Module Responsible Investment & Climate Risks – Climate Risks

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Hello viewers of the MiFID II stay compliant program of CFA Society VBA Netherlands, thank you so much for joining this climate finance module. My name is Willemijn Verdegaal and I am the Co-Head of Ortec Finance's Climate & ESG Solutions. Today, I would like to discuss the following topics with you:

- Part I: An introduction to climate modelling and the data market
- Part II: Outline the scientific & regulatory state of play
- Part III: Introduce how climate risks influence the investment portfolio
- Part IV: Discuss how carbon footprints could impact shares and bonds

Part I— Climate Modelling and Data Market

In the past few years, climate modelling and the related data have become increasingly available in the market. Besides proprietary methodologies, developed by parties like Ortec, there are also open-source options available. Examples include Open-Source Climate (OS-C) and the Science Based Target Initiative (SBTi). Financial regulators are increasingly publishing their own climate scenario assumptions, such as the Bank of England ('CBES scenarios'). For-profit organizations often collaborate with open-source solutions so that they can build on each other to catalyze innovation.

On the data-front, there are myriads of proprietary vendors and some not-for-profit options such as CDP and the Platform Carbon Accounting Financials (PCAF). CDP offers several datasets, with the aim that these datasets will help organizations measure their climate risks and opportunities. PCAF provides insights and guidance into the global, regional, and national implementation of financial carbon accounting.

Part II— Scientific & Regulatory State of Play

What is the current state of climate science? Where are we now? How urgent is it for us to act?

With a building sense of climate urgency, it is of course pertinent to ask— what does the research say now? While it remains to be seen whether, or when, countries will enshrine these targets into law, the science is clear. We have already observed approximately 1^{o}C of warming (likely range 0.8^{o}C-1.2^{o}C)

above pre-industrial levels[1], water resources have been degraded in many areas due to changes in precipitation and the melting of snow and glaciers, even Antarctica is turning green due to algal blooms.

While it seems a daunting task to limit warming to well below 2°C as stipulated in the Paris Agreement, science shows that it may be our salvation for a livable planet. Even if we are to meet Paris goals, winter temperatures over the Arctic Ocean will still increase 3-5°C by mid-century compared to 1986 to 2005 levels, and Arctic permafrost is expected to shrink 45% compared to levels today. A two degree celsius of warming still means that coral reefs, marine biodiversity hotspots, in many regions will be lost. There will be increased flooding and coastal erosion, and the production of major crops in tropical and temperate regions will be under threat, putting food security in an increasingly populous world at risk.

UN Climate Change's designated scientific body, the IPCC, created standardized climate models called the Representative Concentration Pathways (RCPs) to capture the projected impacts of climate change under various temperature pathways. The well-below two degrees celsius goal set forth in the Paris Agreement most closely aligns with RCP2.6, while RCP4.5 corresponds with approximately three degrees, and RCP8.5 serves as a "worst case scenario" at greater than four degrees. The IPCC's Special Report on 1.5°C warns that we have fewer than 11 years to reduce emissions and align with Paris goals[2], in reality however, if we were to wait until year 10 to act, the financial losses would be insurmountable. If we had begun the transition 5 years ago, the transition to a Paris-aligned low carbon economy would have been comparatively cheaper.

What is the global opinion of climate change— public, legal, governance, policy?

Global Perspectives— In December of 2015, the 21st annual UN Climate Change Summit concluded with the establishment of the Paris Agreement where most countries around the world agreed to limit global warming to well below 2°C by 2100. While the Paris Agreement built optimism for global collaboration, the world's largest emitters subsequently continued to carry on business as usual. With insufficient political will and regulatory action, activist groups like Greta Thunberg's Fridays for Future and the Extinction Rebellion began to strike. At the same time, the public has become increasingly aware of and dissatisfied with the lack of action on climate change.

