DHG

VIEWS

November 2020

Developing a Climate Risk Model Framework

Economists and scientists have studied climate risk for decades, however, climate science is relatively new to the private sector and regulators alike. Approximately five years ago, many of these stakeholders turned their focus to climate change and understanding its potential impact. Fast forward to present day; both groups are catching up at an unprecedented speed. This is a timely development as many see climate risk as a large driver of industry change which will allow innovators to reap profits while leaving laggards with losses and stranded assets. There are myriad impacts to the world as a result of the climate change issue and one thing is for sure; climate risk consideration and the management thereof will remain a hot topic for years to come.

CLIMATE RISK BACKGROUND

Climate risk refers to the risk of loss and the uncertainty related to climate change. Climate risk is categorized into physical and transition risks that translate via various channels, (e.g., damages to property, business disruptions, capital depreciation) into losses in the more traditional risk categories, such as credit risk, operational risk, and legal risk.

Physical risks can stem from damages to coastal infrastructure due to sea level rises (Figure 3), wildfires, droughts and other natural disasters. Insurance companies, banks, asset managers, and the real estate sector all often hold portfolios with physical risks including real estate exposed to flooding, insurance contracts covering assets exposed to physical risks and loans in high climate risk exposed areas.

Transition risks are associated with financial losses resulting from the societal shift towards a low-carbon economy. Changes in regulation may have an impact on the cash flows from assets and in some cases, lead to stranded assets (e.g., coal production facilities). A prominent example has been the introduction of the European CO2 charge, which internalized carbon-related externalities (Figure 1). It required firms to pay for producing carbon emissions and changed cash flows by internalizing costs. Broader than regulatory aspects, transition risk arises when societies move toward a lower emission, eco-friendly economy. This economic shift also causes risks and opportunities due to client preference changes - the latest rise of Economic, Social, and Governance (ESG) investments is a prominent example.

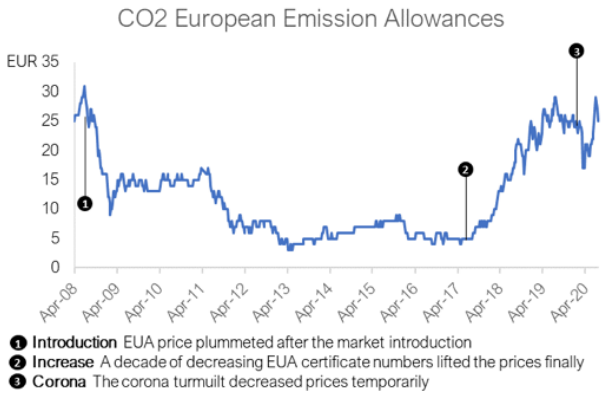

Figure 1: Price development of European CO2 Certificates. Increasing prices pose a risk to brown assets.

CLIMATE RISK FRAMEWORKS

Climate risk manifests itself within the traditional risk categories that are already managed in existing risk frameworks. While managed in traditional risk categories and frameworks, there are significant gaps when it comes to climate risk, particularly in valuation and risk modeling. This leaves room for mispricing, adverse selection and negative portfolio concentration – put simply, risk of loss.

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However, on the other side, firms that successfully close these pricing gaps and incorporate climate risk into their risk and valuation models have an opportunity to reduce risk while adding returns. Therefore, adjusting valuation and risk models for climate risk is widely discussed within the industry.

