Analyse

Pricing of climate-related risks in financial markets

22 December 2022. Floortje Merten and Niek Verhoeven

DeNederlandscheBank

EUROSYSTEEM

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Authors: Floortje Merten and Niek Verhoeven. With thanks to Aerdt Houben and David Rijsbergen for the useful exchange of views. All remaining errors are ours.

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The effects of climate change are being felt more and more in the economy and financial system. As a result, financial institutions are also becoming more alert to climate-related risks. It is important that financial markets reflect risks in asset prices appropriately to avoid financial shocks. However, an analysis of several studies shows that financial markets do not adequately price climate-related risks at present. To address this, climate-related information needs to be refined further. In this analysis, we make several proposals to improve the quality of climate-related information.

1. Introduction

The consequences of climate change are being felt more and more in the economy and the financial system.

Non-life insurers are reporting mounting climate-related damages, while it is evident that industries vulnerable to climate change and/or governmental climate policies need to undergo a major transition.1 Awareness among market participants of these vulnerabilities in the economy should translate into price adjustments in financial markets, with companies with unsustainable business models facing greater hurdles when accessing capital markets. In contrast, companies with sustainable business models should attract greater interest from investors and thus find it easier to attract cheaper financing. The Bank for International Settlements (BIS), in collaboration with De Nederlandsche Bank (DNB), brought together several experts (including scholars, market participants and central bankers) in September 2022 to share insights on the extent to which financial markets price climate-related risks.2 In this DNB Analysis, we provide an overview of (academic) research on how financial markets price climate-related risks and we share insights based on our own research. We use this as a basis to make recommendations for promoting the pricing of climate-related risks.

[1] See, among others, Capgemini & AFME (2022). *Walking the Talk. How insurers can lead climate change resiliency. Available on:* WIRPandC_2022_vFinal.pdf (worldinsurancereport.com)

[2] To this end, a literature review has also been published, see Eren, Merten & Verhoeven (2022). *Pricing of climate risks in financial markets: a summary of the literature*. Pricing of climate risks in financial markets: a summary of the literature (bis.org)

2. Literature

Climate-related risks can translate into physical and transition risks.

Physical risks involve economic and financial losses due to a changing climate (e.g. increased severity and/or frequency of extreme weather). Transition risks stem from the transition to a climate-neutral economy. These can result from government policies (e.g. carbon pricing), but can also be due to changing societal preferences or technological advances in favour of sustainable solutions (NGFS, 2019). Physical and transition risks are connected and are assumed to move in opposite directions. As our economy becomes more sustainable and/or does so more quickly, transition risks increase and expected physical risks decrease.3 At the same time, delaying effective climate policies implies higher carbon emissions in the future and thus a greater risk of more severe ramifications from climate change.4

Scholars, international institutions and market participants largely agree that financial markets do not sufficiently price climate-related risks.

Nordhaus (2019) explains that externalities due to greenhouse gas emissions can lead to a decoupling of market prices and (actual) social costs. Externalities such as climate change are not an integral part of the market system, with market failure as a potential result. The only solution is for governments to enforce higher emission pricing, according to Nordhaus. Several international institutions, including the IMF (2020), the ECB (2021) and the OECD (2021), have recently expressed concerns that market prices do not adequately reflect climate-related risks. This increases the risk of abrupt price shocks in financial markets. Sudden write-downs of assets by investors lead to financial stability risks, for example when the realisation grows among market participants that the actual market value of assets following the introduction of stricter climate policies is considerably lower than their book value.5 Market participants and scholars share this concern, according to a survey by Stroebel and Wurgler (2021). An overwhelming majority of respondents consider climate-related risks insufficiently priced into financial markets.

Research shows that physical climate-related risks are priced only to a limited extent.

For example, the IMF (2020) concludes that stock prices do not reflect expected market corrections due to physical risks under different climate scenarios, which indicates insufficient alertness among investors to climate-related risks. Moreover, studies show that the pricing of physical risk – where it occurs – is mostly reactive (rather than forward-looking). Furthermore, scholars have identified some degree of pricing in a few specific sub-markets. For instance, borrowing conditions for governments in the Caribbean are deteriorating due to extreme weather conditions. In equity markets, Acharya et al. (2022) find a robust impact of the increasing frequency of heat waves on equity valuations since 2014, but evidence for other types of physical risk is lacking.

In contrast, researchers find more evidence of transition risk pricing.

