

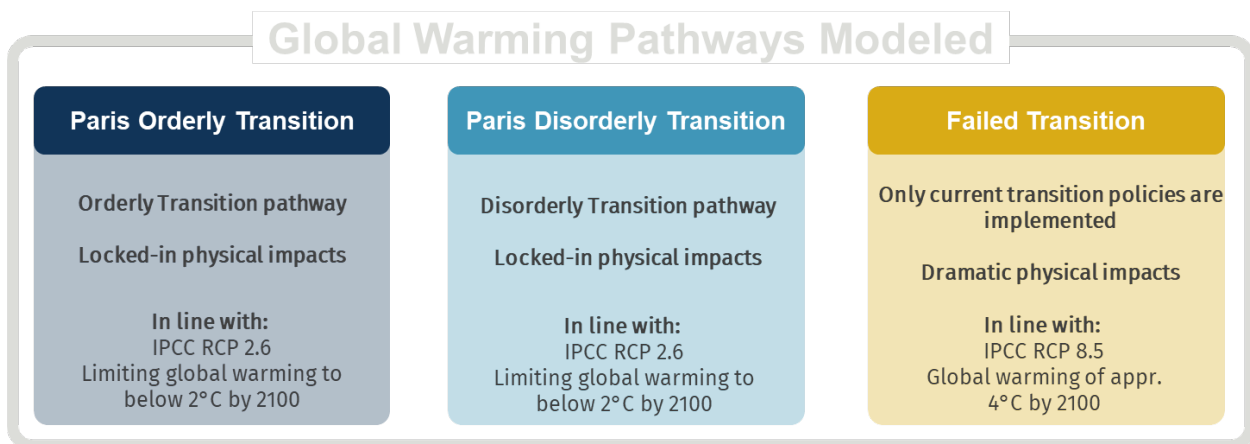
Climate scenario analysis: an illustration of potential long-term economic & financial market impacts

Draft extract from a forthcoming paper from an IFoA Resource and Environment Working Party and Ortec Finance (subject to revision)

Draft Executive Summary

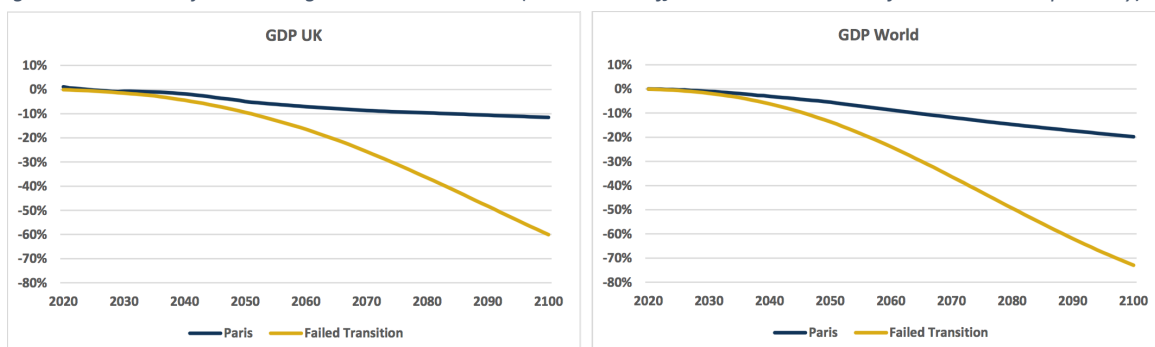
Climate Change will fundamentally impact how economics perform as a whole. It will affect the macro-economic variables such as GDP growth, and in turn have a significant influence over the resulting performance of asset classes and industry sectors. This paper shares more of the financial outputs from the modelling within “Climate scenario analysis for pension schemes: a UK case study” that was written by the same authors.

This paper examines the long-term economic and financial Impacts projected by a model that combines climate science with macro-economic and financial effects to examine the relative impacts compared with 3 different pathways:



This paper first considers the impact on GDP by expressing this as a percentage of baseline GDP where there is no allowance for climate change.

