

MISTRA FINANCIAL SYSTEMS

MISTRA FINANCIAL SYSTEMS IS A RESEARCH PROGRAM EXPLORING HOW FINANCIAL SYSTEMS MORE EFFECTIVELY CAN WORK FOR SOCIAL AND ENVIRONMENTAL SUSTAINABILITY

ANNUAL REPORT 2019

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ABOUT MFS

Mistra Financial Systems (MFS) was set up in 2016 as an interdisciplinary research program with the goal to assess how the financial sector can contribute to sustainable development. Sweden is a forerunner in this regard, and Swedish investors and financial institutions are keen to play their part besides politicians and companies. The unique feature of MFS is that it puts the different financial actors into context and assesses classical finance problems on the one hand, but on the other hand considers ethical and natural science perspectives by pointing out linkages between financial flows and ecosystem protection as well as social welfare and policy discussions. To organize these varied scientific approaches, MFS projects are clustered in the five work streams *Green Macro*, *Policy*, *Market Drivers*, *Governance* and *Practical Tools*. The former three take a system perspective including the natural environment, political economy approaches and the special characteristics of “sustainable markets”, for instance the market for renewable energy or the specific needs of sustainability start-ups, while the latter two use established finance theories and methods to adjust asset evaluation techniques with regard to sustainability issues, enhance corporate reporting and decrease information asymmetries between issuers and investors, as well as households, and assess different incentives and regulatory frameworks to correct market failures in the financial sector.

The multifaceted nature of the program is reflected in its constitution from renowned academic institutions in business and social sciences as well as natural sciences and engineering: The five research teams are located at the *Stockholm School of Economics (SSE)*, the *Lochlainn Quinn School of Business at the University College Dublin (UCD)*, the *KTH*

Royal Institute of Technology, the *Stockholm Resilience Center (SRC)* and the *Stockholm Environment Institute (SEI)*. The Board of the Program furthermore brings together experts from the finance sector, economic politics and international academia: Peter Norman, former Swedish Minister for Financial Markets chairs the Board, and the members Christoffer Järkeborn, Ingrid Werner and Per Krusell represent i. a. Skanska, Ohio State University, the Stockholm University’s Institute for International Economic Studies and the committee of the Swedish Riksbank Prize in Economic Sciences in Memory of Alfred Nobel.

In August 2019, the Executive leadership was handed over to Michael Halling, Associate Professor at SSE and Research Fellow at the Swedish House of Finance, who succeeded Professor Bo Becker as Program Director of MFS. Michael Halling has a particular research and teaching focus on asset and risk management. Those are two key areas within finance and are very closely related to environmental, social and government (ESG) issues. “When

interacting with financial stakeholders, I experience more and more that sustainability has become a key challenge for asset managers in the last couple of years. While on paper a large fraction of invested capital has shifted towards green and sustainable investments, a lot of these activities can be classified as ‘green washing’ yet, rather than the reflection of a fundamentally changed investment approach”, he points out. “This is in parts due to the lack of knowledge and methodology – research on the interactions between sustainability and expected returns as well as risk exposures is still scarce, albeit growing at a rapid pace. I am very excited to join MFS and contribute to close this gap.”

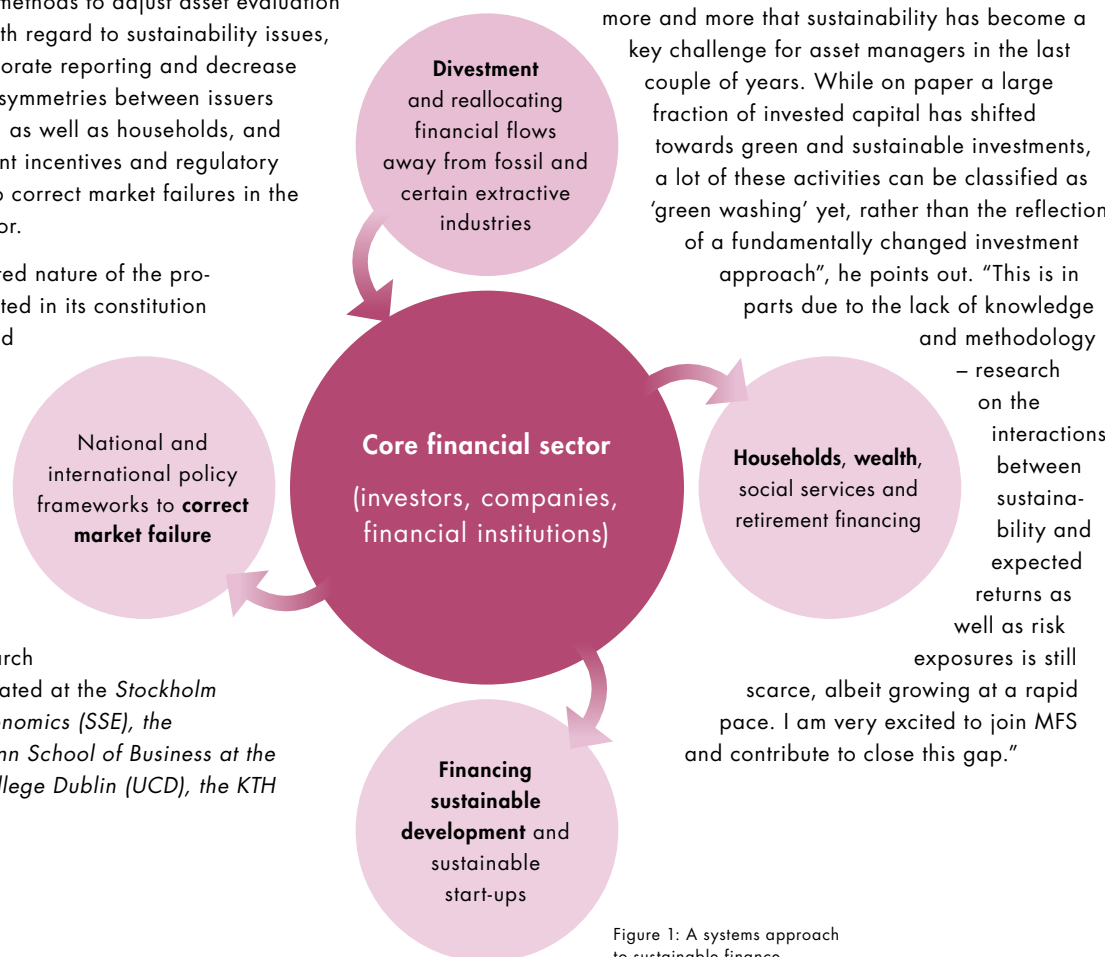
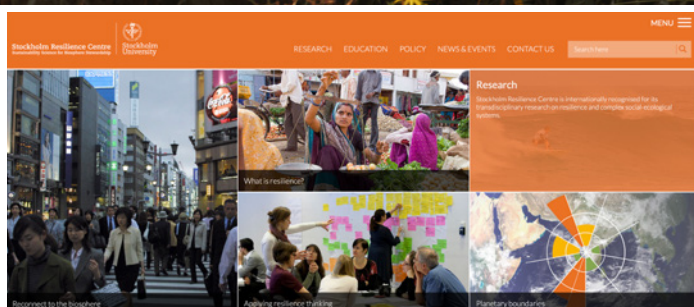


Figure 1: A systems approach to sustainable finance.