In the past year, the COVID-19 pandemic resulted in global emissions taking an unprecedented downturn for the first time in history since the beginning of the Industrial Revolution[3]. As we all retreated into our homes and reduced global demand for aviation and travel, the Earth saw a reduction in carbon emissions. This did not last for long, with China's emissions already exceeding the emissions quantity prior to the pandemic[4]. How we as a planet choose to proceed in our emissions reductions in the next few years will decide whether we are able to limit warming sufficiently for a livable planet.

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[1] IPCC Special Report on Global Warming 1.5°C
[2] Ibid
[3] https://www.sciencedaily.com/releases/2020/10/201014082806.htm
[4] https://www.carbonbrief.org/analysis-chinas-co2-emissions-surged-past-pre-coronavirus-levels-in-may

The 26th UN Climate Change Summit was postponed to 2021 due to COVID-19, with growing consensus to rebound with climate at the forefront. Late last year, China, South Korea, and Japan, joined most of the western world in announcing Net-Zero emissions reduction targets. This year's UN Climate Summit will be held in Glasgow, Scotland in November, where countries are expected to announce their latest Nationally Determined Contribution (NDC) to global emissions reductions in the coming 5 years. With a change in US presidency, the dynamics of diplomatic collaboration on climate action from the world's largest emitters and economies may alter as well.

United States— The Biden Presidency has recommitted the US to the Paris Agreement. With the US, China, and the EU agreeing on the need for ambitious climate action, a global transition is looking more likely.

China— The world's largest emitter surprised the world with their announcement of Net Zero emissions by 2060 goal, with peak emissions reached by 2030[5]. In the past few years, China's climate ambition has continued to climb, currently with the world's largest green finance market with 1.8 trillion USD in green credit and 190 billion USD in green bonds in 2020[6].

European Union & The Netherlands— In December 2020, a group of 17,000 Dutch citizens and many environmental groups sued Royal Dutch Shell, seeking to compel the energy giant to reduce carbon emissions 45% by 2030 compared to 2019 emission levels[7]. This case is one to watch, as the decision will have significant implications for how private sector may be held accountable to emissions reductions in the years to come. In the Netherlands a significant amount of financial sector players signed a voluntary commitment 'Klimaatakkoord financiële sector' to set reduction goals and report publicly on progress[8].

The European Union continues to build significant momentum for emissions reduction, with ambitions to become the world's first climate-neutral continent as part of the European Green Deal[9]. In order to do so, the EU has set in motion a whole suite of climate goals. Here are a few of the really important ones:

- The EU has announced a Net Zero by 2050 target, reducing emissions by at least 55% by 2030 compared to 1990 levels.
- As part of the European Green Deal, the Sustainable Finance Disclosure Requirements (SFDR) come into effect in March of 2021 where financial institutions will be liable to disclose on climate and sustainability[10].
- An amendment to MiFID II proposes a requirement for firms to integrate ESG. The Network of Central Banks and Supervisors for Greening the Financial System (NGFS) seeks to

[5] https://www.wri.org/news/2020/09/statement-china-aims-carbon-neutrality-2060
[6] https://chinadialogue.net/en/business/green-finance-china-carbon-neutrality-2060/#:~:text=Green%20finance%20in%20China,in%20green%20bonds%20by%202020.
[7] https://www.insurancejournal.com/news/international/2020/12/01/592214.htm
[8] Commitment van de financiële sector | Publicatie | Klimaatakkoord
[9] https://ec.europa.eu/neighbourhood-enlargement/news_corner/news/european-green-deal-sets-out-how-make-europe-first-climate-neutral-continent-2050_en#:~:text=News-,The%20European%20Green%20Deal%20sets%20out%20how%20to%20make%20Europe,and%20leaving%20no%20one%20behind
[10] https://www.bloomberg.com/professional/blog/demystifying-the-sustainable-finance-disclosure-regulation/

collaborate and contribute to the development of environment and climate risk management on a voluntary basis. The current 83 members of which the NGFS is comprised of, covers the world's major economies, and includes the Dutch National Bank (DNB). The ECB is expected to publish its strategy review later this year. How monetary policy can address climate change is a key part of this review.

