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## SPOKE 4

# D4.1.3 – Policy briefs and best practices for SME's access to sustainable finance instruments

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# The tail impact of ESG risk

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## Executive Summary

*The European Central Bank (2020) defines Climate Transition Risk as "an institution's financial loss that can result, directly or indirectly, from the adjustment process to a less carbon and more environmentally sustainable economy". This represents a concern rooting in the Paris Agreement, pushing countries to introduce carbon reduction policies for controlling or limiting the impact on climate change. Many studies have addressed the issue of measuring Climate Transition Risk, how it emerges and how it impacts on the countries' economy, but less attention has been given to the transmission of climate transition across countries (or financial markets). This aspect deserves more attention, due to the globalization of the financial markets and the strong trade and financial links across countries. The study of Yang, Caporin, and Jiménez-Martin (2024) provides a criterion for measuring the spillover originating from climate transition risk, disentangling the simultaneous reaction from the non-simultaneous one, the latter coming from a predictive view. The non-simultaneous risk transmits within 6 weeks from an originating event, with positive and negative shocks being characterized by different speeds of transmission. Economics and financial links across countries/markets represent a major channel for climate transition risk spillover.*

## ESG exposure as a source of risk

In recent years, the interest for Environmental, Social and Governance (ESG) investments has sensibly increased, mostly from the COVID-19 crisis onward. Rating of companies according to ESG criteria become more popular and widespread, as well as the interest of institutional and retail investors. A similar pattern has been observed from the academic point of view, with an increase in studies and research focusing on the role and relevance for ESG investments and ESG ratings. On the investment side, the request for ESG companies with higher (better) ESG scores (ratings) has increased, and from the research viewpoint, specific topics attracted interest, specifically, for determining the pricing implications of the exposure to ESG risks. For the latter, a commonly followed approach is the construction of an ESG risk factor, following the seminal contribution of Fama and French (1993, 2020); see, among others, Lioui and Tarelli (2022). Given a risk factor, the estimation of a compensation for the exposure to a ESG risk source (an ESG risk premium), can be estimated using market data. Results in the literature are mixed, depending on the period of the analysis, the assets included in the investment universe, and the methodology adopted for the construction of the ESG risk factor.

In this strand of the academic and practitioner's literature, the focus is on the evaluation of ESG risk or of the ESG exposure in driving the returns of investments, while less attention is given to the measurement of the impact of the ESG exposure on the risk side. The perception is that companies with high ESG ratings should be less impacted by negative shocks or be less risky during turbulent times (Nofsinger and Varma, 2014, and Dong et al., 2019). Despite that, the relation between ESG risk exposure and the downside risk of investments has received less attention. In this regard, the study of Yang et al. (2024) tries to provide some insights.

The first step is given by the evaluation of how much ESG activities of companies are realized as benefits in the market. This is obtained following the current literature, thus estimating an ESG risk factor using a cross-sectional approach in the spirit of Fama and French (2020), and accounting for other cross-sectional company characteristics. Specifically, the ESG risk factor return at period $t$ is estimated as the coefficient $f_{ESG,t}$ in the cross-sectional regression

$$R_{i,t} = \alpha_{0,t} + f_{ESG,t} ESG_{i,t-1} + f_{MV,t} MV_{i,t-1} + f_{BM,t} BM_{i,t-1} + f_{OP,t} OP_{i,t-1} + f_{INV,t} INV_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where $R_{i,t}$ is company *i* stock return of period *t*, $ESG_{i,t-1}$ is company *i* ESG rating at period *t-1*, while $MV_{i,t-1}$, $BM_{i,t-1}$, $OP_{i,t-1}$, $INV_{i,t-1}$ are the market value, the book-to-market ratio, the operating profitability and the investment, respectively, for company *i* in period *t-1*. Note that all the right-hand side variables are standardized in the cross-section of companies, ensuring that $f_{ESG,t}$ can be interpreted as a portfolio return (see Lioui and Tarelli, 2022). For the estimation of the ESG risk factor, a large collection of companies quoted on one or more markets must be used. By running the cross-sectional regression for multiple consecutive periods, Yang et al. (2024) recover a sequence of ESG risk factor returns. Beside the ESG risk factor, other risk indicators are simultaneously recovered for the other company characteristics ($f_{MV,t}$, $f_{BM,t}$, $f_{OP,t}$, and $f_{INV,t}$).