ADDRESSING THE KEY CHALLENGES FOR SUSTAINABLE FINANCE

Financial institutions provide essential services for society. The sector allows households to save and borrow, buy houses and retire. It is essential for modern production and building all kinds of infrastructure, and facilitates the realization of new business models. At the same time, many outcomes are detrimental for sustainable development due to three fundamental aspects:

- 1) Market failure
- 2) Short-termism
- 3) Increasing inequality

Market failures are well-known problems for economists with far reaching consequences but no panacea to solve them. They stem from environmental and social ('external') costs of production that are not reflected in market prices, leading to too high profits and excessive growth rates, with carbon emissions, climate change and biodiversity loss being prominent examples. Concomitantly, a range of entrepreneurship, societal organizations, and not least ecosystem services like water purification, nutrient cycling or recreational value provide societal benefits that are not paid for in markets, leading to an under-provision of those goods. Furthermore, market mechanisms only work efficiently when all agents have complete and equal information, but financial markets are subject to large information asymmetries between the issuers and buyers of assets and bonds, and there is considerable uncertainty about future development and many factors that might influence the income of households and organizations that are not taken into account by them, for instance market disruption, stranded assets or environmental disasters.

These shortcomings require political regulation. But which instruments out of the domestic government toolkit are most effective in correcting the multiple, partly interdependent, problems? Is it rather command-and-control measures, monetary or fiscal policies, or incentives in the form of public investments or tax benefits? What are the costs compared to the benefits, and are there potential unintended side-effects? Which mechanisms and actors have to be taken into account? And where do we need rather international policymaking? Since sustainability problems arise predominantly outside the classical financial sphere, we also need to think about how to include social and environmental aspects in the modus operandi of financial institutions, which is mostly driven by numbers and (short-term) profits. Researchers play a crucial role here in collecting data and making sense of it in the financial context, adjust the conventional models of pricing and risk evaluation and test success factors for more far-sighted investment strategies.

Apart from the transforming inimical practices within the financial sector, the other big question is how financial capital can be reallocated to reduce inequality, to secure vital ecosystem functions and to facilitate sustainable innovations and pursue the sustainable development goals. According to the special World Investment Report on the SDGs (UN, 2014), there are global investment needs in the order of \$5 trillion to \$7 trillion per year. In developing countries alone, \$3.3 trillion to \$4.5 trillion annual





investments are estimated, mainly for basic infrastructure, food security, climate change mitigation and adaptation, health, and education. This implies determined changes in both public and private investments, international capital flows and allocating capital to new business models, new ventures and new types of partnerships to facilitate the sustainability transition. Although more and more investors, as well as households that place money in pension funds, are increasingly conscious about sustainability issues and want to allocate capital accordingly (the Principles for

Responsible Investment (PRI) association alone, for instance manages assets of almost \$35 trillion), it remains a big challenge to match supply and demand, in particular due to the lack of information, and to the prioritization of returns.

Against this backdrop, bilateral relations have to be extended by new partnerships and support schemes, for example payments for ecosystem services, special funds for social enterprises, crowdfunding, and a more effective market for green and social bonds.

GREEN MACRO

The aim of Green Macro is to study the dynamic behavior of macro-financial systems on the path to a decarbonized society. The stream combines macroeconomic modelling, empirical techniques and political economy analysis to study:

i) the potential risks of financial instability linked to the low-carbon transition, ii) how financial regulators could mitigate these risks, iii) the implications of a long-term 'secular stagnation' for sustainable investments

POLICY

The ambition behind the policy projects is to explore policies for financial transition. In contrast to "Governance", the emphasis is more on holistic and long-term questions that address how financial systems can be transformed to properly account for ecological and social matters, not only profit. Important topics are:

i) policies and partnerships for transition, ii) public investments as leverage for transition, iii) linkages between finance and ecosystems

MARKET DRIVERS

The central theme is modeling directed technical change to study implications of environmental policies for a renewable energy transition. The research focuses on:

i) the importance of the financial sector for innovation in clean tech, ii) analysing Swedish innovation data, iii) facilitating technical change through access to finance and regulation

GOVERNANCE

Which structures of financing, governance and practices within the financial industry are beneficial or counteractive for sustainable development? More specifically:

i) the demand side, investment behavior and financial product design, ii) diversity and governance, iii) finance for sustainable firms and angel investors

PRACTICAL TOOLS

How can the different financial institutions in the current system work for sustainable development? The stream uses empirical research to develop tools for investors to assess and measure sustainability via:

i) evaluating the effectiveness of investments, ii) evaluating carbon disclosure, iii) developing benchmarks and indicators for the importance of different sustainability goals

Figure 2. MFS work streams and key questions

THE MFS WORK STREAMS

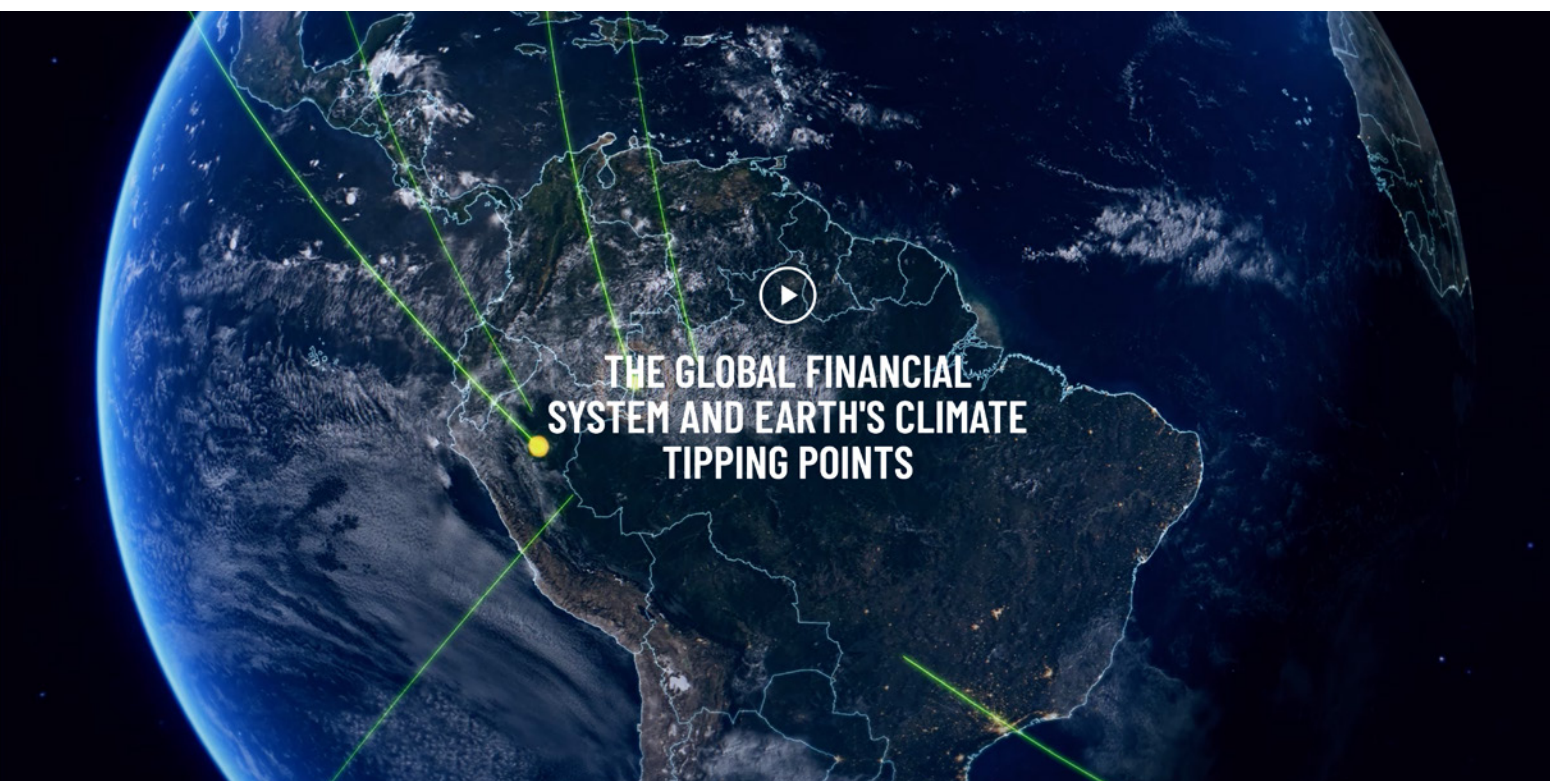
MFS is structured in five work streams that apply different perspectives and analytical methods: "Green Macro" takes the systemic and long-term point of view on a low-carbon transition, while "Policy" and "Market Drivers" focus on policies and actors facilitating this transition as well as the role of alliances and firms to enable technical change. The "Governance" and "Practical Tools" streams, then again, try to identify root causes of unsustainable practices within the financial sector and develop solutions for its current challenges.

