Aberdeen Standard Investments

Executive summary

# Climate Scenario Analysis: A Rigorous Framework for Managing Climate Financial Risks and Opportunities

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"Climate change is one of the defining issues of our age. Understanding it helps us to build more resilient portfolios and generate better returns for our clients."

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# Executive Summary

The physical risks of climate change and the long-term transition to a zero carbon global economy have enormous implications for the investment community. Scenario analysis is an essential tool for managing the risks and identifying the opportunities associated with physical and transition climate risk.

ASI has developed a bespoke approach to climate scenario analysis, that integrates the macro and micro drivers of climate impacts on asset prices within a probabilistic framework (please see our full White Paper, which you can find in the Climate section of our website). Our insights are being embedded in our business strategy, investment processes and the development of climate-driven solutions for or clients.

### Climate scenario analysis is an essential activity for climate-driven asset managers

Climate change is one of the defining issues of our age. Its physical manifestations are negatively affecting ecosystems, human health, and economic infrastructure. And much more disruptive outcomes are coming, even if the world is able to keep global temperature increases to 1.5° above pre-industrial levels. Meanwhile, the growing array of policy initiatives, private sector commitments and technology advances aiming to constrain greenhouse gas emissions and limit climate change are profoundly changing energy systems and patterns of economic activity.

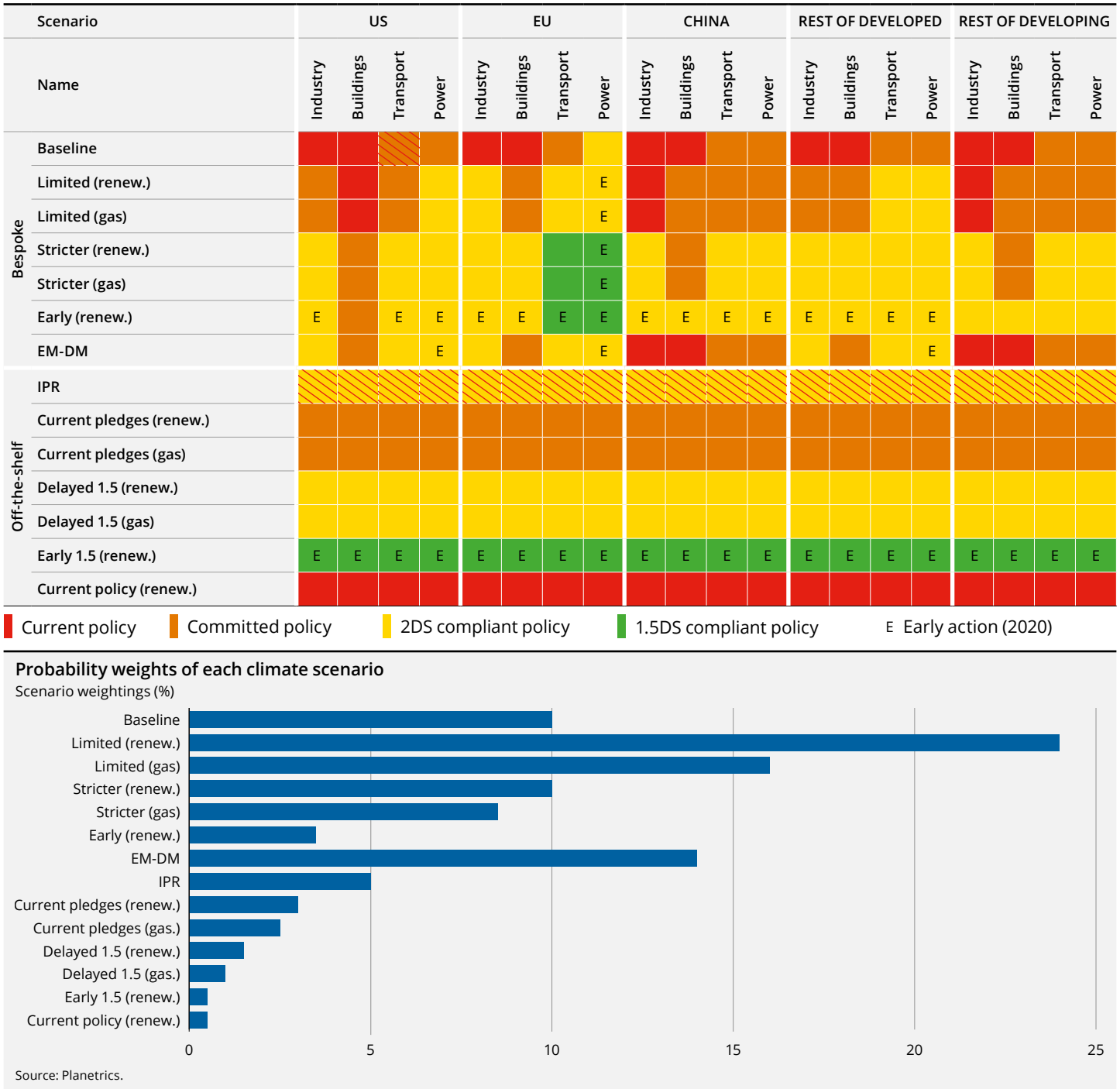
It is vital that investors understand how physical climate change and the energy transition affect the investment returns of the companies and markets they invest in. We believe that doing so will enable us to build more resilient portfolios and generate better long-term returns for clients. It is also increasingly demanded by asset owners and regulators.

