Climate Risk & Green Transition
INSTITUT LOUIS BACHELIER AND THE RISKS FORUM

The Financial Risks International Forum (Risks Forum) is organized by Institut Louis Bachelier in cooperation with the Fondation du Risque, the Institute Europlace de Finance (Louis Bachelier Group) and the Louis Bachelier “Finance and Sustainable Growth” Laboratory.

The Financial Risks International Forum aims to highlight the methodological and regulatory challenges raised by the ongoing developments in financial technologies and to discuss sustainable solutions – this year related to “Climate Risk & Green Transition”.

Through one day and a half, around 100 speakers from France and abroad propose how to tackle these challenges.

“Public, private and academic actors are all needed in the development of sustainable solutions. The Louis Bachelier Group exists to build bridges between these partners and create solutions useful to society and stakeholders, through research projects, conferences and publications. Sometimes on a French scale, and sometimes with an international reach. The Financial Risks International Forum has, as the name says, an international audience. The same goes for Climate Risks. Climate Risks don’t belong to one nation or one sector. Climate Risks can have consequences for all of us, so the Risks Forum is an excellent place to discuss status, methodologies and how to move forward and I am very pleased to see speakers from the entire eco-system present in the programme”,

André Lévy-Lang, chairman of Institut Louis Bachelier.

“One of the challenges we are discussing this year is cascading risks. Climate shocks have cascading impacts on the economy and can become systemic, the financial sector being potentially a shock amplifier. Deriving adequate scenarios and stress tests is thus key for financial institutions and for regulators to assess the risks. This is a good example of why the Risks Forum is a conference for academics as well as professionals. Research developments are key for practice. I thank the Louis Bachelier Group as well as all contributing partners and speakers for this 15th edition. As chairman of the Scientific committee, I am proud to see the Risks Forum in a 2022 hybrid format that truly reaches and touches an international audience”

Marie Brière, Chairman of the Risks Forum Scientific Committee.


About Institut Louis Bachelier and the Louis Bachelier Group:
Institut Europlace de Finance, Fondation du Risque and Institut Louis Bachelier form the Louis Bachelier Group. The backbone of the Louis Bachelier Group (IEF, FdR, ILB) and its network is academic research, that aims to promote sustainable development in Economics and Finance. The Louis Bachelier Group currently hosts more than 70 research programmes within four main societal transitions: environmental, digital, demographic and financial.
www.institutlouisbachelier.org

About the Financial Risks International Forum:
The 15th Financial Risks International Forum has its focus on the environmental transition and carries the title: “Climate Risk & Green Transition”.
www.risks-forum.org

For further information, please contact:
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MONDAY, MARCH 21, 2022

15TH FINANCIAL RISKS INTERNATIONAL FORUM

13:00 - 13:30
REGISTRATION

13:30 - 13:45
WELCOME ADDRESS – SALLE DES LUSTRES
by Jean-Michel BEAUCOQ, General Delegate, Institut Louis Bachelier (ILB), and Marie BRÉHÉRI, Chairwoman of the Scientific Committee, Financial Risks International Forum.

13:45 - 14:15
GUEST SPEECH SESSION – SALLE DES LUSTRES
Chairman: Christian GOURRIEUR, Toronto University, Toulouse School of Economics, CREST.
Guest speech: Stefano GRILLO, Professor of Finance, Yale School of Management.

“A Quantity-Based Approach to Constructing Climate Risk Hedge Portfolios”

Thibaud BARREAUD, Data Scientist, ILB Datab / Pladefis project, Patrice FONTAINE, Director of Research at CNRS, Director of EUROFIDAI, Stefano GRILLO, Professor of Finance, Yale School of Management, Léo GRSEY, Green Finance Expert, Banque de France / NGFS, Jocelyn MARTIEL, Professor of Finance, ESSEC.