PRACTICAL RELEVANCE

Sustainable Finance has become a priority for politicians, investors, businesses and a significant number of con-

sumers, but all these stakeholders keep pointing out the need for more knowledge, reliable standards and data. At the *corporate level*, sustainable finance means above all a broader evaluation of firm's assets and the social and environmental impacts of their activities. So-called Environmental, Social and Governance (ESG) factors are increasingly important for investors, but there is a lack of standards and procedures to measure and report on them. The "Practical Tools" research team therefore puts emphasis on quantifying ESG matters and work stream leader Andreas Hoepner pursues the development of international frameworks, in particular for corporate carbon disclosure, as member of the European Commission's Technical Expert Group on Sustainable Finance (EU TEG).

The key question for *investors* and *financial analysts*, then



THE GLOBAL FINANCIAL SYSTEM AND EARTH'S CLIMATE TIPPING POINTS

again, is how a company's ESG performance relates to its financial returns. Despite the fact that systematic ESG studies are in an infant state, there is certain evidence that high ESG scores are positively related to financial returns. It is unlikely, however, that the honest commitment to enhanced ecological and social conditions will result in the same excessive growth rates in profits and returns that are hailed in shareholder capitalism. Educating large and small-scale investors about the limits and opportunities of "sustainable investments" and proposing solid arguments why and how to invest accordingly is therefore crucial. MFS researchers are in continuous interaction with the *Swedish Sustainable Investment Forum (SweSIF)* that unites big institutional investors, banks, insurance companies and several NGOs and have presented, for example, important empirical findings related to risk-adjusted returns and projections of price developments in line with decarbonization strategies at different fora and conferences.

Sweden is acknowledged internationally for its leading role for sustainable development, and politicians and businesses seek to provide role models for low-carbon and green transitions. The macro-economic and integrated environmental economic models that have been developed by the MFS teams at SEI, KTH and SSE are important tools to evaluate the effectiveness of major policies like carbon taxation or green investment plans, and the Stockholm Sustainable Finance Center (SSFC) as joint initiative between finance and environmental scholars from MFS and the

Swedish Government has become an established platform to convey such scientific results. With regard to the demand side for "green assets", studies have been conducted on how *households* relate to sustainable investments and identified behavioral and educational problems that are likely to result in sub-optimal outcomes.

DEVELOPING THE ACADEMIC FIELD

Mistra Financial Systems has not only pursued knowledge transfer between research and practice, but strengthened interdisciplinary collaboration between natural sciences and economics as well. The connection between finance and (environmental) system sciences is decisive to work out strategies for sustainable transition pathways for society with all its complexities. While it is particularly important for policymaking to point out such systemic interlinkages, representatives of the field of finance benefit from the environmental assessments to enhance asset pricing methodologies and risk modeling. "MFS has had a significant impact on the finance department at SSE (Swedish House of Finance, SHoF)", says Gustav Martinsson, leader of the "Governance" work stream. "Sustainable Finance is now one of the major research fields at SHoF, and given its outstanding international reputation this will hopefully be a leverage for academic work in other countries as well. This is really necessary, with regard to the fact that not even 0,1 % of the articles that have been published in the leading 21 finance journals in the last years address urgent global challenges like climate change."

RESEARCH HIGHLIGHTS

LÖÖF, H. & STEPHAN, A.: THE IMPACT OF ESG ON STOCKS' DOWNSIDE RISK AND RISK ADJUSTED RETURN

REPORT FOR THE SWEDISH AGENCY FOR GROWTH POLICY ANALYSIS' WORKING PAPER SERIES



Hans Lööf, co-author and work stream lead of 'Market Drivers'.

Are companies pursuing a Corporate Social Responsibility (CSR) agenda benefiting shareholders by reducing their financial downside risk? The report by Hans Lööf and Andreas Stephan investigates the relationship between a firm's environmental, social and corporate governance (ESG) scores and the Value-at-Risk (VaR) volatility of its assets

on the stock market. While a number of meta-analyses suggest a positive association between CSR and firms' financial performance, sustainable financial systems have to go beyond this and focus more on the long-term resilience of markets and appropriate risk management.

Lööf and Stephan point out that there are only very few studies on the link between a firm's social policy and its financial downside risk. Apart from this, the existing econometric studies on ESG and different measures of firm performance exhibited some technical limitation due to minimal time variation in the measure of firms' social policy due to limited observation periods and mainly yearly observations.

Their paper responds to these shortcomings by estimating the impact of firms ESG scores on their VaR performance. Lööf and Stephan estimate the VaR and ESG scores of nearly 900 European stocks, using time series from 2005 until 2017 which use *daily* stock market returns and monthly ESG scores and test if there is a reverse relation between the ESG scores and the actual VaR of the stocks.

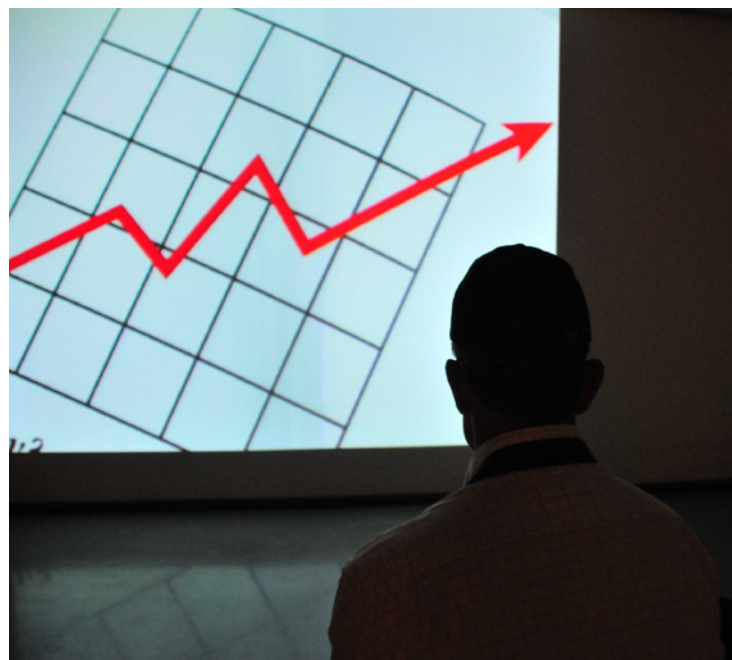
First, VaR were estimated for all stocks using five different time series procedures and moving 1000 days windows for the returns. Subsequently the obtained VaR values were regressed on lagged aggregated ESG scores for the respective firms. The monthly ESG scores were obtained from Sustainalytics which provides global research and data related to ESG and corporate governance. The results show a negative correlation between the ESG variables and VaR on a significant level, which means that firms' downside risk decreases with a positive change of ESG rating.