### ASI's bespoke approach to climate scenario analysis sets us apart from other asset managers

Our approach to climate scenario analysis is motivated by the view that a rigorous and transparent methodology is essential for making sound investment decisions, encouraging positive change at the companies we invest in, and achieving robust outcomes for our clients. There are three features that jointly differentiate ASI's climate scenario framework from that of most other asset managers and allow us to fully integrate the results into our business strategy:

1. **Bespoke scenario design** – Climate scenarios are typically taken 'off the shelf' from expert outside agencies. While this facilitates comparability and can be useful for policy design, it comes at the expense of unrealistic assumptions about policy uniformity across regions and sectors that weaken their usefulness for investment integration and product development. By relaxing these assumptions we can build more plausible scenarios that better inform our assessment of climate risks and opportunities.
2. **Macro and micro integration** – Investment integration also requires a rigorous process for translating climate scenarios into financial impacts for all the assets we manage. Drawing on the expertise of our external partner – Planetrics – we do this in three stages:
   I. Our scenarios are converted into economic shocks like carbon taxes or physical damages that alter energy usage and the demand and supply of different products through time.
   II. Effects on asset value streams are then modelled as a function of firms' exposures to these shocks, their ability to react to them in terms of abatement or adaptation, and the nature of competition in their industry and thus the ability to pass on any higher costs to consumers or gain market share at the expense of more impacted competitors.
   III. Finally, we generate impairment estimates for individual securities, using standard asset pricing models, which can be aggregated at sector, regional and portfolio level.
3. **Probabilistic assessments** – The financial implications of climate change and the energy transition will be determined by the evolution of regulation, policy and technology. However, these drivers are difficult to forecast over long horizons. It is critical to take this uncertainty into account and update our analysis as new information becomes available. We do this by:
   a) Specifying a wide range of plausible scenarios (see Figure 1);
   b) Assigning probabilities to each scenario based on the political economy and economics of mitigation;
   c) Pooling the results so that we can analyse how asset prices respond to the probability-weighted mean outcome, as well as tail outcomes; and
   d) Updating our scenarios and their probabilities on an annual basis.

**Figure 1: Bespoke scenarios with modest additional policy ambition have the highest weights**




## A major energy transition is taking place – it is just a question of scale, speed and composition

In terms of the future of energy, the most important takeaways from our analysis are as follows:

a. The transition to a lower-carbon global economy is highly likely to continue. Even in our probability-weighted (mean) scenario, which sees the world fall short of keeping global temperature increases below 2°, the non-renewable energy share in the global energy mix declines from 68% today to 27% by 2050 thanks to stricter policy and the increased penetration of low-carbon technologies. And under the weighted average across our Paris-aligned scenarios, that share falls even further, to 12%.