Please note that sustainability related financial regulation goes well beyond climate. Biodiversity is a key emerging topic on the regulatory agenda. However, quantifiying these impacts in terms of financial risks is still in very early stages. Quantifying the financial impacts of social topics (e.g. diversity, inclusiveness, labor-standards) is also extremely important but even more difficult and will require significant further research.

Part III — How climate risks influence the investment portfolio

What is climate risk and are there different types of climate risks?

Climate risks are those associated with mitigation and adaptation. While mitigation focuses on society's transition to a low-carbon economy, adaptation focuses on adapting society to a changed climate.

Transition risks captures changes in policy, technology, markets, legislation, and regulation. Physical risks on the other hand, refer to climate related risks that have to do with the planet itself such as sea level rise and extreme weather events.

The physical and transition impacts that actually materialize will depend crucially on the speed and magnitude of climate change and the policy response. There are many possible pathways such as those put forth by the IPCC, driven by choices made by governments and society at large, varying from those in which our behavior does not change (leading to more severe physical impacts) to those in which drastic action is taken to counteract climate change (leading to more severe transition impacts). The actual pathway that we will follow is uncertain as it depends on how we as a society choose to act, particularly as sudden policy changes remain within the realm of possibility.

There is no 'business as usual' scenario where climate does not play a role. Transition and physical risks are relevant in every scenario – but with varied degrees of risk. In order for investors to be prepared for the risks and opportunities of climate change, both transition and physical risks on the investment portfolio should be actively managed in the years to come. There are likely to be significant opportunities too, particularly in relation to the transition, although the net impact is likely to be negative for many sectors and for the financial system as a whole because physical risks tend to dominate the risk profile.

How do we translate climate risks into financial risks?

In order to capture the impacts of climate change within scenario analysis, the IPCC's climate models are combined with economic and financial models. In general, there are two main complementary approaches to translate climate risk into financial risk metrics. They are loosely referred to as 'top-down' and 'bottom-up' approaches.

Understanding 'top-down' and 'bottom-up' approaches— A top-down approach highlights that climate risks are systemic, which means the risks of climate change cannot be managed by regular diversification strategies alone. Top-down models quantify the networked economic impacts of climate change. They look at feedback loops across sectors, technologies, trade, and government spending. For example, top-down models can capture important nuances like the role of the emissions-intensive steel industry in green infrastructure.

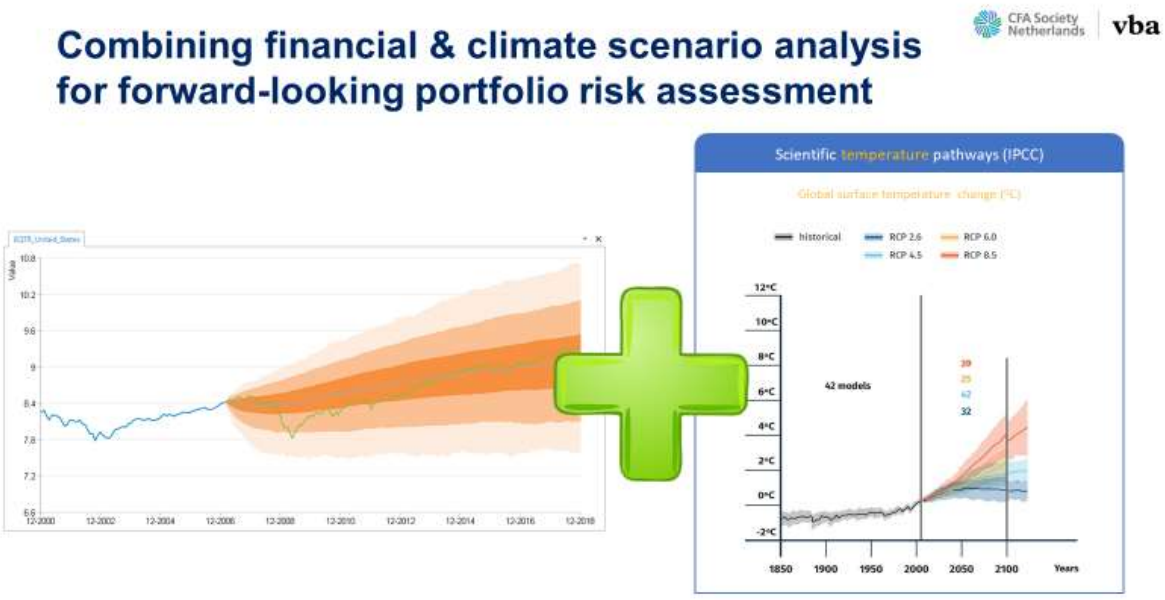
These models are best suited for understanding climate risk at the level of the portfolio, asset class, sector, and region. For many well-diversified asset owners, this tends to be the most important analytical dimension as it addresses the systemic nature of climate risk or in other words, the part that cannot be 'diversified away'. These models are used in scenario analysis to understand the various plausible futures society may embark on, and are by definition forward-looking.