"The 95%-VaR point estimate for Swedish companies displayed in the upper panel, is -0.416, significant at the 10% level, indicating that a 1% higher ESG score is associated with 0.4% lower 95%-VaR."

The model applied by the MFS researchers also revealed some interesting variations in the impact of ESG scores dependent on the location of the companies and with regard to timing. The analysis includes 81 Swedish stocks, and 796 stocks from German, French, Dutch, and UK companies.

In general, the reducing effect of the ESG score is strongest after two months. This is explained with the assumption that changing corporate policies may need some time until they practically affect firms' financial performance.

Swedish stocks' risk appears to be more sensitive to ESG score than stocks in other European countries, Swedish stocks' downside risk is sensitive to scores in all variants. In contrast, Dutch stocks' risk is not affected by ESG scores' variation in almost all cases. The VaR of stocks listed in Germany appears to be more correlated with ESG scores with a certain delay compared to current ESG values. Regarding the sample of companies listed in the United Kingdom, the results suggest that different VaR levels alter lag importance and in France, surprisingly, the Environment score does not appear to have any effect on market risk of firms.



Eventually, the empirical analysis also includes a Fama-French three factor model to test the a priori assumption that 1) successful CSP engagement, 2) reduced downside volatility and 3) lower downside risk should not be positively associated with a high risk-adjusted return. For the whole sample of all countries, the impact of a firm's ESG score is not statistically significant here. For the Swedish stocks, however, the ESG variable has a positive and statistically significant effect on risk-adjusted returns, more precisely a 1% increase in ESG score causes a 0.085% increase in stocks' risk adjusted return.

The study underlines the importance of considering ESG factors in the bigger picture of financial analysis. For

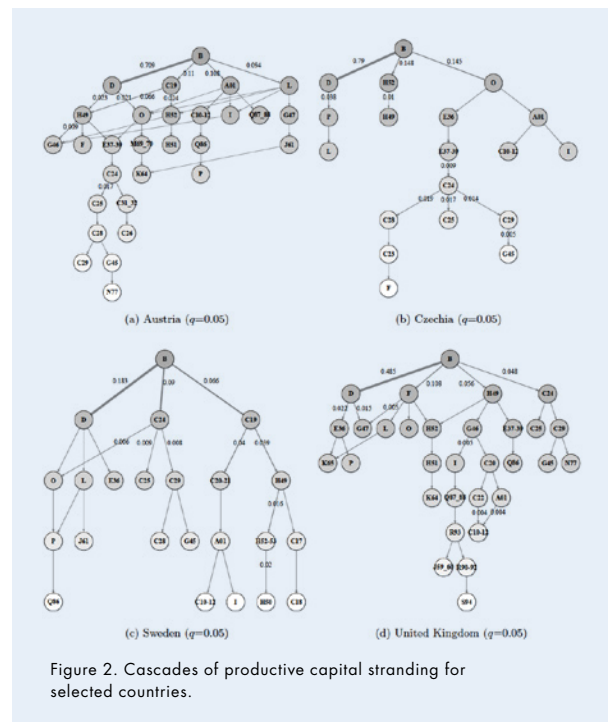
instance, the capital asset pricing model (CAPM), commonly used to determine a theoretically required rate of return of an asset and for making decisions about adding assets to a well-diversified portfolio, states that lower risk should be associated with lower required return on the stock, and vice versa. Thus an important implication of improved ESG performance and reduced downside risk is that firms can lower their capital costs, not only on equity markets but also with respect to debt. For instance, a bank might be willing to give a firm a loan with lower interest rates if that firm's ESG scores are high and thus the firm-specific risk is low. In the equity market, a growing number of investment funds consider ESG factors in their investment strategies.

CAHEN-FOUROT ET AL.: CAPITAL STRANDING CASCADES. THE IMPACT OF DECARBONIZATION ON PRODUCTIVE ASSET UTILIZATION.

WORKING PAPER

There are few governments and business leaders left that don't acknowledge that profound changes are needed to mitigate climate change and transform towards a low-carbon economy. Such a transition requires systematic efforts and dealing with a lot of complexity and interdependencies. If not properly managed, the process of decarbonization might result in reduced economic prosperity, unemployment and financial instability. A significant body of work has been developing to study the effects of so-called "stranded assets", in this case assets related to the fossil fuel industry that lose their value prematurely and a lack of anticipation (Caldecott, 2018). However, fossil reserves are only part of the picture. In a rapid low-carbon transition, a large amount of built infrastructure, industrial plants and machinery would have to be abandoned or entirely reconverted. Cahen-Fourot et al. refer to this as "cascades of capital stranding" which means that the devaluation of fossil reserves translates to the devaluation of physical capital in many other sectors supporting the real economy.

This article is pioneering in that it develops a novel methodological framework to investigate the exposure of economic systems as a whole to the risk of physical capital stranding. Combining Input-Output (IO) and network theory, the authors define measures to identify both the sectors likely to trigger relevant capital stranding cascades and those most exposed to capital stranding risk. More specifically, they construct national sector matrices and "asset stranding multipliers" that capture the monetary value of physical capital stocks in various sectors that



would become idle (i.e. stranded) due to a unitary drop in primary inputs to this sector.

For a sample of ten European countries, the researchers depict a similar pattern, despite differences in the peculiarities of each country's industrial structure. The sectors

	Total Capital		Mining (B)		Manufacturing (C)		Electricity/gas (D)	
Austria	5,689	(0.8%)	431	(16.0%)	1,706	(2.4%)	3,315	(12.5%)
Belgium	3,181	(0.6%)	1	(0.1%)	2,692	(3.0%)	285	(1.2%)
Czechia	17,536	(3.7%)	4,075	(60.9%)	2,772	(3.3%)	6,718	(25.7%)
Germany	40,752	(1.0%)	3,629	(29.6%)	12,702	(2.8%)	21,627	(12.2%)
Greece	8,774	(2.7%)	1,313	(48.7%)	1,800	(8.1%)	2,683	(17.1%)
France	35,514	(1.4%)	3,644	(21.4%)	3,877	(2.1%)	21,913	(23.3%)
Italy	58,589	(2.1%)	2,252	(10.7%)	19,776	(4.9%)	30,565	(14.0%)
Sweden	3,970	(0.8%)	55	(1.4%)	1,762	(2.2%)	1,856	(3.1%)
Slovakia	18,749	(8.2%)	473	(15%)	3,220	(7.7%)	13,458	(35.1%)
UK	84,678	(3.6%)	45,900	(69.3%)	7,385	(2.9%)	28,384	(35.7%)

Table 1. Productive capital stock at risk of stranding (million € at current prices in 2010 and share of total/sectoral capital stocks).

most at direct risk of stranding include electricity and gas; coke and refined petroleum products; basic metals; and transportation and storage. The stranding in electricity and gas often cascades in a significant manner down to public administration and water-related services. The coke and refined petroleum products sector affects the capital stock of the chemical and land transport sectors the most, with further links to the rest of transportation sectors (water and air transport, warehousing and postal services). Finally, the stranding in the basic metals sector has significant impacts on fabricated metal products and motor vehicles, which in turn cascade down to the trade and repair of motor vehicles. In contrast, the service sectors appear to be the least at risk in terms of transition-related physical asset stranding.