b. But the transition will be uneven across sectors and geographies. Because the politics of climate mitigation vary considerably across the major economies, and abatement opportunities vary significantly across sectors, the transition is likely to proceed at different rates. Sectorally, the power sector is the most likely to decarbonise on Paris-aligned timeframes, and the industrial and buildings sectors the least likely. Geographically, Europe has the highest probability of completing the zero-carbon transition by 2050, and the emerging-market complex the lowest, with the US in the middle.

c. Solar photovoltaics (PV) is likely to be the biggest winner from the energy transition. Even in our least favourable scenario, the share of solar in the power sector's energy mix doubles to 4% by 2050, with this increasing to 25% in our mean scenario and almost 60% in some strict-action scenarios. Onshore and offshore wind also account for a rising share of the energy mix in most scenarios, albeit with weaker growth than solar, except when pessimistic assumptions are made about future improvements in solar efficiency and storage capabilities.

d. Among the fossil fuels, the outlook for coal is especially dire while peak oil demand is likely to be just over a decade away. In our mean scenario, coal usage declines at an 0.9% annualised rate (ar) over the next 30 years and by more than 4% per annum in our mean Paris-aligned scenario (see Figure 2). This is because it is the dirtiest fossil fuel and is penalised the most by carbon pricing and the declining cost of clean alternatives. In our mean scenario, oil demand gradually rises until the early 2030s before trailing off as the share of electric vehicles crosses critical thresholds.

e. Natural gas has a larger role to play in the energy mix, but the demand outlook varies considerably across scenarios. Our research affirms the potential for natural gas to act as a transition fuel, with usage increasing at around a 1% ar in our mean scenario. In Paris-aligned scenarios, however, its long-term outlook depends heavily on the extent to which the cost of renewable-energy technologies continues to fall rapidly and whether carbon-capture and storage technologies become more cost-competitive.

**Figure 2: Comparative energy-technology growth rates in our mean and Paris-aligned scenarios**

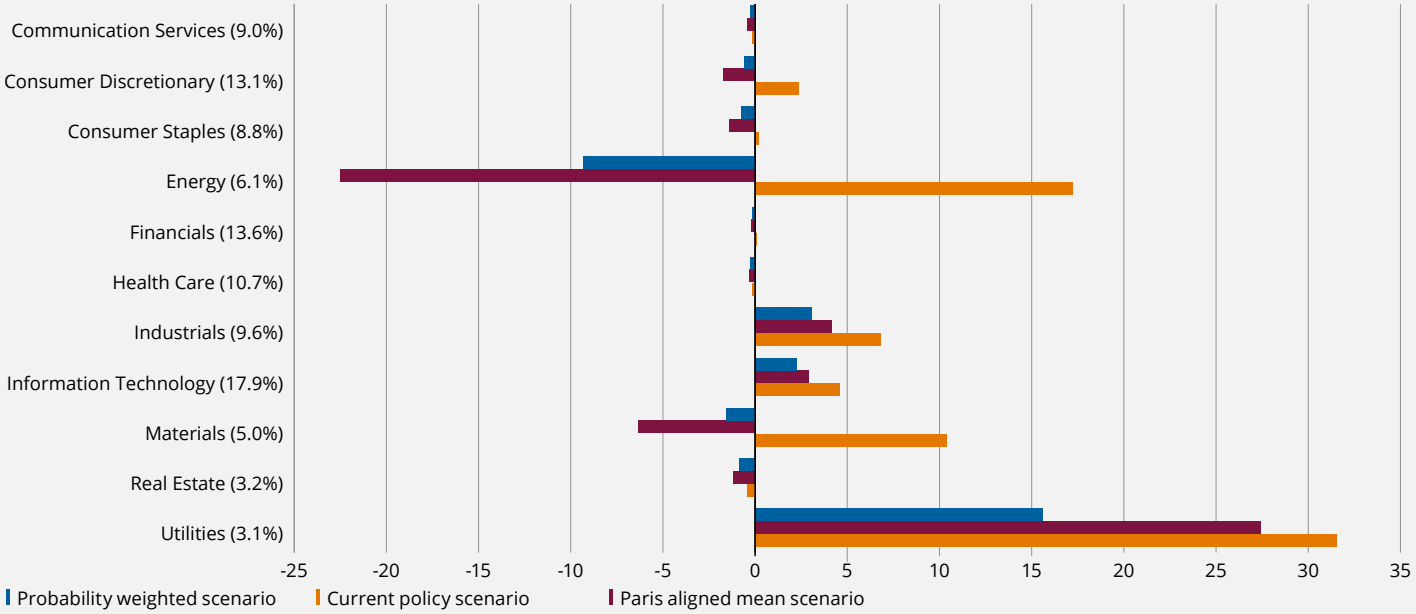
| | Average annual growth rate (2020-2050) % | | | | |
|---|---|---|---|---|---|
| | Coal | Gas | Oil | Solar | Wind |
| Baseline | -0.68 | 1.52 | 0.29 | 2.34 | 3.27 |
| Probability-weighted mean | -0.88 | 1.08 | -0.09 | 8.93 | 3.43 |
| Paris-aligned mean | -4.43 | 0.28 | -0.6 | 10.11 | 4.01 |
| Early 1.5. (renew.) | -10.79 | -2.84 | -0.98 | 11.72 | 3.43 |
| Delayed 1.5. (gas) | -5.72 | -0.96 | -5.01 | 6.44 | 5.14 |