14:15 - 15:00
ROUNDTABLE 1: DATA GAPS AND NEEDS FOR SUSTAINABLE FINANCE RESEARCH – SALLE DES LUSTRES
Chairman: Peter TANKOV, CREST, ENGEA, IP Paris, and Green and Sustainable Finance (GSF) programme, Institut Louis Bachelier.

Thibaud BARREAUD, Data Scientist, ILB Datab / Pladefis project, Patrice FONTAINE, Director of Research at CNRS, Director of EUROFIDAI, Stefano GRILLO, Professor of Finance, Yale School of Management, Léo GRSEY, Green Finance Expert, Banque de France / NGFS, Jocelyn MARTIEL, Professor of Finance, ESSEC.

15:00 - 16:30
PARALLEL SESSIONS A

PARALLEL SESSION A1 - ESG AND MUTUAL FUNDS – SALLE DES LUSTRES
Chairman: Serge DARIOLLES, Université Paris-Dauphine, PSL Research University.

“Quantity and Product Differentiation: Theory and Evidence From the Mutual-Fund Industry”
Tianhao YAO, HEC Paris and Maxime BONELLI, HEC Paris.
Discussant: Tamara NIEFDOVA, Université Paris-Dauphine, PSL Research University.

“Fund Portfolio Networks: a Climate Risk Perspective”
Adrian AMALLIAS, European Securities and Markets Authority.
Discussant: Arthur STALLA-BOURDILLON, Banque de France.

“How Different are ESG Mutual Funds? Evidence and Implications”
Camilla BAILLY, CREST, University of Namur and Jean-Yves GABBO, CREST, University of Namur.
Discussant: Marie LAMBERT, HEC Liège.

PARALLEL SESSION A2 – ISOLVEMENT – SALLE DES SEANCES
Chairman: Patricia CERRIO, École Polytechnique and CREST.

“Shutting off Cleaner Hands: Mandatory Climate-Related Disclosure by Financial Institutions and the Financing of Fossil Fuel”
Jean-Stéphane MÉSOMMER, Banque de France, Sciences Po, and Benoît NEUVY, Banque de France.

“Board Ancestral Diversity and Voluntary Greenhouse Gas Emission Disclosure”
Johannes A. BARG, University of Hamburg, Wolfgang SOBETZ, University of Hamburg, Sadik EL GHOUL, University of Alberta, Diamante GUÉDAMI, University of South Carolina, and Henning SCHROEDER, University of Hamburg.
Discussant: Tabatha SCHROEDER, UCSD Michael Smarts Graduate Business School.

“ESG Features Explain One Bit of Idiosyncratic Price Returns”
Damien CHALLET, Fiduquant Group, CentraleSupélec, Paris-Saclay University, Jérémy ASSEUL, Fiduquant Group, CentraleSupélec, Paris-Saclay University, BNP Paribas, and Laurent CARLIER, Head of the AI Lab, BNP Paribas.
Discussant: Catarina SANTY, HEC Liège.

VIDEO PRESENTATION “Does Media Coverage of Firms’ Environment, Social, and Governance (ESG) Incidents Affect Analyst Coverage and Forecast Accuracy?”
Zhichao LI, Durham University.

PARALLEL SESSION A3 – CLIMATE STRESS TESTS – AUDITORIUM HAUSMANN
Chairman: Jean-Paul LAURENT, Durham University.

“Cascading Effects of Carbon Price through the Value Chain: Impact on Firm’s Volatilization”
Théo LE GUENEDA, Amundi Asset Management, CREST, Théophile AGUENET, Marie BRÉHÉRI, Pierre COURATHE, Mathieu JOUANNEAU and Thomas LE BERTHÉ, Amundi Asset Management.

“The Climate Extended Risk Model (CERM)”
Jocelin GARNIER, École Polytechnique, Lusum, Jean-Baptiste GAUDENTE, Green RMA, and Anne GRUZ, IGGAR.
Discussant: Maria FLORA, CRE"STE
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RESEARCH PAPERS SUMMARY
**PARALLEL SESSION A1 - ESG AND MUTUAL FUNDS**

"Quality and Product Differentiation: Theory and Evidence from the Mutual Fund Industry"
Tianhao YAO, IÉC Paris and Maxime BONELLI, IÉC Paris.

