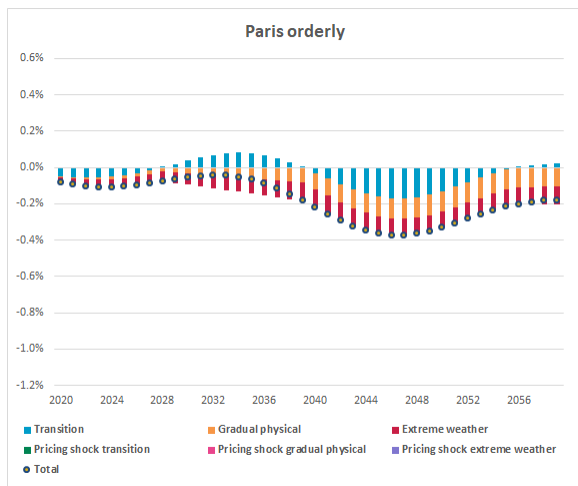
Source: Ortec Finance, 31 March 2020



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Climate Attribution: UK GDP

Figure 15: Percentage difference in the level of UK GDP explained by the various climate risk drivers (difference to climate-uninformed baseline pathway)



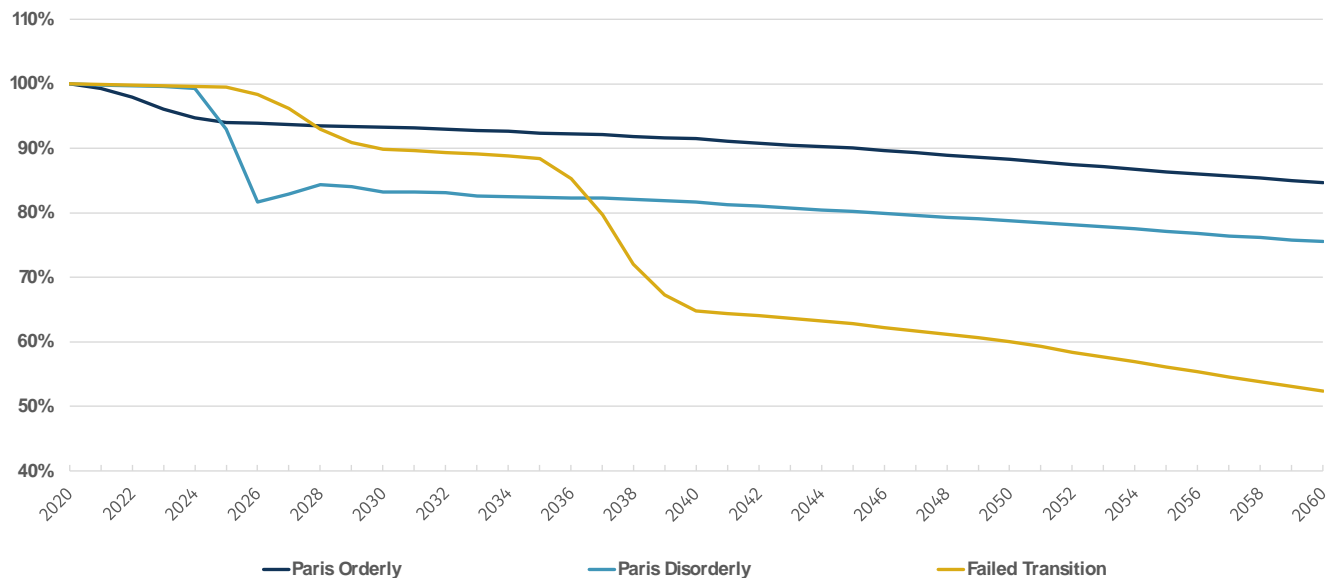
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Climate Impact on Global Equity Returns