Bottom-up models focus on analyzing how individual companies are impacted. These are more 'micro-level' analyses. They often do not take networked impacts into account. They can be useful if, for example, you as an investor are considering to invest a large sum into to one specific company and/or are less diversified.

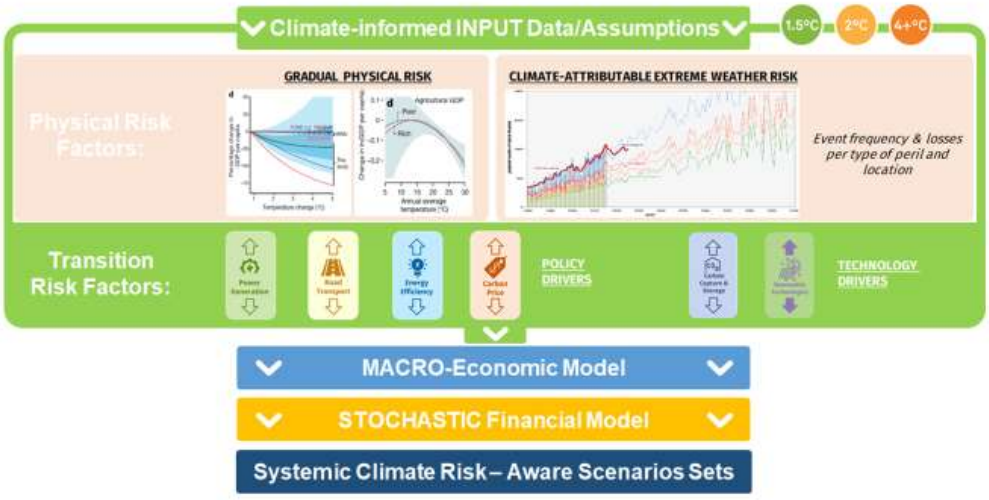
It is worth noting that total risk does not necessarily equal the sum of individual companies' risk. The reason why one cannot simply aggregate individual companies' risks, i.e. bottom-up, to equate total risk is due to the absence of feedback loops at that level of granularity. Ideally, top-down and bottom-up models are both used and implemented on a consistent set of assumptions, allowing for both company-level and systemic intra-sector insights.

How do climate risks impact the investment portfolio?