We study product differentiation in the mutual fund industry. We design a model in which funds with heterogeneous perceived quality can choose their level of product differentiation. In equilibrium, high quality funds choose broad market designs (i.e., low differentiation) appealing to many investors, while low quality funds adopt niche designs (i.e., high differentiation) that investors either love or loath. Using as a measure of fund differentiation the degree of textual uniqueness of investment strategy description in fund prospectuses, we confirm empirically that funds with lower expected performance tend to differentiate more. We use the issuance of Morningstar rating to previously unrated funds as an exogenous shock to perceived quality to identify the economic mechanism. We find that funds receiving a low rating increase their product differentiation. The effect is mainly concentrated on funds run by small management companies, a feature associated with lower performance. This increase in product differentiation makes funds more likely to survive. It also has a market-level impact on the menu of funds available to investors.

"Fund Portfolio Networks: A Climate Risk Perspective"
Adrien AMZALLAG, European Securities and Markets Authority.

Within the European financial sector, investment funds are more exposed to climate-sensitive economic sectors than banks, insurers and pension funds. However, few investment fund climate-related financial risk assessments have been conducted. We attempt to help fill this gap, using a dataset of EUR 8 trillion of European investment fund portfolio holdings. We recover the network of fund portfolio overlaps (interconnections) and augment this information on the relative environmental performance (‘driftiness’) of fund portfolios. Funds whose portfolios are tilted towards more polluting assets (brown funds) distribute their portfolio over a larger number of companies than funds with cleaner portfolios (green funds). This apparent diversification hides a concentration risk: brown funds are more closely connected with each other (have more similar portfolios) than green fund portfolios, which tend to ‘herd’ less (have less similar portfolios to those of other green funds). This suggests that widespread climate-related financial shocks are likely to disproportionately affect brown funds. A climate risk scenario exercise confirms this: within total system-wide losses of EUR 152 billion to EUR 443 billion, most brown funds’ losses range from about 9% to 18% of affected assets, in contrast to green funds’ losses, which usually range from 3% to 8%. In addition, brown funds have more systemic impact: they contribute more to total system-wide losses (by virtue of their greater interconnections within the fund universe) than green funds. These findings provide support for ongoing EU regulatory and supervisory initiatives on sustainable finance.

"How Different are ESG Mutual Funds? Evidence and Implications"
Camille BAILT, CeteMAF, University of Namur and Jean-Yves ONABO, CeteMAF, University of Namur.

Investment funds that integrate ESG considerations have become mainstream. In the wake of this trend, there is still debate about whether they actually differ from their conventional peers in terms of investment strategies, the returns they offer to their investors, and the capital flows they attract from the latter. Using a panel data set of 2,042 U.S. equity mutual funds, we empirically examine these issues in recent years (2016-2021) and show how they evolve over time, and in response to climate risk. In terms of portfolio holdings, our findings indicate that high-ESG funds do indeed differ from their conventional peers and, more surprisingly, from each other. As time goes on, high-ESG and conventional groups become increasingly similar, while high-ESG portfolios also become more homogeneous. In terms of financial performance, our results suggest that, on average, high-ESG funds underperform their conventional peers. However, they show better resilience to climate risk, erasing the gap in financial performance between the two groups when climate risk surges. Finally, our findings provide evidence that higher climate risk is associated with more capital flows, especially into less distinct mutual funds. Nevertheless, we cannot find any difference in capital flows between high-ESG and conventional funds.

**PARALLEL SESSION A2 - DISCLOSURE**

"Showing Off Cleaner Hands: Mandatory Climate-Related Disclosure by Financial Institutions and the Financing of Fossil Energy"
Jean-Stéphane MÉSONNER, Banque de France, Sciences Po, and Benoît NGUYEN, Banque de France.

