Executive summary

"Climate risk requires a scientific mindset: quantifying risk is the first step to managing it and turning it into opportunity".
Larry Fink[19]

Climate change, rising temperatures, the increasing severity of extreme weather events, and environmental degradation represent significant risks that can impact the development of economies worldwide. As economic models are based on highly carbon-dependent sectors, global temperatures continue to rise. These climate changes generate physical risks, such as an increase in the frequency and severity of phenomena like floods and heat waves, which impact the productivity and profitability of various economic sectors and represent an economic threat to companies and governments.

Given its central role in the economy, the financial sector faces direct and indirect risks related to climate change and environmental degradation. Financial institutions are exposed to climate risks through their credit, investment and insurance portfolios. Physical risks, such as forest fires and storms, affect the productive capacity of companies and can erode the value of assets securing loans, increasing the risk of default and the deterioration of financial balance sheets. This context requires the banking and insurance sectors to re-evaluate their risk management practices in order to anticipate, manage and mitigate climate and environmental impacts.

It is therefore necessary to develop quantitative mechanisms to measure the impact that climate and environmental risks can have on the economic value of the balance sheets of institutions, with the aim of managing risks and strengthening the resilience of the financial system, thus promoting a structural change towards a sustainable economy.

Supranational requirements for measuring climate and environmental risks

The growing concern about climate change and environmental degradation has led regulators and financial authorities to establish a regulatory framework for the measurement of climate and environmental risks and to promote the integration of these risks into the management models of financial institutions.

The Basel Committee on Banking Supervision (BCBS) has developed 18 principles that form an essential pillar for the management and supervision of climate risks, covering aspects such as governance, capital adequacy and the integration of climate risks into risk analysis frameworks.

In Europe, the European Banking Authority (EBA) and the European Central Bank (ECB) have developed specific frameworks that complement these international principles. The EBA has issued guidelines on the integration of ESG (environmental, social and governance) risks into the strategy, governance and risk management systems of financial institutions. Similarly, the ECB has included in its supervisory expectations that institutions integrate climate-related risks into their strategy, risk management and disclosure, as well as conduct climate stress tests, with the aim of strengthening transparency and accountability in decision making.

Other global regulators have also adopted important frameworks. In the United Kingdom, the Bank of England has issued guidelines emphasizing the identification and measurement of climate risks in large financial institutions, while in the United States, the SEC has developed rules for the disclosure of climate risks.

These global efforts to consolidate specific regulations reflect the critical importance of climate and environmental risks in the financial system. While there are differences in approaches across jurisdictions, the convergence towards international standards points to greater integration of sustainability in the financial sector.

Climate risks

There are two main types of climate risks that affect the financial sector: physical risks and transition risks.

Physical risks refer to damage from extreme (acute) weather events, such as floods, forest fires and storms, and gradual (chronic) changes in climate, such as sea level rise and global warming. These risks directly affect the physical assets of companies and thus increase the risk of default by financial counterparties. In the case of loans secured by real estate or industrial assets, these phenomena can reduce the value of the collateral, affecting financial ratios and increasing the probability of losses for financial institutions.

[19] Laurence Douglas Fink (2020), managing director and chairman of Blackrock.

To properly assess physical risk, climate scenarios are used to forecast possible changes in climate variables, such as temperature and rainfall, on a regional and global scale. These scenarios, developed by the Intergovernmental Panel on Climate Change (IPCC), combine socioeconomic trajectories and greenhouse gas emission levels to predict different degrees of global warming and its impact on the climate.

The physical risk measurement methodology uses these projections to simulate the probability of extreme weather events and calculate the expected impact on assets in financial portfolios based on the geolocation of physical assets and their exposure to weather events. This is done using "damage curves" (also called impact functions) that quantify the likely economic loss depending on the intensity of the weather event.

On the other hand, transition risks are associated with the process of change towards a low-carbon economy. These risks arise from regulatory, technological and market changes aimed at reducing greenhouse gas emissions. Carbon-intensive sectors, such as energy and transportation, are particularly exposed to these risks, as they face potential asset devaluations or additional costs to comply with sustainability regulations. For financial institutions, transition risks represent the possibility that certain assets may lose value or that counterparties may face higher costs to adapt to new environmental regulations or technology.

Transition risk analysis uses transition scenarios that project different pathways towards decarbonization of the economy. These scenarios consider variables such as the speed with which climate policies are implemented and the level of innovation in clean technologies. The transition scenarios make it possible to forecast how the shift towards a sustainable economy could impact economic sectors, assessing the exposure of financial assets to regulatory and technological risks.

The methodology for measuring transition risks in financial portfolios uses these scenarios to estimate the impact on the credit quality and asset value of counterparties. In the case of corporate loan portfolios, the methodology applies a sectoral sensitivity analysis to assess the vulnerability of each company according to its exposure to transition risks. This analysis identifies the counterparties with the least adaptive capacity, calculating the impact on the probability of default and the loss in the event of default. Similarly, for financial asset portfolios, valuation models are used to estimate the impact of transition risk on corporate and government bonds and equities, allowing investment portfolios to be adjusted to reflect these risks.

Environmental risks

Environmental risks include ecosystem degradation, biodiversity loss and natural resource depletion. These risks are driven by factors such as deforestation, pollution and changing land-use patterns, and affect both supply chains and the security of essential resources. As such, they all pose significant threats to the economy. For financial institutions, exposure to environmental risks implies potential economic losses due to the vulnerability of counterparties in natural resource-dependent sectors.

As with climate risks, environmental risk scenarios can be used to simulate the impact of different levels of environmental degradation on financial assets. These scenarios project, for example, how the loss of pollinators or water stress may affect agricultural productivity and, consequently, the economic stability of companies in this sector.

To measure environmental risk, a methodology is proposed that focuses on assessing companies' resilience to the loss of natural resources and the vulnerability of their supply chains, analyzing the impact of resource degradation on revenues and on the sustainability of companies' assets and, therefore, on their solvency.

Methodologies and models available today are important and accessible tools for addressing complex climate and environmental challenges, enabling effective integration of these risks into financial analysis and supporting strategic decision making in a context of increasing environmental uncertainty.

The management of climate and environmental risks has become a very important issue, especially in the financial sector. Managing these risks requires quantifying the impact on the value of investments through the use of advanced methodologies and tools to strengthen decision making.

It is therefore necessary to strengthen internal governance and invest in technology to facilitate the integration of these risks into the business strategy. This process should be carried out in cooperation with regulators and by promoting sectoral initiatives to overcome data limitations, among other things.