The second, and most relevant step makes use of the ESG risk factor returns to determine the ESG impact on the downside risk of quoted companies. To this purpose, Yang et al. (2024) suggest adapting to a sustainability framework the systemic risk indicator Delta Conditional Value-at-Risk (ΔCoVaR) introduced by Adrian and Brunnermeier (2016). The novel tail measure of ESG impact they propose is called Delta Conditional ESG Risk (ΔCoESGRisk) and monitors the reaction of a target institution or portfolio tail measure when the ESG risk factor moves from a median to a tail value. The construction of this ESG tail risk indicator builds on the estimation of two different models. First, for the ESG risk factor, a Conditional Autoregressive Value-at-Risk (CAViaR) model of Engle and Manganelli (2004) is estimated, obtaining the θ conditional quantile and conditional median of the ESG factor, denoted as $VaR^{\theta}_{ESG,t}$ and $VaR^{0.5}_{ESG,t}$, respectively. Then, by resorting to quantile regression (Koenker, 2005) a θ conditional quantile for the target institution or portfolio is estimated as

$$Q^{\theta}_{i,t}(R_{i,t}) = \alpha_{i,\theta} + \beta_{i,\theta,ESG} f_{ESG,t} + \beta_{i,\theta,MV} f_{MV,t} + \beta_{i,\theta,BM} f_{BM,t} + \beta_{i,\theta,OP} f_{OP,t} + \beta_{i,\theta,INV} f_{INV,t}. \quad (2)$$

Finally, the ΔCoESGRisk is obtained as

$$\Lambda CoESGRisk = \beta_{i,\theta,ESG}\left(VaR^{\theta}_{ESG,t} - VaR^{0.5}_{ESG,t}\right) \quad (3)$$

where the conditional quantiles of the ESG factor are combined with the sensitivity of a company return's tail to the ESG factor (the $\beta_{i,\theta,ESG}$ parameter). This indicator allows determining the tail impact of changes in the ESG risk factor for a given institution, and when the indicator in (3) is evaluated for a panel of companies, it

allows contrasting the downside impact of the ESG risk by conditioning, for instance, on the company size and on the company ESG rating.

The approach of Yang et al. (2024) is flexible and makes it possible to analyse not just the downside risk, but the entire distribution of a company returns conditional to the ESG risk factor providing specific values (namely, at a quantile of its distribution). Following Bonaccolto et al. (2019), in their work, Yang et al. (2024) show how to estimate the conditional quantile model in (2) when the ESG risk factor is close to a specific target value (one of the ESG risk factor quantiles), allowing the construction of returns densities conditional to ESG risk factor levels. Therefore, this allows evaluating how companies with high/low ESG rating reacts to ESG risk factor taking extreme large/small values.

## Policy Options and Analysis

### Option 1: companies' tail reaction to ESG risk

- **Analysis:** by estimating the $\Lambda CoESGRisk$ over time and for a large panel of European quoted companies, it will be possible to determine the downside impact of the ESG risk, and evaluate if this risk differs according to various company characteristics (economic sector, company size, ESG rating, carbon emissions).
- **Policy Implications:** financial market reactions to ESG or more generally to climate shocks might lead different downside risk for single companies and portfolios held by investors (institutional and private). Understanding the downside ESG risk is fundamental for the mitigation of its impact.

### Option 2: ESG risk impact across economic sectors and ESG ratings

- **Analysis:** by estimating the quantile model of Yang et al. (2024) for a wide range of quantiles and conditional on several ESG risk levels, we have access to a powerful tool for determining the ESG risk impact for companies belonging to different economic sectors and/or characterized by varying levels of ESG ratings.
- **Policy Implications:** both risk management and portfolio allocation could benefit from a detailed knowledge of companies' reaction to ESG risk, allows to better design portfolios private and institutional investors, and to better monitor the portfolio risk level.

## Recommendations

1. When implementing ESG-related risk management policies analyzing the relation between ESG risk factors and companies or portfolios returns is fundamental to allow proper measurement and monitoring of downside risks.
2. Financial intermediaries should account for the different downside risk features characterizing companies belonging to different economic sectors or having different ESG ratings.

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