We investigate the real effects of mandatory climate-related disclosure by financial institutions on the funding of carbon-intensive industries. Our impact metric is the amount invested into securities, bonds and stocks, issued by fossil fuel companies. A French law, which came into force in January 2016 in the aftermath of the Paris Agreement on climate change, provides us with a quasi-natural experiment. The new regulation, unique in Europe at that time, requires institutional investors (i.e., insurers, pension funds and asset management firms), but not banks, to report annually on both their climate-related exposure and climate change mitigation policy. Using a unique dataset of security-level portfolio holdings by each institutional sector in each euro area country, we compare the portfolio choices of French institutional investors with those of French banks and all financial institutions located in other EU countries. We find that investors subject to the new disclosure requirements curtailed their financing of fossil energy companies compared to investors in the control group.

"Board Ancestral Diversity and Voluntary Greenhouse Gas Emission Disclosure"
Johannes A. BARG, University of Hamburg, Wolfgang DROBETZ, University of Hamburg, Sadok EL GHOLI, University of Alberta, Omsara GUEDHAMI, University of South Carolina, and Henning SCHRODER, University of Hamburg.

Prior research suggests that the disclosure of greenhouse gas (GHG) emissions—the main cause of climate change—affects firm valuation. In this paper, we provide new insights into the determinants of the voluntary disclosure of GHG emissions. We show that board ancestral diversity has a positive and statistically significant effect on a firm’s scope and quality of voluntary GHG emission disclosure. This effect is robust to controlling for several other dimensions of board diversity as well as to addressing endogeneity and sample selection. Additional analysis suggests that board ancestral diversity has a higher impact on GHG emission disclosure in firms with low institutional ownership and high corporate complexity. We interpret these findings as consistent with the view that board diversity enhances monitoring and advising.

"ESG Features Explain One Bit of Idiosyncratic Price Returns"
Damien CHALLET, FiQuant Group, CentraleSupélec, Paris-Saclay University, Jérémie ASSAIL, FiQuant Group, CentraleSupélec, Paris-Saclay University, BNP Paribas, and Laurent CARLIER, Head of the AI Lab, BNP Paribas.

We systematically investigate the links between price returns and ESG features. We propose a cross-validation scheme with random company-wise validation to mitigate the relative initial lack of quantity and quality of ESG data, which allows us to use most of the latest and best data to both train and validate our models. Boosted trees successfully explain a single bit of annual price returns not accounted for in the traditional market factor. We check with benchmark features that ESG features do contain significantly more information than basic fundamental features alone. The most relevant sub-ESG feature encodes controversies. Finally, we find opposite effects of better ESG scores on the price returns of small and large capitalization companies: better ESG scores are generally associated with larger price returns for the latter, and reversely for the former.

**VIDEO PRESENTATION:** "Does Media Coverage of Firms’ Environment, Social, and Governance (ESG) Incidents Affect Analyst Coverage and Forecasts?"
Zhichao LI, Durham University.

Media coverage of environment, social and governance (ESG) issues provides useful information for analysts as corporate social irresponsibility events potentially influence firm performance and risk. Our study explores whether and how analysts: respond to media coverage of corporate social irresponsibility by examining its relationship with analyst coverage and forecasts. We find that the level of analyst coverage is negatively associated with a firm’s ESG incidents covered by the media. This association is more pronounced for firms with high business risk, high information opacity, and more intense industrial product market competition. We also find a positive association between media-covered ESG incidents and analyst forecast error and dispersion, suggesting that analysts might fail to incorporate the ESG risk exposures into their forecasts in an appropriate manner. Overall, our results suggest that corporate social irresponsibility undermines the role analysts play as information intermediaries for investors in the stock market.
The transition towards a low-carbon economy can have significant implications for the financial sector, as discussed in the paper "Climate Consequences of Rebalancing Official Climate Finance: Analyzing Multilateral Development Banks’ Allocation Practices" by Linna XIE and Swarnodeep HOMROY, University of Groningen, Bert SCHOLTENS, University of Groningen, and St. Andrews.