Bolton and Kacperczyk (2021) conclude that shares of companies with higher carbon emissions are perceived by investors as riskier and thus have higher required returns. Moreover, this "premium on emissions" is higher for companies in countries with stricter climate policies and a correspondingly higher

[3] See, for example, Lord, R., Bullock, S., Birt, M. (2019) Understanding Climate Risk at the Asset Level: The Interplay of Transition and Physical Risk., available on https://www.spglobal.com/marketintelligence/en/documents/sp-trucost-interplay-of-transition-and-physical-risk-report-05a.pdf

[4] The double materiality of climate physical and transition risks in the euro area (europa.eu)

[5] For more information on the implications of climate-related risks for financial stability, see, among others, European Central Bank (2021). *Climate-related risk and financial stability,* July, https://www.ecb.europa.eu/pub/pdf/other/ecb.climateriskfinancialstability202107~87822fae81.en.pdf

transition risk. Evidence of transition risk pricing can also be found in bond markets. Bonds of companies with limited potential to become more sustainable trade at a discount (Seltzer et al., 2022), and bonds of companies with lower E-scores trade at higher interest rates (Capasso et al., 2020). Moreover, markets price the risk of stranded assets to some extent. For example, boosting oil reserves has a negative impact on the market capitalisation of US oil companies, as investors believe this investment will not pay off in the long run (Atanasova and Schwartz, 2019). Finally, some researchers highlight the risk of a green bubble (Borio et al., 2022), in which an overestimation of the speed and magnitude of the transition could lead to misallocations in financial markets.

Based on our own research, we also see tentative signs of transition risk pricing.

In a forthcoming article, Broeders et al. (2023) show that the average maturity of newly issued bonds by coal companies – which are associated with relatively high carbon emissions – is slowly decreasing, while the maturity of bonds issued by renewable energy companies is increasing. This may indicate that investors are less comfortable making a long-term financial commitment in a sector whose future viability is uncertain due to climate change.

The literature shows that governments' climate policies affect the extent of transition risk pricing.

New climate policies affect the profitability of firms with high carbon emissions more than firms with relatively low carbon emissions (Hsu et al., 2022). Related to this, a rising probability of tighter climate policies results in lower share prices of companies with high exposure to transition risk (Barnett, 2019). International differences in current and expected climate policies also lead to regional differences in the extent of transition risk pricing. For example, the credit rating of European companies has deteriorated more on average than that of US companies since the Paris Agreement was signed, which may be linked to different expectations about climate policies (Carbone et al., 2021). Also, the European Emissions Trading System, in effect a form of carbon taxation, can, if appropriately priced, influence the market valuation of companies and thus provide an incentive for sustainability (see, for example, Brouwers et al., 2016). Stricter government climate policies in response to climate change are also identified in Stroebel and Wurgler's (2021) survey as the most important climate risk for companies in the short term (i.e. in roughly the next five years). In the long term (around 30 years) in contrast, physical risks are seen as the most important climate-related risks. Finally, as early as 2010, Hepburn noted that the impact of climate policies on the pricing of climate-related risks depends on the long-term credibility of those policies.

Research shows that the incomplete pricing of climate-related risks in financial markets is partly due to the limited availability and consistency of available information on these risks.

For example, the OECD (2021) warns of inconsistent and incomplete transition risk pricing in financial markets due to limited company disclosures on future emissions and their plans to reach net zero. In addition, some argue that ESG ratings aim to capture too wide a variety of factors in a single assessment, thus limiting their quality and reliability. Moreover, these ratings differ substantially between credit rating agencies (Avramov et al., 2022). Finally, the OECD (2022) concludes that the quality of companies'

disclosures on climate risk exposures and whether or not they have a formal ESG policy is in some cases more important than actual "climate performance" such as emission intensity and emission reductions.

3. Conclusions

Although research indicates tentative signs that climate-related risks are being reflected in prices on financial markets, these signals are still inconsistent and the pricing of these risks is largely inadequate.

Incomplete pricing of climate-related risks leads to an increased risk of abrupt price shocks and thus risks to financial stability. Based on the above literature, DNB makes a number of proposals to improve climate-related information.

It is essential to improve the quantity, quality and comparability of climate-related information.

To this end, mandatory disclosure requirements on companies' vulnerability to climate-related risks may be prudent. Such disclosures may not always be favourable for companies, for instance because of the costs involved or because of potential negative publicity in case of high vulnerability to physical and/or transition risks. This information is needed, however, because it allows investors to identify climate-related risks. The quality of disclosures can be improved by using forward-looking indicators such as projected emissions. In addition, international standards should be developed that indicate what information (including forward-looking indicators) should be disclosed. The new International Sustainability Standards Board, established in 2021 with the intention of streamlining climate disclosures globally and taking them to the next level of standardisation, is a first step in the right direction. Standardisation will boost the comparability of disclosures. Finally, there is a need for greater transparency in the development of discretionary scores, such as ESG ratings. This will clarify how rating agencies establish their scores, thus further enhancing comparability.