Through the combination of a lot of statistical material with national economic structures, the authors are able to depict which sectors are affected by which degree. In contrast to the particularly exposed sectors from above, out of the primary sectors, only agriculture is present in the cascade networks (presumably due to high fossil-fuel inputs in modern agricultural systems), while forestry and fishing never appear. Service sectors such as information and communication, finance and insurance, professional services, administrative services, human health and social work services, and arts and recreation services, also tend not to be present in the networks, or only to appear at lower layers, suggesting that the decarbonization process might not be particularly detrimental for them in terms of capital asset stranding.

Eventually, Cahen-Fourot et al. also provide quantitative estimates for the assets at risk.

"We calculate that the lower-bound amount of assets at risk of transition-related stranding is in the range of 0.6–8.2% of the overall productive capital stock for our sample of countries. These results depict the significant risks and systemic relevance of stranded capital in Europe."

Results differ widely across countries, ranging from less than 1% of capital stock in Belgium and Sweden to more than 8% in Slovakia. In absolute terms, the largest countries in terms of capital stock are also the most affected ones. In the majority of countries in the sample at least half of the stranding takes place in the electricity and gas sector. The main exceptions are the United Kingdom, where a large part of the stranding happens in the mining industry, and Belgium, where manufacturing is the sector proportionally more at risk.

Due to data availability and limitations of IO data, the estimates provided should be taken as rough ballpark figures.

First, it is likely that the decarbonization process would entail a gradual phase-out of fossil fuels utilization as production inputs rather than a sudden and complete disappearance (Kemp-Benedict, 2018). In this sense, the figures provided should be interpreted as the upper bound of capital stocks that would potentially become idle due to a low-carbon transition. In a dynamic perspective, a forward-looking technological shift to low-carbon inputs, combined with the gradual depreciation of current fossil-intensive capital stocks, would lead to lower stranding impacts. Then again, the authors underline that much current research related to the macro-economic implications of climate mitigation trajectories through numerical simulations, usually predicated on the assumption of full capital utilization, might be underestimating the economic effects of a low-carbon transition.



Eric Kemp-Benedict, co-author and work stream lead of 'Green Macro'.

INTERVIEW WITH ANDERS ANDERSON (SSE) ABOUT HIS WORK ON THE DEMAND SIDE OF FINANCIAL MARKETS AND HOUSEHOLD INVESTMENT BEHAVIOR IN SWEDEN

How do Swedish households relate to climate change and to sustainable investments? This is examined in the research report "Knowledge, Fears and Beliefs: Understanding Household Demand for Green Investments" written by Anders Anderson, Swedish House of Finance, and David Robinson, Duke University, as part of the MFS "Governance" work stream.

Background of the study

The research report is based on a spring 2018 questionnaire survey of 20,000 randomly selected Swedish households aged 18 to 65. More than 4,000 of these responded. They were, among other things, asked about their financial knowledge and their attitudes towards sustainable savings.

"We found that most households overestimate their financial and environmental knowledge. The increased interest in engaging in environmental issues and the willingness to pay higher fees for green financial products can be explained by an overconfidence in their own environmental knowledge and fears rather than facts. In a follow-up of the project we also found that fears explain the tendency to invest in ESG funds in the premium pension", says Anders Anderson.

Perceptions based on own experiences

If you have experienced extreme weather, temperature records or heat warnings, it is more likely that you are a "green investor". Thus, your own experiences largely drive households' attitudes and investment decisions, according to Anders Anderson.

"There is previous research that show the same mechanism. For example, a US study shows that generations that have experienced deep recessions in the world economy are less likely to invest in stocks compared to generations that have grown up during periods of strong growth. It is an example of what psychologists call availability or recency bias", says Anders Anderson.

Risk of misjudgements and mistakes

Anders Anderson believes that there are dangers in not basing your decisions on facts.

"How is it possible for an individual to know whether a financial product is good or bad based on his or her experiences, rather than on actual knowledge? Even if you do the "right" thing, it may be for the wrong reason and the risk of misjudgements and mistakes increases", says Anders Anderson.



Difficult for the consumer to make decisions

Since it is not only knowledge that explains the environmental commitment, it is difficult for the consumer to make informed decisions.

"If we discover in our research that investments in green funds are emotionally

driven, we must consider how we can create financial information that provides guidance in how to think so that it is not only an emotional dimension that is communicated to consumers. After all, it is important to create secure pension solutions that do not cost consumers too much", says Anders Anderson.

Green planet preferred over financial welfare

A surprising result according to Anders Anderson was that so many Swedes are "green".

"As many as 65 percent of Swedes believe that a green planet is more important than financial welfare. That view is mainly expressed by younger, well-educated women in big cities", says Anders Anderson.

Polar bears revealed ignorance

One of the questions that Anders Anderson and his colleague David Robinson asked in the survey was why polar bears do not eat penguins.

"Nearly half did not answer correctly. A quarter did not know, eleven percent indicated that polar bears have been driven from their natural habitat, and two percent stated that polar bears are vegetarians. If you do not know that polar bears and penguins live on different continents, it is probably difficult to assess how some of the most vulnerable animal species are affected by global warming", says Anders Anderson.

Focus on consumers in continued research

Anders Anderson's orientation is consumer market research on behavioral finance.

"We often evaluate returns, but what do we really know about consumers? What are their decision-processes and how do they reason? I will do more research on this because we have a unique opportunity to match survey responses with register data in Sweden", says Anders Anderson.



Anders Anderson, member of 'Governance' work stream.

*Interview by Emilie Eliasson Hovmöller
and accessible via hhs.se*

OUTREACH 2019

CLIMATE CHANGE MITIGATION IMPLICATIONS FOR POLITICS AND INVESTORS – MFS IN THE MEDIA

In the aftermath of the Paris Agreement from 2015, many countries, especially in Europe, have shown an increased interest in putting a price on CO₂ emissions through carbon taxes. Sweden has introduced such a tax already in 1991, and its rate is still significantly higher than in other countries that have followed the example since then. But according to a new study by the MFS researchers Gustav Martinsson and Per Strömberg ("Governance" work stream, co-authored with Laszlo Sajtos and Christian Thomann), despite the strong signal effect for political commitment to climate change mitigation, the tax has not been very effective. "Many companies have reduced their emissions substantially, but not the sectors which emit the most and account for ca 70–75 % of the Swedish [domestic] emissions, namely the steel and cement industry – they potentially have even increasing emissions", said Per Strömberg in an interview with svt in December¹. For their working paper "The world's highest carbon tax", he and Gustav Martinsson have investigated time series of companies' emissions in Sweden 1990–2008, with the objective to find exact causalities between their development and policies for systematic decarbonization. The startling results can be explained if one looks at the tax design in more detail: "There is a ceiling for the total amount a company has to pay, which means that if you are above this threshold, the marginal tax per unit CO₂ is effectively zero. The big polluters emit much more than this, thus they don't have any incentive to reduce their emissions", explained Per Strömberg to svt. This special regulation stems from lobbying, but if politicians had implemented the tax scheme without such a mechanism, the consequence would have been that the big Swedish industrials had to shut down. Instead of a very high tax rate with a ceiling, the researchers conclude that it would be wiser to use a lower rate but with a continuously positive marginal taxation of CO₂, to incentivize companies to reduce pollution as much as possible.

While putting a price on emissions is a key measurement for a low-carbon transition, new technologies have to be



scaled up drastically to avoid high macro-economic costs.

