

ARTICLE

07 JUNE, 2021

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Shining a spotlight on scenario analysis and climate risk

Climate change is quickly emerging as a key area of concern for longer-term investors—and insurers are among the institutions to be affected due to their multi-decade strategic investment horizons. Alasdair Thompson, Associate Director of Research at Moody's Analytics, looks at how scenario analysis can help insurers understand the potential risks and uncertainties associated with different climate pathways, and shares an example of how insurers can convert climate scenarios into financial effects to gain a clearer picture of associated risks.

The insurance industry is increasingly recognizing the implications of the climate crisis and carbon transition on strategic financial exposures held by long-term investors, and the material long-term risk. As a result, risk management, investment, finance, and actuarial teams are all being asked to incorporate climate change into their working practices. However, incorporating climate risk into Own Risk And Solvency Assessment (ORSA), business planning, risk management, and investment decisions poses a significant challenge for financial institutions, and there are many dimensions to consider before you get an accurate picture of future risk associated with climate change on your business.

To gain clarity, financial institutions must be able to anticipate trends and identify uncertainties that may affect their business. Cue the climate scenario analysis.

Scenario analysis can help long-term investors understand the potential risks and uncertainties associated with different climate pathways. The two principle types of climate risk are defined as:

- » Transition risks, which are permanent shifts driven by changes in policies, technology, carbon pricing, regulations, and market behavior
- » Physical risks resulting from committed and unabated future emissions, including:
 - Acute risk shocks due to increased frequencies of extreme weather or climate events
 - Chronic risks from systematic (non-diversifiable) factors such as lower productivity levels from changing climate norms

In addition to risks, scenarios can also help long-term investors understand climate uncertainties including:

- » Scientific uncertainties such as climate sensitivities (the level of warming or the nature of a shift in climate norms given a certain level of emissions)
- » Socioeconomic uncertainties such as the level of economic damages that will occur under a particular warming pathway, or how coordinated the global carbon transition will be

After uncertainties in climate science and economics are factored into the analysis, there is a considerable range of possible outcomes for future returns. Examining just one or two scenarios, however, will not give a comprehensive view of the actual risks. Adopting a transparent framework to convert climate scenarios into financial effects will allow firms to consider potential pathways, and understand sensitivities to different underlying assumptions.

Converting climate scenarios into financial effects: an example of climate pathway scenarios in practice

The modeling underlying Moody's Analytics climate pathway scenarios is based on the recently published Network for Greening the Financial System (NGFS) climate scenarios, which were developed specifically for the financial sector. These scenarios were constructed using detailed integrated assessment modeling (IAM) and cover many possible climate change and carbon transition pathways. The scenarios can also leverage alternative climate narratives from Moody's Analytics climate-aligned economic assumptions or a client's own view.

To calculate climate impacts across a range of asset classes, we first calculate the longer-term economic costs within the NGFS scenarios due to physical damages and abatement investment. We then convert these costs into expected changes in real returns and risk premia using financial economic models through a combination of the Ramsey rule (Ramsey, 1928) and multi-asset capital asset pricing modeling. By applying the methodology across several NGFS scenarios, it is possible to use the NGFS scenario database to quantify the potential implications of climate change on strategic financial exposures held by long-term investors.

So, how can these scenarios be used as the basis for financial and asset-class scenarios analysis of the type typically implemented in liability-driven investors' asset and liability modeling (ALM) and strategic asset allocation (SAA) work?

To reflect the climate risks in financial markets, Moody's Analytics calculates the opportunity costs resulting from climate change and climate policies. These costs can be classified as adaption costs/physical damages (caused by or in response to physical risks), abatement costs (spending on decarbonization), and allowance costs (carbon taxes, permits, or prices). This "three-A" approach—adaption, abatement, and allowance—to account for climate costs aims to quantify the primary impact on economic activity of different climate pathways.

These costs are expected to manifest as a drag on consumption and consumption growth. At an aggregate level, taxes are assumed to be offset by increased government spending and consumption, leaving physical damages and abatement costs as the primary impacts. We then convert the economic costs to financial costs, adjusting expectations for the cost of capital in financial markets using the Ramsey rule. The cost of capital assumption is then separated into a risk-free rate and a cost of risk (risk premium), and then specified to align with the current low yield/rate of return market conditions.

Longer-term investors vary their risk exposures principally through asset allocation (with liability-matching investors preferring cash flow-matched risk-free bonds, while growth investors choose a diversified mix of risky assets (including equities and property)). Thus, it is important to show the effect of climate pathways on various asset classes. We do this by calibrating a multi-asset capital pricing framework in Moody's Analytics Scenario Generator in a way that ensures returns reflect longer-term levels of asset risk.

This methodology allows us to adjust the projected paths for different financial variables across the range of published NGFS scenarios for multiple scenario assumptions and uncertainties, and for a mix of different investments and portfolio exposures. We can then explore the array of possible pathways in a multi-scenario framework, taking into consideration the risks and uncertainties associated with long-term economic or climate modeling.

To learn more about our sophisticated set of climate risk analytics that help insurers support the systematic integration of climate change into investment and risk management decisions, click [here](#).

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