To capture the effects of climate change, it may be useful to delve into scenario analysis using several plausible climate pathways that provide insight into what the future may look like. Different parties can come up with different scenarios of plausible climate pathways. The Central Banks and Supervisors Network for Greening the Financial System (NGFS) have selected a set of three scenarios: Orderly, Disorderly, and Hothouse World. These pathways are in line with IPCC's climate scenarios whilst incorporating transition and physical impacts. To illustrate such scenarios, we will use examples,to be called: Paris Orderly Pathway, Paris Disorderly Pathway, and Failed Transition Pathway. The Paris Orderly Pathway assumes that we are able to meet Paris goals in a gradual and timely manner. The Paris Disorderly Pathway on the other hand, assumes that while we eventually end up meeting Paris goals the transition was abrupt and drastic, thus resulting in high volatility. Within the Failed Transition/Hothouse World Pathway, there are limited transition impacts since countries did not incorporate policies to reduce emissions, with severe physical impacts.

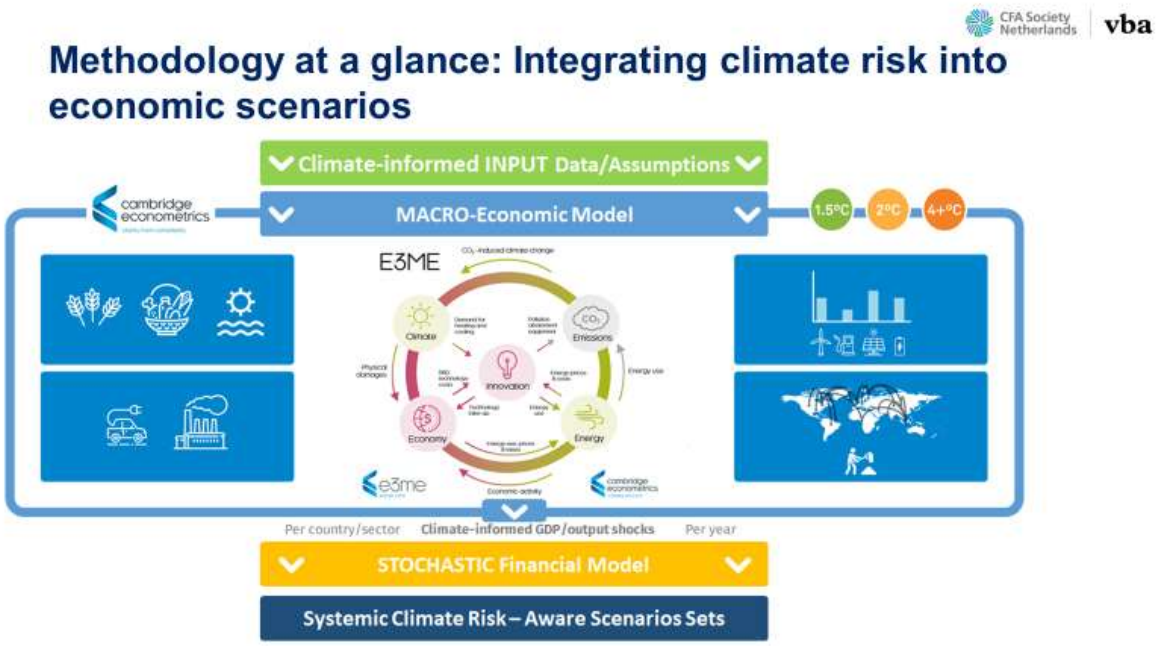


Methodology at a glance: Integrating climate risk into financial scenarios



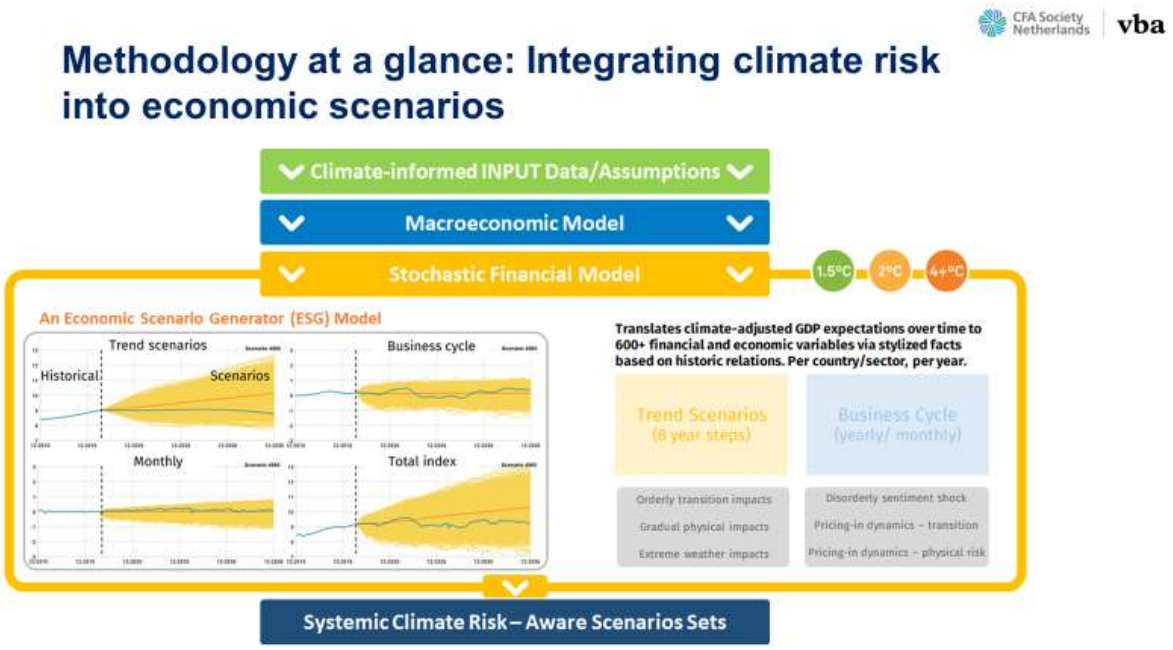
Underlying these scenarios are some key climate risk variables, which explains why performance differs by region and sector. Drivers of transition risk include the level of carbon price, whether the region is a net importer or exporter of fossil fuels, the share of energy sector within the local stock market, energy efficiency of the economy, taxation impacts, and sensitivity to sentiment shock. Further, some physical risk drivers include latitude effect and sensitivity to physical impacts. All of these risk drivers will impact how a region and sector performs in the long run as the climate continues to change.