The paper suggests that MDBs’ climate financing is positively correlated with countries’ greenhouse gas emissions but not with their vulnerability to climate risks. The authors argue that including climate change considerations in the allocation of official development finance can help mitigate climate risks and align financial policies with climate goals.

PARALLEL SESSION A3 - CLIMATE STRESS TESTS

"Cascading Effects of Carbon Price through the Value Chain: Impact on Firm’s Valuation" by Thilo LE GUENEDAL, CREIT, Theophile ADENOT, Marie BRIOERE, Pierre COURATHIE, Mathieu JOUANNEAU, and Tegwen LE BERTHIE, Amundi Asset Management. This paper examines the cascading effects of carbon prices on the value chain, highlighting how changes in carbon prices can impact firms across different sectors.

PARALLEL SESSION B5 - BOND RISK

"Pricing Climate Change Risk Corporate Bonds" by Elsa ALLMAN, Banque de France, Autorité de Contrôle Prudentiel et de Résolution (ACPR). This paper explores the pricing of climate change risk in corporate bonds, focusing on how firms’ environmental performance can influence bond prices.

"ESG and Sovereign Risk: What is Priced in by the Bond Market and Credit Rating Agencies?" by Raphaël SEMET, Thierry RONCAUL, and Laura STANOLO, Amundi Asset Management. This paper investigates the pricing of ESG factors in sovereign bonds and credit ratings, examining how these factors are considered in the valuation of sovereign debt.

"Do Investors Reward Countries for Participating in Climate Agreements? Yes." by Mandeep SINGH, Centre for Climate Finance and Investment (CCFI), Imperial College Business School, and Konark SAXENA, University of New South Wales. This paper examines the reward investors place on countries that participate in climate agreements, finding evidence that countries' climate action is rewarded through lower sovereign bond yields.

PARALLEL SESSION B6 - AUCTIONS AND CONTRACTS

"Climate Consequences of Rebalancing Official Climate Finance: Analyzing Multilateral Development Banks’ Allocation Practices" by Linna XIE and Swarnodeep HOMROY, University of Groningen, Bert SCHOLTENS, University of Groningen, and St. Andrews. This paper provides evidence on the climate financing practices of MDBs and their long-term climate consequences. The paper finds that MDBs’ climate financing is for mitigation projects and is concentrated in a small number of relatively wealthy countries. It also notes that the impact of climate change on sovereign bond yields is positive and correlates with countries’ greenhouse gas emissions.

"Do Investors Reward Countries for Participating in Climate Agreements? Yes." by Mandeep SINGH, Centre for Climate Finance and Investment (CCFI), Imperial College Business School, and Konark SAXENA, University of New South Wales. This paper examines the reward investors place on countries that participate in climate agreements, finding evidence that countries' climate action is rewarded through lower sovereign bond yields.

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This paper examines the role of insurance companies in coordinating the joint policy for the coverage of new and undiversifiable risks. The undiversifiable nature of such risks causes a shortage of insurance capacity, and their limited knowledge makes learning and information sharing necessary. In practice, organizing such insurance supply amounts to sharing a common value divisible good between capacity-constrained and privately informed insurers with a reserve price. Widely used ad-hoc co-insurance agreements allow to operate as a uniform price auction with an "exit/re-entry" option. We compare it to a discriminatory auction, another auction present in the insurance industry. Both auction formats lead to different coverage/premium tradeoffs. If at least one insurer provides an optimistic expertise about the risk, ad-hoc co-insurance agreements offer higher coverage. This result is reversed when all insurers are pessimistic about the risk. Static comparative results with respect to the severity of the capacity constraints and the reserve price are provided. In the case of completely new risks, a regulator aiming at maximizing the expected coverage should promote ad-hoc co-insurance agreements when the reserve price is low enough or when competition is high enough.

"Pitfalls of Insuring Production Risk: A Case Study on Some Wind Power Auctions in France"  
Laurent LAMY and Clément LEBLANC, Ecole des Ponts, ParisTech.

