

# Cascading Effects of Carbon Price through the Value Chain: Impact on Corporate Valuation

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At COP26 in November 2021, governments shared the need to take concrete and radical measures to cut global GHG emissions. Policies aimed at reducing these emissions and facilitating the transition to a greener economy may create important risks for carbon-intensive industries. Stress testing banks' exposures to climate risks became an important exercise among central banks. Today, a number of supervisors are considering their extension to institutional investors, such as insurance companies and pension funds. But climate stress tests are still not widespread in the investment management industry, despite the recent recommendation by ESMA (2022). Our paper offers a methodological step in that direction, and shows **how investors could implement a simple stress testing exercise at their portfolio level.**

Stress testing **the impact on a portfolio of introducing a carbon pricing mechanism** that will place an adequate price on GHG emissions, can help decision makers internalize the external cost of climate change and set economic incentives to develop clean technology. In particular, it will allow investors to analyze the potential impact of climate change on their investment portfolios and efficiently reallocate capital towards low-carbon or climate-resilient activities.

Our paper proposes to estimate the impact of **the introduction of a carbon price on firms' earnings** on the universe of firms belonging to the MSCI World Index. We consider three distinct scenarios for the carbon price, set to be equal to USD 50, 100 or 300 per ton of CO<sub>2</sub>eq. This corresponds broadly to the suggested values for the SSP2-26 (1.8°C) in 2030, SSP2-19 (1.5°C) in 2030 and SSP2-19 (1.5°C) in 2040. We consider the case of introducing a carbon pricing mechanism that would impact the operating costs of emitting corporations. We study the **cross-sector diffusion of this cost through the value chain** and its impact on consumers' demand and firms' earnings. We propose an environmental extension of the Leontief (1970) Input-Output model and micro-simulations to estimate the shock suffered by a given firm, considering both the costs of (1) firm-level direct carbon emissions and (2) indirect emissions, whose costs propagate through the various sectors and countries because of their trading links.

An important insight from our analysis is that even low carbon-intensive sectors could be substantially impacted by the introduction of a carbon price, because of its cascading effect on firms' supply chains. Although carbon intensive sectors, such as **Utilities, Energy and Materials, could suffer earnings shocks between 7% and 12%**, with the introduction of a carbon price at USD 50, **less intensive sectors such as Information Technology, Consumer Discretionary and Consumer Staples could also incur a non-negligible shock**, close to 3-4%. In the case of a higher carbon price, these effects could be exacerbated. The earnings' shock for carbon-intensive firms could reach 21% (and even 45%) on average for the most impacted sector

(Utilities), with a carbon price of USD 100 and USD 300 respectively. In these two scenarios, less intensive sectors would be also heavily impacted. For example, the Information Technology sector could be subject to earnings shocks of 6% and 17% in these two carbon price scenarios, respectively.

Interestingly, the introduction of a carbon price will also have a substantial impact on the investment universe, **distorting the sector composition of the main indices**. Our exercise based on the MSCI World index shows that introducing a USD 50/ton shock would significantly lower the weight of the Utilities, Energy and Materials sectors, while the Financials and Real Estate sectors would benefit the most.