The "Policy" work stream has put special emphasis on the importance of the financial sector, big institutional investors and public-private partnerships for facilitating the decarbonization of the economy, and its members Thomas Hahn, Björn Nykvist and Victor Galaz have published a range of articles in the big Swedish newspapers Svenska Dagbladet and Dagens Industri during 2019. Interviews with major Swedish investors have shown that there is neither a lack of private capital nor the will to invest, but green technologies still have detrimental risk profiles which prevent a re-allocation of financial flows. "One problem is that public investors continue to support companies and big projects that are related to fossil fuels, like airports or heavy industries", wrote Björn Nykvist in Dagens Industri in September². This hampers the competitiveness of already existing solutions and

investors prefer conventional options with stable revenues in the end. Public actors should not only shift their financial support from "brown" to "green" technologies and catalyze more private investments in doing so, but even expand spending on new solutions and R&D. "Clear policies like carbon taxation are required but can lead to carbon leakage if there is no international coordination. Low carbon technologies within Sweden therefore have to be actively supported to make them internationally competitive."



Per Strömberg.



Gustav Martinsson.

¹ <https://www.svt.se/nyheter/inrikes/forskning-svensk-koldioxidskatt-ineffektiv>

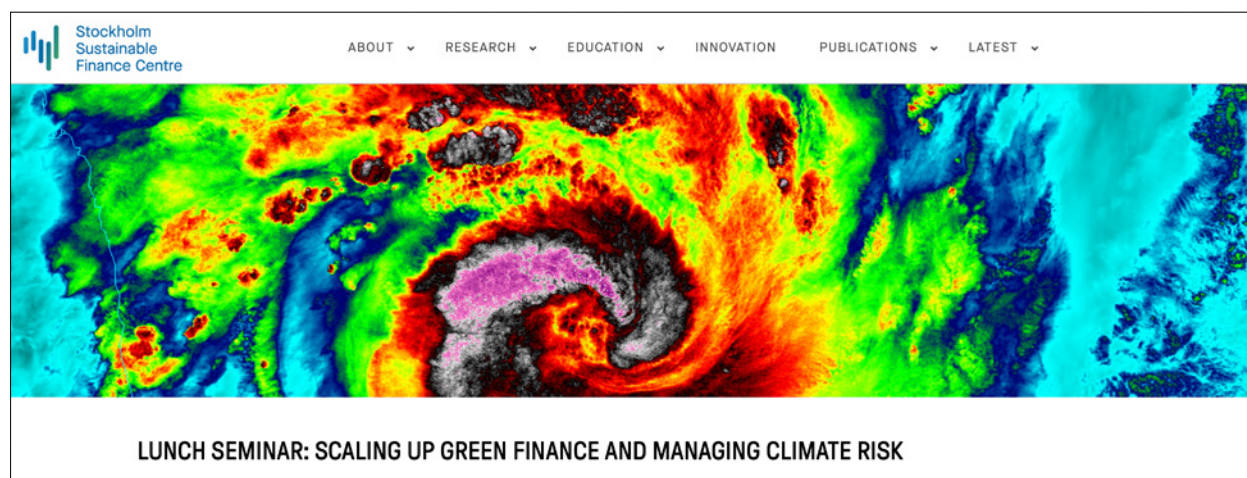
² <https://www.di.se/debatt/forskarna-finanssektorn-kan-investera-sverige-ur-klimatkrisen/>



CLIMATE CHANGE MITIGATION IMPLICATIONS FOR POLITICS AND INVESTORS – MFS PUBLIC SEMINARS

MFS research results have been presented to a variety of stakeholders during 2019 – executives particularly in Europe, but also in other parts of the world, have realized the crucial role of the financial sector and the need to join forces between public and private actors to foster innovation and to achieve the Sustainable Development Goals. Especially the "Policy" and "Governance" work stream members met with politicians and investors on a regular basis, with the Stockholm Sustainable Finance Center as a new major hub for exchanging ideas and discussing challenges and opportunities for sustainable investments. Potential strategies and tools have been evaluated for

instance for the Swedish Growth Agency (Tillväxtverket), the Swedish Development Cooperation Agency (Sida), Swedish pension funds, the Nordic Sustainable Investment Forum and political spokespersons like Karolina Skog (Member of Parliament and economic spokeswoman for Miljöpartiet). Bigger public events included seminars on "Scaling up green finance and managing climate risk" and "Public-private path to decarbonizing industry and achieving net-zero emissions" at the Stockholm Sustainable Finance Center in September and the Finance Panel on Sustainable Finance in Europe co-organized by the Swedish House of Finance and the Center for Business and Policy Studies (SNS) in August. MFS researchers furthermore were invited for a series of lectures for Asian investors, for example in Tokyo, Hanoi and Shanghai.



MFS INTERNATIONALLY

The need for a cross-cutting integration of the SDGs across policy areas is acknowledged more and more by leading international organizations. Most prominently, the United Nations, the Organization for Economic Co-operation and Development (OECD) and the European Union have intensified efforts to develop indicators and measures to account for environmental and social impacts in economic cost-benefit analyses, and to mobilize private financial capital for an overall economic transition. The EU is the global frontrunner in climate politics and the biggest donor for respective projects, but the EU budget is still comparably small and different experts have underlined the need for comprehensive frameworks to catalyze economy-wide actions (SDSN & IEEP, 2019). In March 2018, the EU Commission adopted an action plan on sustainable finance with three key objectives:

- reorient capital flows towards sustainable investment, in order to achieve sustainable and inclusive growth
- manage financial risks stemming from climate change, environmental degradation and social issues
- foster transparency and long-termism in financial and economic activity.³

In May 2018, the European Commission convoked the Technical Expert Group on Sustainable Finance (TEG), to provide consultation for the establishment of legislative frameworks and standards for green finance. Professor Andreas Hoepner, head of "Practical Tools", was appointed by the Commission as one of 35 experts from financial institutions, NGOs and selected academia to develop standards and criteria for economic evaluation, namely:

1. an EU classification system – the so-called *EU taxonomy* – to determine whether an economic activity is environmentally sustainable;
2. an *EU Green Bond Standard*;
3. methodologies for EU climate *benchmarks* and disclosures for benchmarks; and
4. guidance to improve *corporate disclosure* of climate-related information.⁴

The TEG organized a big academic conference on "Promoting Sustainable Finance" in Brussels on the 8th and 9th of January 2019, with panels and academic sessions around the core themes greenhouse gas data and information



needs, low carbon indices, green bonds, ecolabels, active ownership and green banking. Presenters from various disciplines and professions put emphasis on rather poor data quality of ESG reporting and a lack of understanding what is relevant for long-term sustainable economic development among financial stakeholders⁵. Andreas Hoepner, among the other financial scholars, outlined the basic "technical requirements" that have to be achieved for the transition to a sustainable financial system: "Companies don't disclose their emissions – the labels of assets and bonds come from external estimates which are usually not put into question. If companies report on their greenhouse gas emissions, it is only about the 'financially relevant ones', that means we don't get the full picture. Academics, at the same time, tend to design their research based on the available data sets. We need a strong push from academia and institutional investors to make companies and financial analysts move. And establish a common classification system which economic activities are relevant for sustainable development."

In the following months, the TEG published four reports on a) climate benchmarks and benchmarks' ESG disclosure, b) a taxonomy to classify economic sectors and activities for sustainable development, c) climate-related corporate disclosures, d) a potential green bond standard, and one handbook on climate transition benchmarks and benchmarks' ESG disclosure. The mandate of the group has been extended until autumn 2020, and Andreas Hoepner continues to meet with both TEG members and institutional investors to promote benchmarking and climate related disclosures, and discuss how challenges like poor data quality, uncertainty and double counting can be addressed.