Figure 7: Global equity return percentage difference to baseline



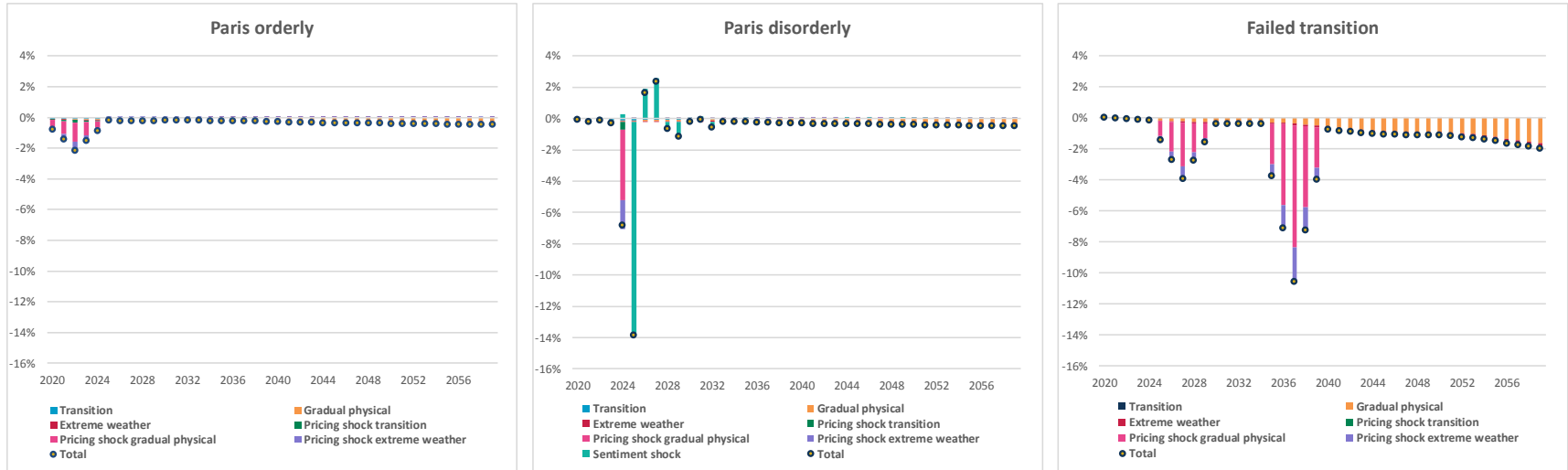
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Climate Attribution: Global Equities

Figure 8: Global equity returns (year-on-year) per climate pathway – contribution analysis by climate risk factor



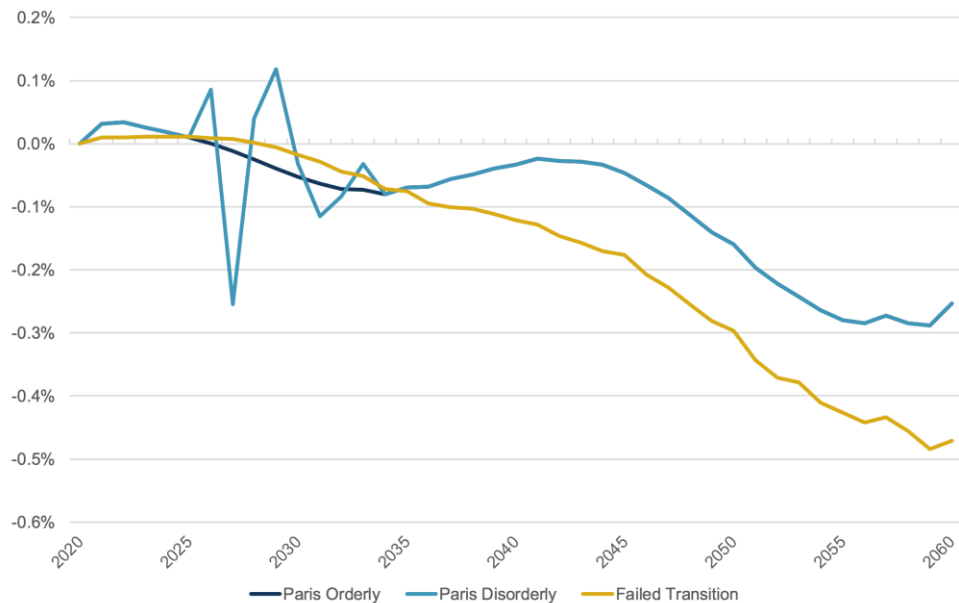
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Climate Impact on Inflation

Figure 5: Climate-adjusted CPI
(annualized difference to climate-uninformed baseline pathway)