These variables are fed into a pair of connected models: a global macro-econometric model and a stochastic financial model.



The macro-econometric model integrates a range of social and environmental processes. It has two two-way linkages between the economy, wider society and the environment. It acts as a 'google – translate' to quantify climate related physical and transition variables into macro-ecnomic impacts. such as changes in expected GDP growth, interest rates, inflation, investment, and international trade flows.

The financial model: This model provides consistent, realistic and up to date stochastic scenarios with a worldwide coverage for long, medium and short term horizons. It models the historical relations between financial and economic variables in order to capture their impact on investment returns. By replacing climate uninformed variables with climate informed ones from the macro-model, we can perform climate informed forward looking risk-return analysis.



Stochastic scenario analysis is important to calculate measures such as the probabilities of being underfunded due to climate risk. This provides decision makers with insights into the potential impact of their asset allocation decisions. For example, trustees of a pension fund may want to understand the impacts of climate risk on the probability that their fund will hit its targets. Bodies like the Task Force on Climate Related Disclosure (TCFD) and the NGFS offer relevant material for further research.

At the micro-level, climate risks and opportunities will impact almost all aspects of the business including: business-models, supply-chains, customer preferences, reputation, legal risks, the ability to attract the right skills. Macro-economic & micro-economic factors will interact together and both should be considered when analyzing how climate impacts investment portfolios.

Part IV– How carbon footprints impact investment categories (shares and bonds)

What is a carbon footprint?