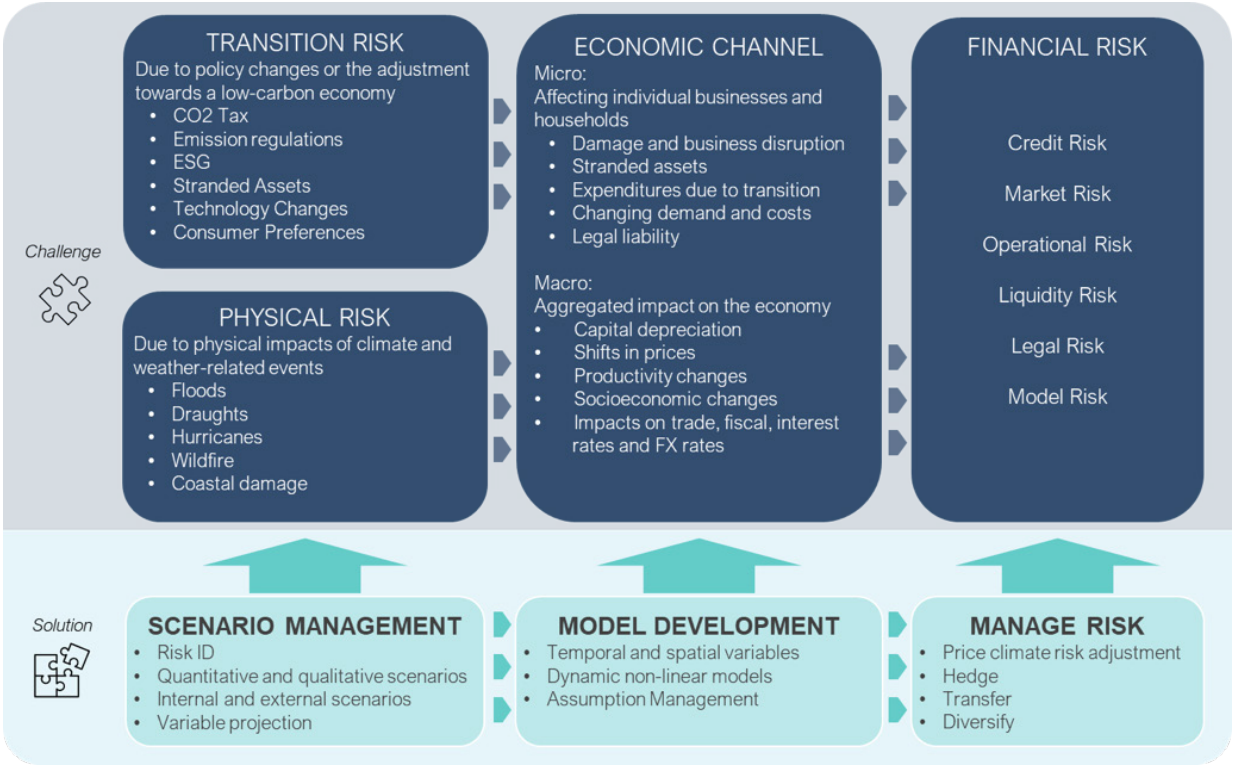

Figure 2: Climate Risk Model Framework

DEVELOPING CLIMATE RISK MODELS

The unique characteristics of climate risk pose new challenges and innovative solutions are needed to address them.

While climate risk is a global phenomenon, its impact varies broadly across regions and geographies. Spatial data and geographical information systems (GIS) will need to be incorporated into model frameworks which lead to a renaissance of GIS software providers.

Climate change is a relatively new and unprecedented phenomenon for which the existence and usefulness of historical data are inherently limited. Research has shown that many climate risk-related time-series are nonstationary which causes challenges[1].

Last, climate risk's complex and often nonlinear behavior, as well as the longer risk duration make it notoriously hard to model and subject it to considerable levels of model risk.

Very similar risk characteristics can be found in the operational risk space. Model developers regularly turn to an array of qualitative and quantitative scenarios to solve such complex modeling issues. Climate risk models can benefit from the mature scenario techniques found in the operational risk space.

Figure 3: Illustrative physical risk due to sea-level changes. Climate risk models often rely on geographical information systems (GIS) and spatial data.

The Bank of England – an advanced regulator in the area of climate risk – defined a set of candidate variables for climate risk scenarios (Figure 4)[2].