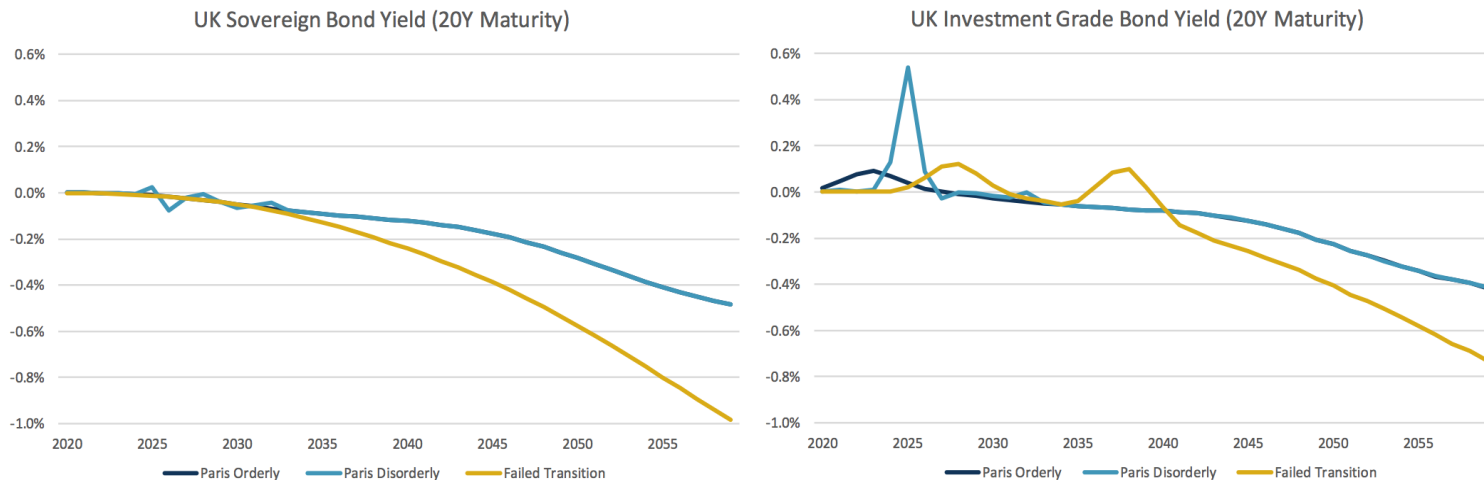
Source: Ortac Finance, 31 March 2020



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Climate Impact on Bond Yields

Figure 6: Climate-adjusted 20-year nominal yields of UK government and investment grade bonds (annualized difference to climate-uninformed baseline pathway)