Source: Planetrics and ASI, January 2021.

### Climate risk and opportunity is largely a micro or stock-specific phenomenon

The impact of climate change on returns for aggregate global equities is very modest, a +/- 2% impact on aggregate valuation in most scenarios. This is roughly equivalent to losing one quarter of average returns on the S&P 500 over the past 50 years. Aggregate effects on regional indices are also generally modest because of their diversification.

**Figure 3: Asset price impairment is concentrated in a small number of sectors**

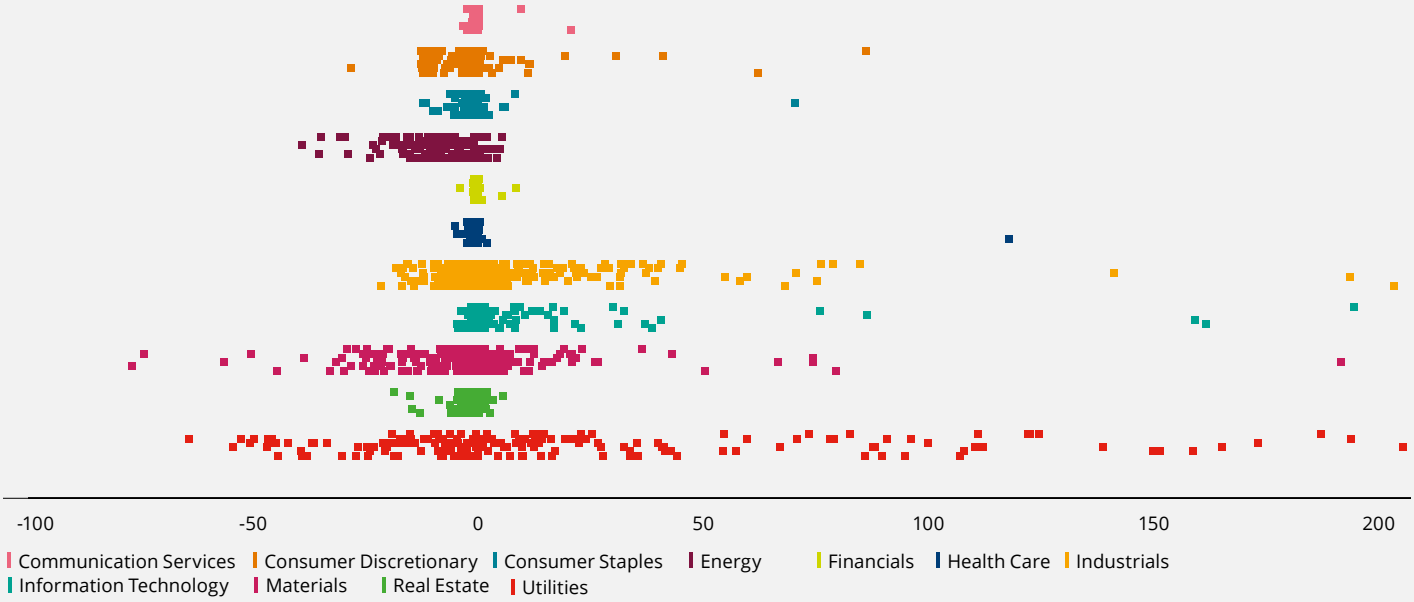



Comparison of sector level impact or impairment (means weighted by market cap; relative to what is priced into the Baseline) under three scenarios. Bracketed percentage shows the sector weight within the aggregate index. Data source: Planetrics and ASI analytics.