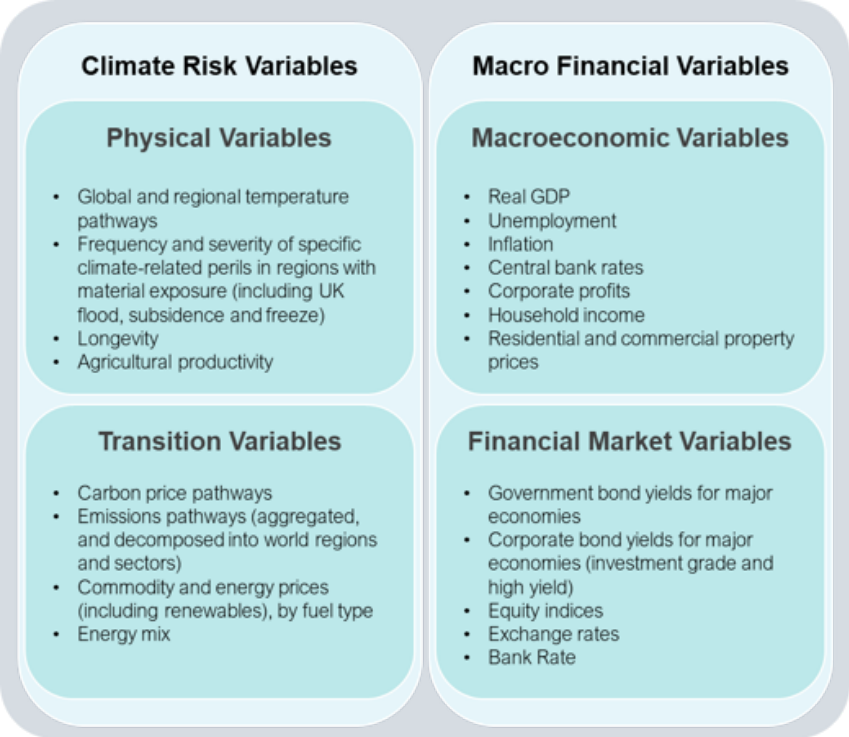

Figure 4: Variables used in climate risk models

Despite all these challenges, climate risk models are on the rise, however, with widely differing maturity stages. Unlike a few years ago, many large financial institutions in the U.S. have incorporated climate risk into their risk ID process and will continue to do so.

WHAT'S NEXT

Climate risk will likely remain top-of-mind for financial institutions and regulatory bodies alike. Regulators are expected to continue their push toward a financial system that is more transparent, resilient, and efficient. They will continue to include climate risk in their mandate albeit with differences across jurisdictions and climate stress testing will be incorporated into enterprise risk management systems and programs more broadly.

Regulators may, through their attempts to create a more sustainable economy, create significant transition risks. Policies and regulations could harm the performance of brown assets, including coal and oil producers, and may even cause sudden collapses in asset prices. Companies and investors must stay abreast of such regulations to avoid being left with any stranded assets.

Market induced disclosures and reporting requirements are expected to increase and become standardized even when regulatory disclosures differ.

Financial institutions should continue to incorporate climate risk into their existing enterprise risk management frameworks. As firms evolve along this maturity ladder, simple climate risk limit systems should evolve into climate risk pricing frameworks resulting in capital re-allocations and climate risk mitigation methods beyond simple diversification strategies. The market for financial products that transfer and hedge climate risk is already beyond its early stages and should further mature.

HOW DHG CAN HELP

DHG's Enterprise Risk and Quantitative Advisory team provides solutions in all aspects of climate risk management including sustainability and climate risk assessments, climate risk management framework development, climate risk modeling and stress testing. Our team of enterprise risk and regulatory experts, quantitative analysts and thought leaders have delivered ERM solutions across multiple industries and has the expertise needed to solve and communicate complex topics such as climate risk.

REFERENCES

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2 Bank of England Discussion Paper: The 2021 biennial exploratory scenario on the financial risks from climate change (https://www.bankofengland.co.uk/-/media/boe/files/paper/2019/the-2021-biennial-exploratory-scenario-on-the-financial-risks-from-climate-change.pdf)

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