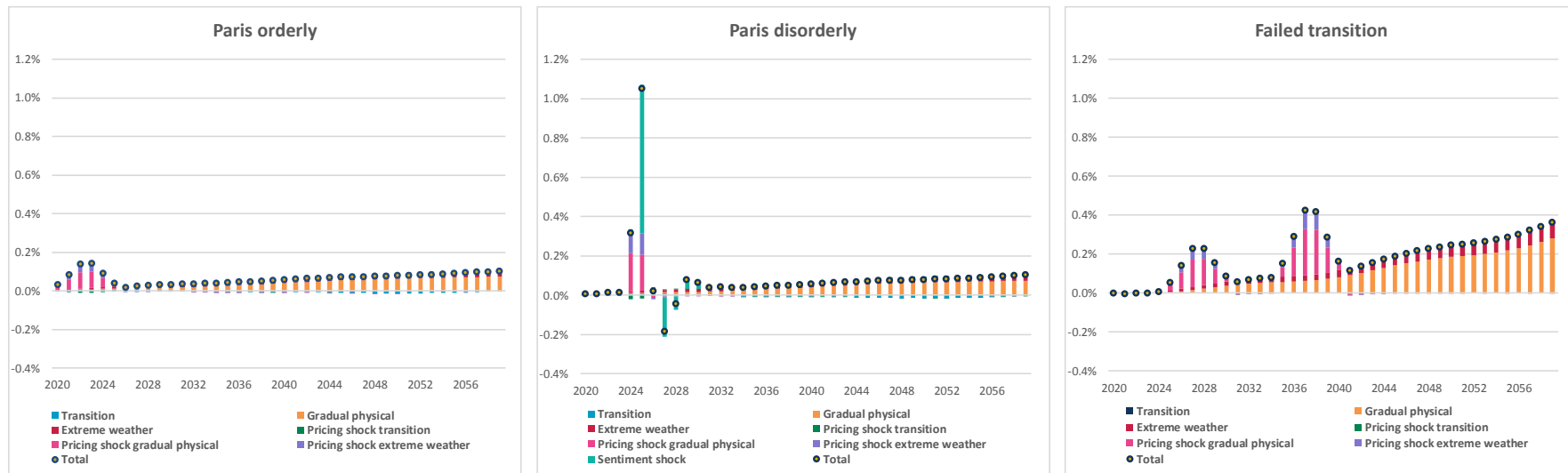
Source: Ortec Finance, 31 March 2020



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Climate Attribution: Investment Grade Bonds

Figure 24: Climate risk factor contribution analysis for UK investment grade bond spreads under all climate pathways



Source: Ortec Finance, 31 March 2020



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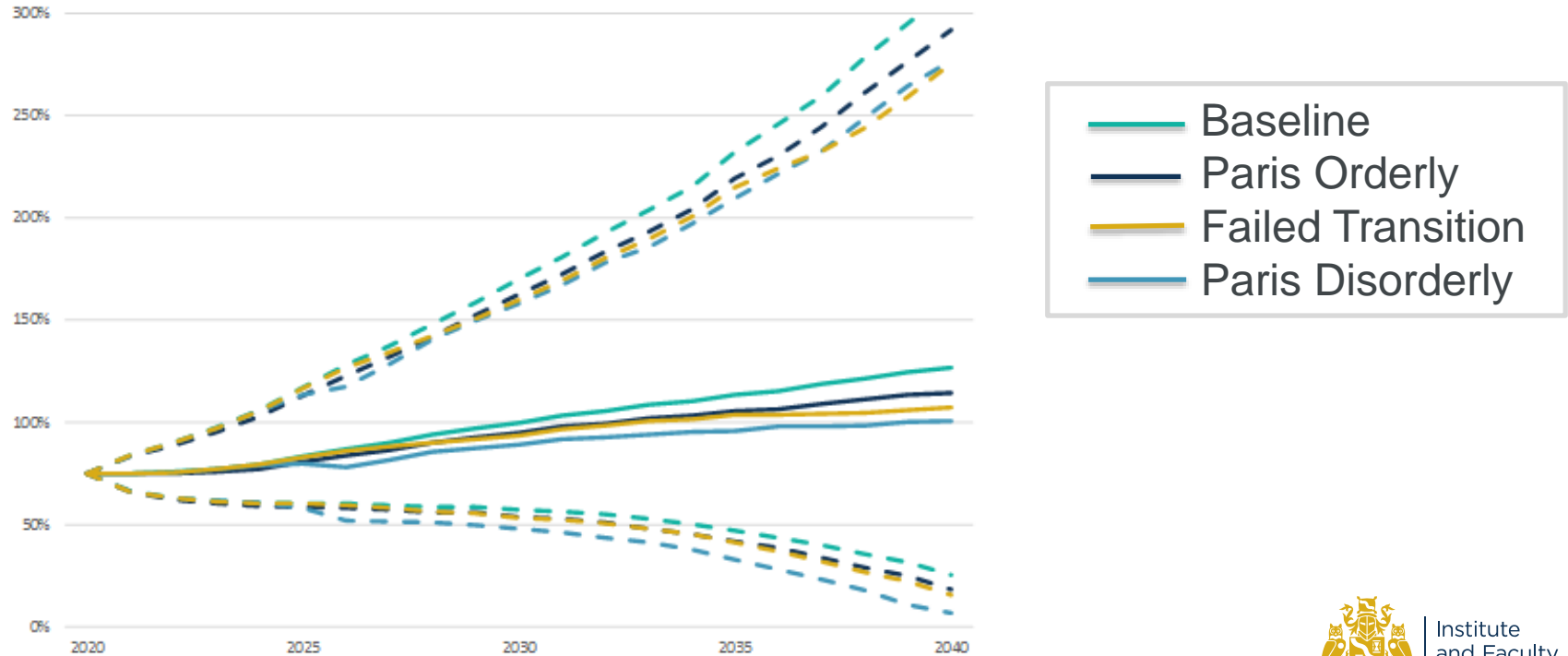
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Case study