At the sector level, global utilities are likely to be the largest winner; and fossil fuel energy the largest loser from the energy transition (see Figure 3). Indeed, there is no scenario in which the global utility sector suffers negative equity and credit impairment, with upsides above 30% in most strict climate action scenarios because of the growing demand for renewable power. By contrast, the only scenario in which the fossil fuel energy sector does not suffer an average negative impairment is if there is no scaling up of current climate policies over time. Most other sectors are, on average, negligibly affected even under strict abatement scenarios because of their lower carbon intensity.

Within aggregate sectors, though, there is great dispersion across sub-sectors, firms and regions. The largest risks and opportunities are concentrated within the energy, utilities, industrials, materials and information technology sectors (Figure 4). Renewable energy based utilities significantly outperform coal utilities; copper and lithium miners do much better than coal miners; and oil equipment manufacturers lose out to battery, wind turbine and solar panel manufacturers (see Figure 5).

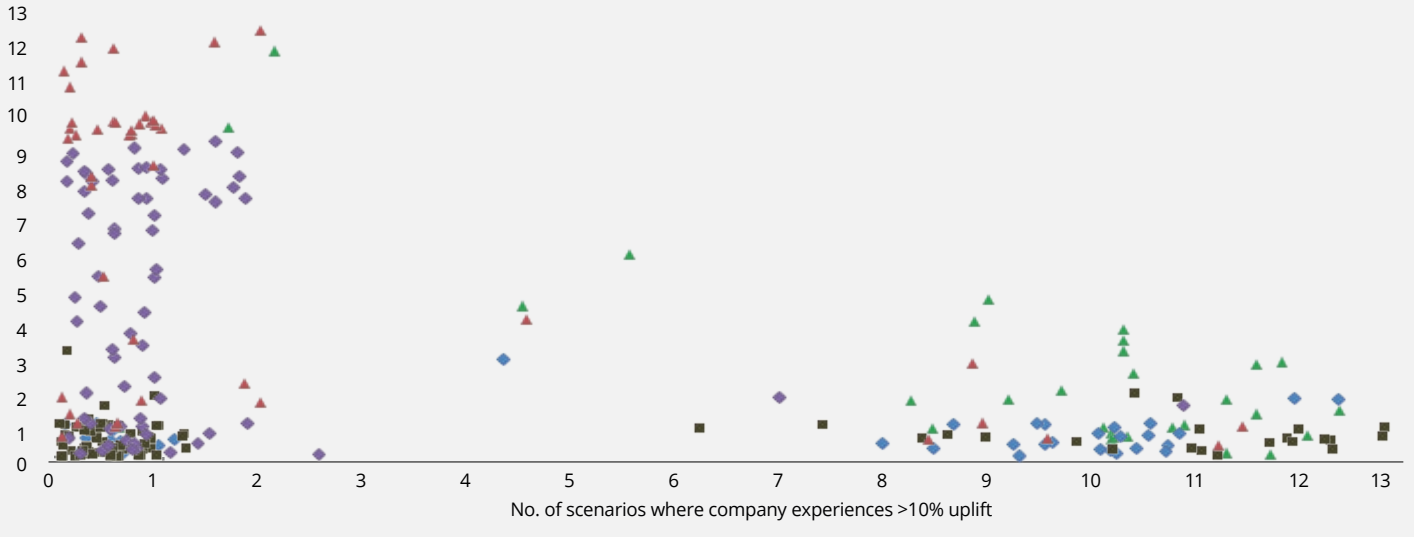
**Figure 4: Within aggregate sectors, climate impairment effects are highly dispersed**




Dispersion of total impact across all companies in the MSCI World index for each sector (probability-weighted mean scenario). Outliers beyond 200% are not shown. Data source: Planetrics and ASI analytics , January 2021.