4. Bibliography

Atanasova, C and E Schwartz (2019): "Stranded fossil fuel reserves and firm value", NBER Working Papers, no 26497, November. https://www.nber.org/papers/w26497.

Barnett, M (2019): "A run on oil: climate policy, stranded assets, and asset prices", unpublished working paper, June. https://www.frbsf.org/wp-content/uploads/sites/4/Paper-7-2019-11-8-Barnett-240PM-1st-paper.pdf.

Bolton, P and M Kacperczyk (2021): "Do investors care about carbon risk?", Journal of Financial Economics, vol 142, no 2, November, pp 517–49. https://doi.org/10.1016/j.jfineco.2021.05.008.

Borio, C, S Claessens and N Tarashev (2022): "Finance and climate change risk: managing expectations", VoxEU, 7 June. https://www.bis.org/speeches/sp220607.htm.

Broeders, D, N Verhoeven, I Tiems and B Schouten (2023): "Pricing of climate transition risks across different financial markets." Forthcoming

Brouwers, R., Schoubben, F., Van Hulle, C., Van Uytbergen, S. (2016). The initial impact of EU ETS verification events on stock prices. Energy Policy 94 (2016).

Carbone, S, M Giuzio, S Kapadia, J S Krämer, K Nyholm and K Vozian (2021): "The low-carbon transition, climate disclosure and firm credit risk", ECB Working Paper, no 2631, December. https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2631~00a6e0368c.en.pdf.

European Central Bank (2021): Climate-related risk and financial stability, July. https://www.ecb.europa.eu/pub/pdf/other/ecb.climateriskfinancialstability202107~87822fae81.en.pdf.

Hepburn, C. (2010). Environmental policy, government, and the market. Oxford Review of Economic Policy, Volume 26, Issue 2, Summer 2010, Pages 117–136, https://doi.org/10.1093/oxrep/grq016

Hsu, P H, K Li and C Y Tsou (2022): "The pollution premium", Journal of Finance, forthcoming. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3578215.

Huynh, T and Y Xia (2021): "Climate change news risk and corporate bond returns", Journal of Financial and Quantitative Analysis, vol 56 no 6, September, pp 1985–2009. https://doi.org/10.1017/S0022109020000757.

International Monetary Fund (2020): "Chapter 5: Climate change: physical risk and equity prices", Global Financial Stability Report, no 2020/001, April. https://www.imf.org/en/Publications/GFSR/Issues/2020/04/14/global-financial-stability-report-april-2020#Chapter5.

Network for Greening the Financial System (NGFS) (2019): "A call for action. Climate change as a source of financial risk." First Comprehensive Report, April.

https://www.ngfs.net/sites/default/files/medias/documents/ngfs_first_comprehensive_report_-_17042019_0.pdf

Mallucci, E (2022): "Natural disasters, climate change, and sovereign risk", Journal of International Economics, vol 139, November. https://doi.org/10.1016/j.jinteco.2022.103672.

Nordhaus, W (2019): "Climate change: the ultimate challenge for economics", American Economic Review, vol 109, no 6, June, pp 1991–2014. https://doi.org/10.1257/aer.109.6.1991.

Organisation for Economic Co-operation and Development (OECD) (2021): Financial markets and climate transition: opportunities, challenges and policy implications, OECD, Paris. https://www.oecd.org/finance/Financial-Markets-and-Climate-Transition-Opportunities-Challenges-and-Policy-Implications.pdf

Organisation for Economic Co-operation and Development (OECD) (2022): "ESG ratings and climate transition: An assessment of the alignment of E pillar scores and metrics", OECD Business and Finance Policy Papers, no 06, June. https://doi.org/10.1787/2fa21143-en.

Seltzer, L, L Starks and Q Zhu (2022): "Climate regulatory risks and corporate bonds", Federal Reserve Bank of New York Staff Reports, no 1014, April. https://www.newyorkfed.org/research/staff_reports/sr1014.

Stroebel, J and J Wurgler (2021): "What do you think about climate finance?", Journal of Financial Economics, vol 142, no 2, November, pp 487–98. https://doi.org/10.1016/j.jfineco.2021.08.004.