3 https://ec.europa.eu/info/publications/180308-action-plan-sustainable-growth_en

4 https://ec.europa.eu/info/publications/sustainable-finance-technical-expert-group_en

5 Program, presentations and videos from the conference available under <https://ec.europa.eu/jrc/en/event/conference/promoting-sustainable-finance>

ANDREAS HOEPNER ON THE BACKGROUND OF THE EU PARIS-ALIGNED BENCHMARK

"We need absolute climate change benchmarks aligned with the Paris Agreement! So far, we have only relative low carbon investment strategies, which select companies with below-average emissions – but they can be increasing in absolute terms, still."

The research focus of Andreas Hoepner is on ESG quantification and empirics, in particular related to sectoral and corporate CO₂ emissions. "We need to focus on how information is processed in financial markets, and which information is needed to enable more sustainable trajectories."

Within the "Practical Tools" work stream, he published several papers on the determinants of responsible investment behaviors and approaches for corporate carbon disclosure. Against this backdrop, he has been involved substantially in the development of the TEG's benchmarking and carbon disclosure work.

"The main goal behind the work of the EU TEG is to set clear standards for ESG and especially climate disclosures, and benchmark assets as conducive or detrimental for the EU's climate strategy", he says. "Based on our empirical findings and, most importantly, the policy recommendations from the UN IPCC [United Nations Intergovernmental Panel on Climate Change] we developed two simple benchmarks for equity and corporate bonds markets, which will be applied from April 2020 onwards: The EU Paris-Aligned Benchmark (EU PAB) and the EU Climate Transition Benchmark (EU CTB)."

On December 3rd, Hoepner presented those benchmarks at the Investments and Pensions Europe (IPE) Awards Conference in Copenhagen. "The model of the EU PAB is unprecedented, as no other benchmark so far uses absolute emission targets. We are the first to build an absolute target of net-zero carbon emissions by following the Intergovernmental Panel on Climate Change goals. So far, we have only relative low carbon investment strategies, which select companies with below-average emissions. But they can be increasing in absolute terms, still, only to a smaller extent than the average." While the EU PAB is strictly aligned with the annual emission reductions that are needed



to achieve the Paris Agreement's objective to limit global warming at 1,5 degrees and excludes assets from the fossil industry, the EU CTB has more successive restrictions and permits fossil companies in the beginning in order to enable transition away from fossil fuels (see figure 3 below). In his keynote speech he stressed that "the fate of the net-zero goal will be decided in the corporate fixed income market – no responsible investor should anymore refinance any oil and gas because when you do that you directly contribute to the climate crisis

getting worse. In equities, we put emphasis on active engagement rather than total divestment, focusing on making oil and gas companies use numbers that are meaningful and difficult to greenwash. Not a single oil and gas company discloses such numbers in their financial accounts yet. They make media statements but they never disclose the green capex from last year in official audited accounts."

Some investors and benchmark providers have committed to the new benchmarks already, according to the IPE magazine⁶, among others the MSCI and S&P Dow Jones Indices.

EU climate benchmarks		
Minimum standards of EU Climate Transition and EU Paris-Aligned Benchmarks		
	EU Climate Transition Benchmark	EU Paris-Aligned Benchmark
Risk-oriented minimum standards		
Minimum scope 1+2+3 carbon intensity reduction compared to investable universe	30%	50%
Scope 3 phase-in	Up to 4 years	Up to 4 years
Baseline exclusions	Yes	Yes
	Controversial weapons	Controversial weapons
	Societal norms violators	Societal norms violators
Activity exclusions	No	Coal (1%+ revenues) Oil (10%+ revenues) Natural gas (50%+ revenues) Electricity producers with carbon intensity of lifecycle GHG emissions > 100gCO ₂ e/kWh (50%+ revenues)
Opportunity-oriented minimum standards		
Year-on-year self-decarbonisation of the benchmark	At least 7% on average per annum: in line with or beyond the decarbonisation trajectory from the IPCC's 1.5°C scenario (with no or limited overshoot)	
Minimum green/brown share ratio compared to investable universe (voluntary)	At least equivalent	Significantly larger (factor 4)
Exposure constraints	Minimum exposure to sectors highly exposed to climate change issues is at least equal to equity market benchmark value	
Corporate target-setting	Weight increase considered for companies which set evidence-based targets under strict conditions to avoid 'greenwashing'	
Disqualification from label if 2 consecutive years of misalignments with trajectory	Immediate	Immediate
Relevance-oriented minimum standards	Minimum requirements reviewed every three years to recognise market development as well as technological and methodological progress	
Review frequency		

Source: EU Technical Expert Group on Sustainable Finance

Figure 3. EU Climate Transition Benchmark versus EU Paris-Aligned Benchmark, presentation EU TEG.

⁶ <https://www.ipe.com/reports/climate-benchmarks-brown-to-green/10043511.article>

WHAT DO THE NEW EU BENCHMARKS MEAN FOR INVESTORS?

Excerpts from Hoepner, A. G. F. et al. (2019) "Handbook of Climate Transition Benchmarks, Paris-Aligned Benchmark and Benchmarks" ESG Disclosure Brussels: European Commission, p. 8 ff.)

The benchmarks are meant to provide clear orientation for investors, companies and the providers of indices. While this clarity and the conformity with scientific targets is a clear advance for sustainable finance, financial actors have to step up when it comes to the disclosure and projections of CO₂ emissions:

"The technical recommendation is at the portfolio level. It is derived from the IPCC's 1.5 °C trajectory with no or limited overshoot (Years 2020–2030, Rogelj et al., 2018). To follow this trajectory, the global economy should decrease its emissions at 7 % per year. If an index portfolio claims to represent a portion of the economy in line with the Paris agreement, it needs to follow this decarbonization rate.

"Benchmark administrators have at least two mechanisms to achieve the at least 7 % on average per annum reduction in GHG intensity. First, they can focus on their benchmark portfolio's constituent weights. Constituent weights describe the degree to which each individual company contributes to the computation of the overall benchmark. They always add up to 100 %. A company with a higher constituent weight attracts more equity investment or bond financing than a company with a lower constituent weight.

"Hence, companies are incentivised or rewarded through the assignment of higher constituent weights compared to the weights they would be entitled to purely based on their market capitalisation. Thus, benchmark administrators can achieve reductions in GHG intensity by reducing the constituent weights of high intensity sectors or companies while simultaneously increasing the constituent weights of low intensity sectors or companies, respectively. This process of decreasing high intensity constituent weights while increasing low intensity constituent weights has to be performed simultaneously to ensure that the overall constituents' weights of the benchmark portfolio add up to 100 % at any point in time.

"Second, benchmark administrators can aim to identify firms which are likely to reduce their GHG intensity by at least 7 % in the upcoming year. This mechanism is likely to be processed with an extrapolation or a more advanced estimation. The better the benchmark administrator is in identifying firms which reduce their GHG intensity by at least 7 % per annum, the less the benchmark administrator has to rely on constituent weights in achieving the reduction. In essence, benchmark administrators using this second mechanism implicitly engage high intensity companies with the message that their constituent weights will be reduced proportionally unless they achieve the relevant GHG intensity reductions at the company level.

[...]



"In cases where GHG emissions data across any of the three scopes is missing or underreported, it has to inevitably be estimated by benchmark administrators or sourced from third party data providers which have conducted the relevant estimations. If these estimations exceed the 'true' GHG emissions of companies, then they provide an incentive for companies to commence or enhance their reporting to signal that the GHG intensity is actually better than estimated by benchmark administrators. However, if these estimations are on par or especially below the 'true' GHG emissions of companies, then they provide a disincentive for companies to commence or enhance their reporting, as this would make them look worse.