**Figure 5: Resilient winners and common losers**

No. of scenarios where company experiences >10% impairment




Distribution of uplift and impairment across selected sub-industries. Data source: Planetrics and ASI analytics, January 2021.

This implies a large opportunity to draw on scenario analysis to add alpha to actively managed investment portfolios. There are also more systematic opportunities for investment strategies that tilt towards climate transition winners and for thematic climate solutions portfolios.

The takeaways for listed credit securities are similar to those of equities, with a few important differences. Impacts of the energy transition are concentrated in the same sectors and like equities, dispersion within sectors and regions is much higher than across them, with aggregate impacts at the index level modest. However, because credit is higher up the capital structure than equity, and the effective duration of many credit instruments lower, the magnitude of credit impairments for a given firm are also generally lower.

The insights from our analysis are being embedded throughout the business.

In the coming months we will fully integrate our climate scenario framework and insights into our business strategy, the key stages of our investment process as well as the development of climate-driven solutions to deliver superior outcomes for our clients. This will include:

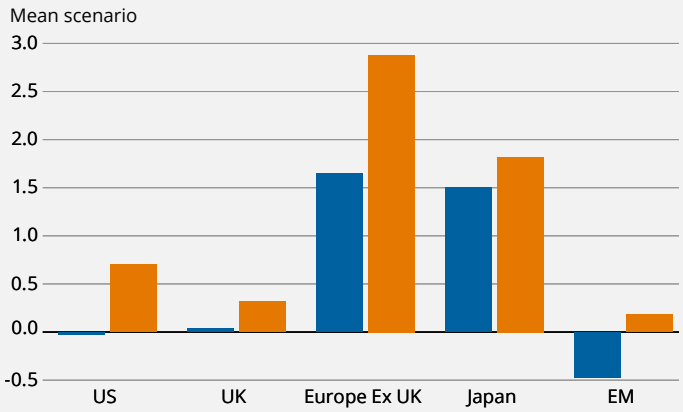
a) Integrating the results into active stock selection by asking critical climate-related research questions that are informed by our scenario analysis. Our answers will complement our broader company research, including our assessment of the credibility of firms' transition strategies. This in turn will allow us to construct portfolios that are resilient to different, plausible climate pathways.

b) Embedding scenario analysis into our approach to stewardship. Where material climate risks are identified, we will engage with companies to understand what actions they are taking to mitigate them and encourage firms to undertake their own analysis. This is aligned with our core principle to disclose on climate change in line with the TCFD framework. Where risks are not well managed, this will inform our investment decisions.

c) Fully integrating climate risk and opportunity into our Strategic Asset Allocation (SAA) framework – our probability weighted mean approach is particularly valuable for improving mean-variance optimisation.

d) Developing a wide range of innovative climate change (including net zero) solutions for our clients. This includes climate-tilted benchmarks – which outperform standard equivalents in most of our scenarios (see Figure 6) - as well as climate-enhanced products that are focused on climate solutions and transition leaders. The objective is to protect clients from climate-related risks, allow them to benefit from climate-related opportunities and have a real world impact on decarbonisation.

**Figure 6: Climate tilted portfolios outperform benchmarks in the average scenario**




Source: Planetrics and ASI analytics, January 2021. Charts show valuation impact compared to baseline. Impairment is provided for five regional equity benchmark indices and their climate-tilted variants.

Climate scenario analysis is a journey rather than a one-off project. Our future work programme is far ranging. We will update the analysis on an annual basis, taking into account changes in policy, technology, and the structure of markets. We will expand our analysis into the full range of private assets and undertake more granular dives into the drivers of change within sectors like energy and utilities. And we will be working to incorporate dynamic business change into our analysis, improving our ability to identify successful transition companies.

This paper focuses more on the financial impacts of climate transition risk than physical risk. Physical impacts were fully incorporated into our stage-1 modelling, but we intend to enrich our analysis in the next stage of our programme. We will do this by increasing the number of physical risk scenarios, allowing for physical 'tipping points' to occur at lower levels of temperature change, expanding the range of assets subject to physical damages, while exploring the important issue of climate adaptation in depth. We will publish our insights in a follow-up paper in late 2021, with a focus on the implications for real estate and infrastructure assets.

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