We consider auctions for procurement contracts involving exogenous production risk and whose payment rule depends not only on realized production but also on self-reported expected production. We first establish a conflict between insurance provision and strategy-proofness. We then analyze equilibrium bidding behavior under several paradigms regarding bidders’ ability to misreport their expected production. Payment rules that are manipulable could induce rents for strategic bidders which may overwhelm the benefits from reduced risk premiums thanks to insurance provision. We illustrate our results through simulations calibrated to some offshore wind power auctions in France and estimate that public spending could have increased by 3%, given that strategic bidders would benefit from overestimating their expected production by more than 10%. We also introduce variants of the French rule with punishments intended to discourage misreporting, and find limited room for improving linear contracts. Various extensions of our baseline model are discussed.

"Climate Linkers: Rationale and Pricing"  
Jean-Paul RENNE and Pauline CHIVRAND, University of Lausanne.

This paper envisions climate linkers. We define climate linkers as long-dated financial instruments (bonds, swaps, and options) with payoffs indexed to climate-related variables, e.g., temperatures, sea levels, or carbon concentrations. On top of facilitating the sharing of long-term climate risks, another key benefit of these instruments would be informational, as their prices would reveal real-time market expectations regarding future climate. We develop and calibrate a sea-level-augmented integrated assessment model (IAM), and we exploit it to study climate-linked instruments’ cost and risk characteristics. We examine, in particular, climate risk premiums: because of the insurance provided by a bond indexed on sea levels (say), investors develop and calibrate a sea-level-augmented integrated assessment model (IAM), and we exploit it to study climate-linked instruments’ cost and risk characteristics. We examine, in particular, climate risk premiums: because of the insurance provided by a bond indexed on sea levels (say), investors would demand a lower average return on such a bond than on conventional bonds. Our findings highlight the sensitivity of climate premiums to the assumptions regarding (i) the damages associated with temperature increases and (ii) feedback effects between temperatures and carbon emissions.

"Impacts of Extreme Weather Events on Mortgage Risks and their Evolution Under Climate Change"  
Antoine MANDEL, University Paris 1 Panthéon-Sorbonne, Climate Finance Alpha, Raffaella CALABRESE, Credit Research Centre, University of Edinburgh, Timothy DOMBROWSKI, University of Missouri-St. Louis, Kelley FACE, Louisiana State University, and Luca ZANN, Prometeia.

We develop an additive Cox proportional hazard model with time-varying covariates, including spatio-temporal characteristics of weather events, to study the impact of weather extremes (heavy rains and tropical cyclones) on the probability of mortgage default and prepayment. We estimate the model on a portfolio of mortgages in Florida, consisting of 69,046 loans and 1,707,831 loan-month observations with localization data at the five-digit ZIP code level. We find a statistically significant and non-linear impact of tropical cyclone intensity on default as well as a significant impact of heavy rains in areas with large exposure to flood risks. These findings confirm existing results in the literature and also provide estimates of the impact of extreme event characteristics on mortgage risk, e.g. the impact of tropical cyclones on default more than doubles in magnitude when moving from a hurricane of category two to a hurricane of category three or more. We build on the identified effect of exposure to flood risk (in interaction with heavy rainfall) on mortgage default to perform a scenario analysis of the future impacts of climate change using the First Street flood model, which provides projections of exposure to floods in 2050 under RCP 4.5. We find a systematic increase in risk under climate change amounting to 1 percentage point in average and much more pronounced in the tail of the distribution, with an increase of 7 percentage points of the default probability at the 99th percentile of the mortgage distribution.

"A “Silent Spring” for the Financial System? Exploring Biodiversity-Related Financial Risks in France"  
Mathilde SALIN, Banque de France, CREID, AgroParisTech, and Paul HADJ-RAZAR, Université Sorbonne Paris Nord, Romain SVARTZMAN and Thomas ALLEN, Banque de France, Etienne ESPAGNE, Julien CALAS and Antoine GORDIN, Agence Française de Développement (AFD), Julien GAUTHET, Office Français de la Biodiversité (OFB), Joshua BERGER and Antoine VALLIER, IOC Biodiversité.