Figure 2: Climate-adjusted GDP growth UK and World (cumulative difference to climate-uninformed baseline pathway)¹



Source Ortec Finance, 31 March 2020

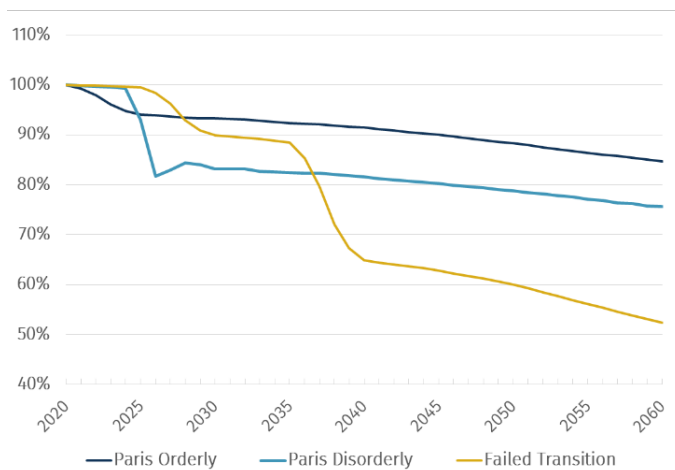
¹ A single Paris Transition pathway is shown since the Paris Orderly and Disorderly Transition pathways look very similar at this scale.

In the UK, the initial impacts on GDP in the Paris pathways are fractionally positive, but the longer impacts are modestly negative, 11.5% (0.15% pa). GDP in the Failed Transition pathway is initially similar to the Paris Transition pathways. However, the increasing impact of physical damages is noticeable even by 2040 and continues to decline at an increasing pace as the physical impacts increase, becoming 60% lower by 2100.

Global GDP follows a similar pattern although greater sensitivity to physical risks means that by 2100 GDP is 20% lower in Paris aligned pathways and 70% lower in the Failed Transition pathway.

There are also significant short term and long term impacts on financial markets, illustrated here in Global Equities.

Figure 7: Global equity return percentage difference of medians to median baseline



Source Ortec Finance, 31 March 2020

Figure 7 illustrates the potential short term shock from a disorderly transition pathway – where a sentiment shock exacerbates the rapid pricing in of Paris Aligned transition. In the model:

- Median equity market returns fall by 18% relative to baseline within two years, although the median then recovers part those losses in the follow 2 years

Figure 7 also shows the longer term impact:

- In Paris aligned pathways, the annualised decline is material but moderate with 15% and 25% declines reflecting 0.4% pa and 0.7% pa respectively.
- In the Failed Transition pathway, there is a significant 50% decline with physical climate impacts accounting for over 2% pa loss of equity returns by 2060, and continuing on a downward path.

Whatsmore, after 2060 the physical impacts on GDP within Failed Transition pathway overwhelm GDP growth leading to nominal GDP decline. The financial markets projections cease in 2060 as the relationships with the unprecedented downward trending GDP cannot be reliably determined.

These represent significant market risks and have significant implications for financial planning within financial institutions over both short and longer term horizons. Our companion paper *“Climate scenario analysis for pension schemes: a UK case study”* provides an illustration of how this analysis can be applied to a UK pension scheme.

There are also implications for financial modellers. These different pathways are not represented in historical data: and modellers should consider the degree with which the impact on expected returns and volatility is reflected in their assumptions. They should also consider how they might advise their clients on managing the short and long term risks the modelling of these different climate pathways has illustrated.

*Draft Extract for discussion purposes only.
Please see final version for complete details.*

The implications for markets and GDP should also be noted by regulators and policymakers. Policymakers in particular should consider the long-term implications for economies that are projected to contract in a Failed Transition pathway due to the physical impacts alone. The broader real-world consequences of failure to transition – such as food shortages, migration and conflicts – are likely to make the actual impacts far worse.

This paper reflects outputs from one model. Climate scenario analysis for financial institutions is a relatively new area where significant work is currently underway. The examination of the climate impact calibrations and comparisons with alternative models is outside the scope of this paper but we hope that the results provide a useful data point against which other model outputs can be compared. A comparison of the calibrations across these emerging different models could be considered in future papers.

Over the next few years, we do expect modelling approaches to become more sophisticated and consensus to start to emerge around which scenarios and calibrations use. In the meantime, we hope this paper is helpful to actuaries and others in demonstrating the potential impacts of climate change and their potential significance over the longer term.

The above is draft and subject to final revision. Final papers will be available from Ortec Finance Limited and Institute and Faculty of Actuaries from 1 June.

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