Andrew Claringbold

29 May 2020

Funding level projections: 5th, 50th and 95th percentile outcomes

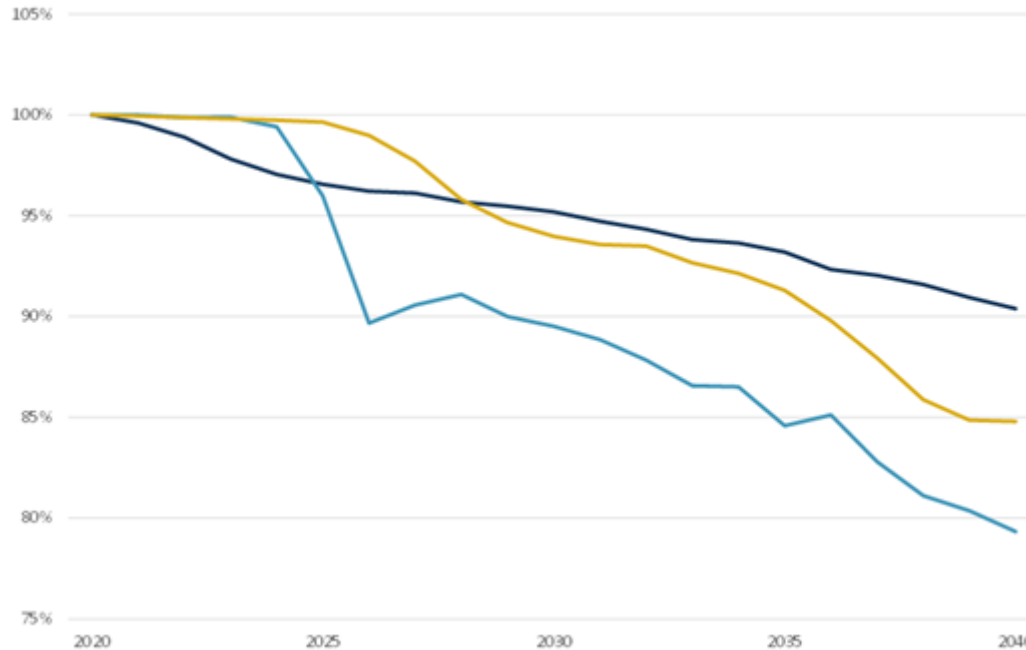


Source: Ortec Finance, 31 March 2020

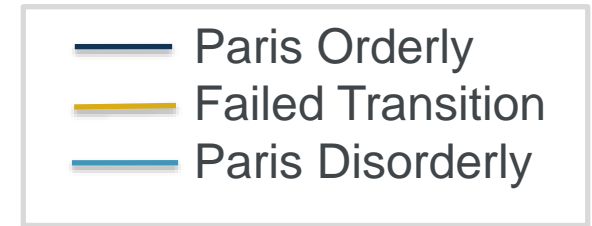


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Funding level projections: Median outcome relative to baseline



Source: Ortec Finance, 31 March 2020



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Initial Observations

Baseline

- All scenarios worse than baseline
- Take 3-9 years longer to reach target

Differences

- Paris disorderly has most adverse impact
- Funding level 20% below baseline in 2040

To 2030

- Driven by investment returns until risks reduced
- But would you reduce target returns if behind?



Further comments

- Other plausible scenarios
 - Markets crash earlier (eg CISL, [Unhedgeable risk: How climate sentiment impacts investment](#), November 2015)
 - Real interest rates fall further (eg Aon, [Climate Change Challenges: Climate change scenarios and their impact on funding risk and asset allocation](#), September 2018)
- More volatility
 - More uncertainty may lead to increased volatility, which has not been fully captured
 - This becomes increasingly important as schemes mature
- Residual risk
 - Captures reduced investment risk from investment in bonds but does not capture risks from changes in annuity pricing



So what?

Investment

Make changes to investment strategies and their implementation

Employer resilience

Engage with employer to understand how resilient it is to climate change and which scenarios it is most exposed to

Risk management

Factor risks into funding and investment strategies and plan in advance how to react should they start to materialise



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Questions for the panel

Chair: Louise Pryor

29 May 2020

Questions

Comments

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