"Hence, the subgroup recommends conducting corporate GHG data estimations based on the United Nation's (1992) precautionary principle: *If in doubt, err on the side of the planet not the side of the company.* Applying the precautionary principle ensures that corporate GHG data is not underestimated and hence companies have incentives to commence or enhance reporting their GHG emissions."

An MFS working paper from 2018 has provided valuable input for the TEG reports on benchmarking and carbon disclosure by reviewing available techniques and standards. At the same time, Hoepner et al. showcased the considerable room for improvement (p. 7):

"Based on current evidence available in Liesen et al. (2015), it is not realistic to assume that data quality of reported carbon data (of any kind, absolute or normalised ratios) is of sufficiently reliable level. The authors find that, between 2005 and 2009, less than twenty percent of the hundreds of corporations reporting carbon emissions in their sample reported (i) at least scope 1 and 2, (ii) GHG emissions instead of just carbon emissions and, especially (iii) emissions for more than 90% of all activities of the entire corporations. Even worse, their sample includes Europe's large listed companies, of which many have operations falling under the EU ETS and hence should have had the strongest incentives to report accurately. While these results stem from the last decade, there is no subsequent academic evidence that the situation would have enhanced substantially. In fact, recent evidence presented by Bloomberg during a webinar hosted by Donald Macdonald, Chair of the International Investor Group on Climate Change (IIGCC), shows only 53 firms worldwide currently report 100.0% greenhouse gas equivalent scope 1 and 2 emissions."



POST MFS

The MFS program will terminate in 2020 after all ongoing projects are completed. The sustainable finance research at SSE and the other MFS members will be restructured and better aligned with other disciplines at those specific institutions. Program Director Michael Halling, together with Deputy Director of the Stockholm Sustainable Finance Center Emma Sjöström, will take the lead in a new program to advance sustainable finance research at the Stockholm School of Economics. This cross-cutting "Sustainable Finance Initiative" will be organized via Misum, the Mistra Center for Sustainable Markets at SSE. While Emma Sjöström has been a researcher at Misum since its inception and done a lot of work on active ownership and responsible investment behavior in particular together with the Stockholm Sustainable Finance Center and the involved practitioners, the goal with the new initiative is to link finance and financing topics to other research areas on sustainable markets and a sustainable economy at Misum. The rationale is that the different projects can complement and leverage each other and provide managers and decision-makers with a broader picture of sustainability governance and how to implement and finance respective approaches in practice. Thus, the very broad focus of MFS 2016-2019 will become more focused on *how to change practices in the financial sector and exploit the proximity*



Michael Halling.



Emma Sjöström.

to the Swedish investor community and the interdisciplinary expertise at SSE.

The other Misum research platforms, "Human Capital", "Sustainable Business Models" and "Accounting Frameworks" for sustainable markets, touch upon macro- and societal aspects, education, health and global economic development, the business and network perspective as well as the micro-level of specific accounting models, policies and management tools. Many of those topics are closely related to finance issues, exemplary corporate valuation and financing sustainable development especially in poor countries.

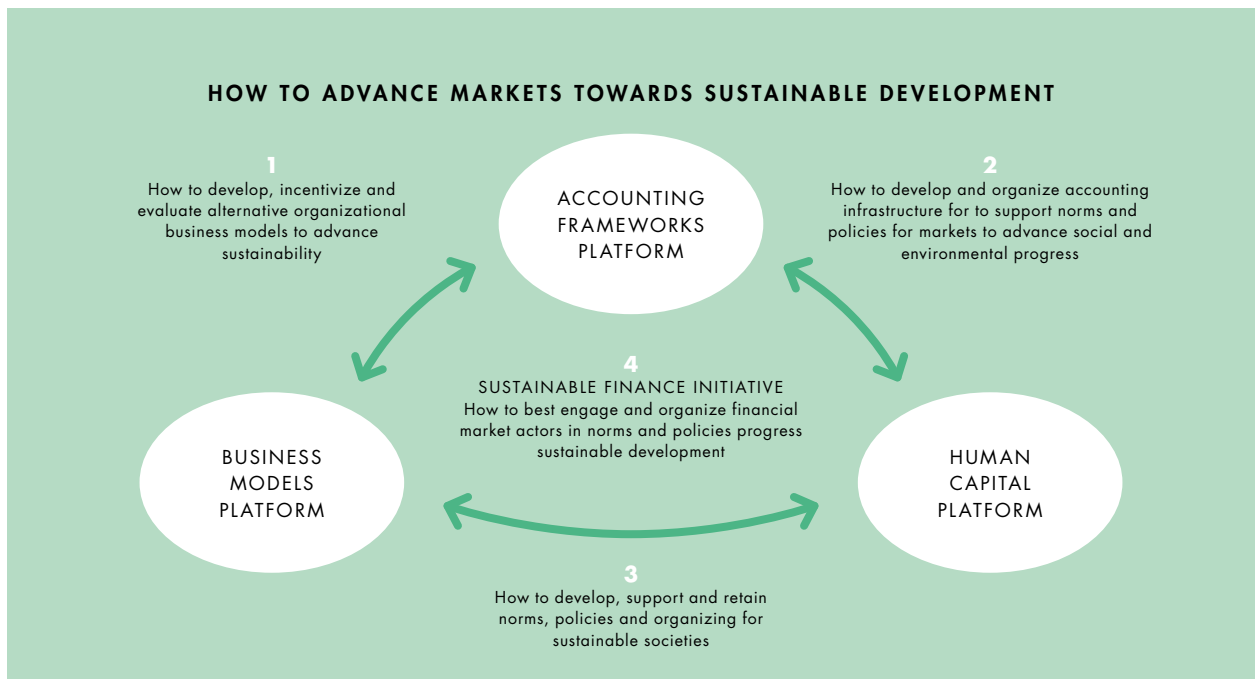


Figure 4. Sustainable finance as cross-cutting issue for sustainable markets: the new conceptual framework of Misum.

Bearing in mind that Agenda 2030 and the 17 UN SDGs require a systematic re-direction of financial flows and the allocation of capital to the most promising and innovative projects for sustainable development, an efficient sharing of risk and the effective collaboration between public and private actors, the new “Sustainable Finance Initiative” will address the key question:

What are effective methods and strategies of investors to drive change in the corporate sector? This includes research on e.g. the effectiveness of different strategies (in different asset classes) for influencing corporate sustainability performance, or investors’ roles as norm-entrepreneurs.

Although the emphasis will be on corporate finance and investment strategies, the initiative will touch upon the systems perspective as well as aiming to collaborate with both SSE scholars from different departments and external experts on environmental topics, predominantly climate change and the low-carbon transition of the economy. The knowledge and networks built by the MFS work streams and the EU TEG will provide important benchmarks in this regard and the Misum Sustainable Finance Initiative leaders are looking forward to fruitful potential collaborations in approaching further research questions such as:

- How can we mobilize capital to support the transition towards a low-carbon and otherwise sustainable economy?
- How can, for instance, the relation between public and private capital be designed and leveraged?
- What are potential trajectories and variations of the risk-return profile across different dimensions of the transition?
- What are the potential real-economy impacts of new financial instruments?
- How can more long-term perspectives in financial market activity be stimulated?
- How can financial analysis and corporate valuation be conducted for longer time horizons, and how does this relate to the integration between financial and non-financial disclosures?
- How can financial-market actors be incentivized, and how can financial activity be influenced by policy decisions to foster long-termism?





MISUM

Mistra Financial Systems is hosted by Misum, the Mistra Center for Sustainable Markets at the Stockholm School of Economics. Program partners are: Swedish House of Finance, KTH Royal Institute of Technology, The Royal Swedish Academy of Science, Stockholm Environment Institute, Gothenburg University, Vienna University and University College Dublin.