A carbon footprint is defined as the total greenhouse gas emissions due the consumption of fossil fuels, expressed as carbon dioxide equivalent. In the context of private sector, an organization's carbon footprint is divided into 3 scopes. Firstly, Scope 1 includes all direct emissions that are operated by or owned by the organization, while Scope 2 emissions are indirect emissions that are owned or controlled by the organization (which includes emissions attributable to electricity generation). The most difficult to

capture and alter, Scope 3 emissions are emissions that the organization supports within its value chain but which the organization does not directly control nor own. Every organization can therefore evaluate their Scope 1, 2, and 3 emissions to understand where their emissions are, and set targets to reduce their emissions in all three areas.

Carbon footprinting is frequently used in order to measure how much carbon is being financed by a particular portfolio. It is viewed as a 'good housekeeping' metric, but the decision relevance of the tool is debated. In parallel with the rise of ESG and sustainability in the private sector, carbon footprinting has become more and more commonplace. Currently, Scope 1 and 2 emissions data are relatively easy to acquire, with more challenges associated with Scope 3 emissions due to many more stakeholders and the challenges associated with a particularly complicated value chain. There are currently many ways to produce an annual sustainability report such as the Global Reporting Initiative (GRI), Sustainability Accounting Standards Board (SASB), GHG Protocol, Task-force on Climate-related Financial Disclosures (TCFD), etc. The common thread between these various reporting methods is that emissions are taken into account. As sustainability reporting continues to pass into legislation, the frequency of emissions reporting and availability of data will continue to increase.

That being said, some drawbacks of carbon footprinting include:

- It is backward-looking, not forward-looking
- It is not helpful to understand the degree to which emissions need to be reduced for a particular sector or company
- Especially important: it should not be viewed as a metric to measure climate-related financial risk. It is not a financial risk metric and physical risks are out of scope

Let's elaborate on that last point as it is important and there is a lot of confusion around it. Climate policy should have at least two dimensions:

- One that focuses on managing risk or in other words – how does climate risk affect my investments? Another term for this is 'outside-in'
- One that focuses on managing impact – how do my investments impact climate change? Or 'inside-out'.

A carbon footprint will tell you something about absolute emissions of, for example, a company, but will not tell you if this is high or low compared to where it 'should be'. It also says nothing about how the company may be impacted by economy-wide transition risks (feedback loops in supply chains, customers, government finances etc.) and fails to delve into physical risk exposure.

As a side note, it is of interest to mention that there are many 'low-carbon' or 'Paris-aligned' benchmarks available in the market. These benchmarks tend to be constructed by lowering the allocation to companies or sectors with higher carbon footprints in relation to the standard benchmark. These products can lower the carbon-footprint of a portfolio while minimizing tracking-error. Many investors therefore find them convenient. Drawbacks of these products include:

- Missing out on opportunities: Divesting from companies that have high carbon footprints now, but have credible transition plans may cause investors to miss-out on upside potential.
- Divesting limits options for active ownership.

How do we go beyond the carbon footprint?

Potentially more suitable metrics for forward looking impact measurement include a 'temperature alignment score', which measures the level of warming in degrees the portfolio is aligned with. A temperature alignment score provides financial institutions with insights into how their portfolio(s) are impacting the environment. This very useful metric can also provide financial institutions with in indication of how far (or close) their portfolio(s) is from Paris goals. The SBTi offers a helpful framework through their finance initiative tooling. This open-source tool allows financial institutions to generate a temperature score for the corporate bonds and equities within their portfolios, at an individual company level in addition to an aggregated score.

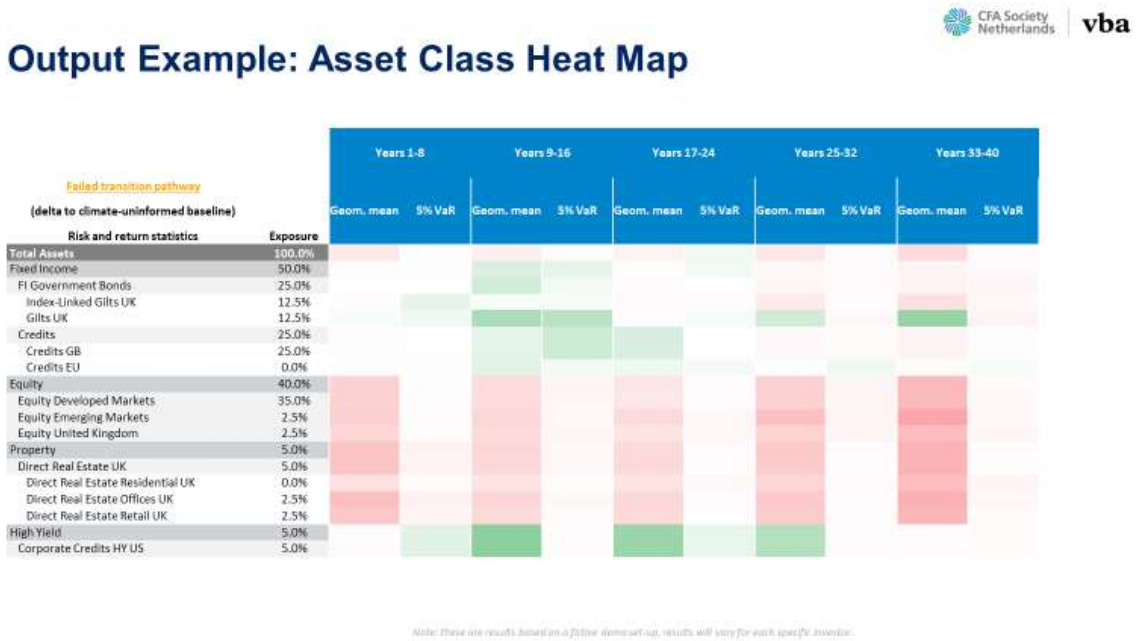
What are the impacts on asset classes?

Scenario-analysis can also be very helpful in understanding how different asset classes, sectors and countries are impacted by climate-related financial risk. Analysis needs to be detailed in order to be useful for decision making. Risks vary widely for each portfolio. Very generally, bonds tend to more resilient to climate-risk than equities. Due to the systemic nature of climate change and the unpredictability of which warming pathway we will follow, the longer-term horizon of stockholders makes equities more susceptible to climate risks. On the other hand, frequent coupons offered by bonds and their shorter-term horizon, result in more resilience to climate risks, in general. Therefore, a "big chunk" of losses caused by physical risks does not impact fixed income risk-return characteristics in the same way as in equities.

Quantified modelling outputs are useful to judge risk, but should not be seen a 'check the box' exercise. Investment professionals need to understand & judge underlying assumptions in order to fulfil their fiduciary responsibility.

It is important that climate-related financial risks are integrated consistently throughout the entire investment process: from the strategic to the implementation (holding selection) level. Questions that may arise include:

- On what climate scenario should I be basing my investment choices?
- Are my assumptions implemented in a consistent manner – do choices made at the level of strategic asset allocation match up with those my asset manager is taking at the individual stock selection level?
- Is my asset manager taking systemic risks into account? Are they looking at feedback loops – also from physical risks-in the wider economy or only looking at companies as if they operate in isolation? It may be tricky to distil this from data that they are sharing. You need to explicitly ask them if they are working with a top-down model that capturs systemic climate risk and probe for details. COVID is a stark reminder that that approach would hugely underestimate risk! Economies are networks after all.



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Conclusions

To sum up: the climate finance space is very dynamic. Regulation and public opinion is evolving at break neck rates. Investors need to be prepared from both the risk-management and social responsibility angles.

Please remember that risk & impact are not the same thing and require different tools. Beware of oversimplified 'tick the box' approaches – sorry to say, but climate change is complicated and thorough analysis is needed in order for results to be decision useful.

At the same time, the urgency and intricacy of the problem make it a very exciting space to work in and I wish you well on your climate risk journey!