This paper contributes to an emerging literature aimed at uncovering the linkages between biodiversity loss and financial instability, by exploring biodiversity-related financial risks (BFR) in France. We first build on previous studies and propose an analytical framework to understand BFR, emphasizing the complexity involved and the limited substitutability of natural capital. We then provide quantitative estimates of dependencies and impacts of the French financial system on biodiversity. We find that 42% of the value of securities held by French financial institutions comes from issuers that are highly or very highly dependent on one or more ecosystem services. We also find that the accumulated terrestrial biodiversity footprint...
forces with positive contemporaneous effects of preference shocks on realized returns, the green-minus-brown portfolio delivers large positive payoffs associated with time-varying convenience yield, while exposures to ESG preference shocks lead to positive green premia. Augmenting these conflicting and equity-dependent ones.

We study the determinants and the patterns of ESG investing by exploiting account-level data from the Shanghai Stock Exchange, which provide detailed information on individual investors’ characteristics and trading over time. We show that investors’ pro-social attitudes affect ESG demand and that these attitudes are shaped by economic and non-economic life-time experiences, such as growing up in a region with more pro-social values, being exposed to an increased level of pollution or to a natural disaster. Recent experiences tend to matter more, and non-economic experiences are particularly important to explain how investors change their attitudes during their trading life. We also show that investors display distinct trading patterns between their ESG and non-ESG stocks, which helps explaining stock market dynamics.

**Parallele Session C9 - Sentiment and Preferences**

*“Green Sentiment, Stock Returns and Corporate Behavior”*
Stefano RAMELLI, University of Zurich, and Marie BRIÈRE, Head of Investor Research Center, Amundi.

In this paper, we propose a new method to estimate non-fundamental demand shocks for green financial assets based on the arbitrage activity of exchange-traded funds (ETFs). By estimating the monthly abnormal flows into environment-friendly ETFs, we construct a Green Sentiment Index that captures shifts in investors’ appetite for environmental responsibility that are not yet priced in the value of the underlying assets. Our measure of green sentiment differs significantly from the news-based climate indices proposed by the extant literature, and it has additional explanatory power on both stock returns and corporate decisions. Over the period 2010-2020, shifts in green sentiment anticipate a persistent stock-price outperformance of more environmentally responsible firms, as well as an increase in their capital investments and cash holdings, particularly for more pro-social investors.

*“Dynamic ESG Equilibrium”*
Andrea TAMELLI, Catholic University of Milan, Doron Aviramov, Interdisciplinary Center (IDC), Abraham LIOU, EDHEC Business School, and Yang LIU, The University of Hong Kong.

This paper develops and applies an equilibrium model that accounts for ESG demand and supply dynamics. In equilibrium, ESG preference shocks represent a novel risk source characterized by diminishing marginal utility and positive premium. Expected green asset returns are negatively associated with time-varying convenience yield, while exposures to ESG preference shocks lead to positive green premium. Augmenting these conflicting forces with positive contemporaneous effects of preference shocks on realized returns, the green-minus-brown portfolio delivers large positive payoffs for reasonably long horizons. Nonpecuniary benefits from ESG investing account for a nontrivial and increasing fraction of total consumption.

**Parallele Session D10 - Climate Footprint of Bitcoin**

*“Machine Learning the Carbon Footprint of Bitcoin Mining”*
Hector CALVO-PARDO, University of Southampton, CFS, University of Wisconsin-Madison, Tulio MANCINI, Amazon, and Jose OLMO, University of Southampton and Centro ARACID, University of Zaragoza.

Building on an economic model of rational Bitcoin mining, we measure the carbon footprint of Bitcoin mining power consumption using feedforward neural networks. We find associated carbon footprints of 2.77, 16.08, and 14.99 MtCO2e for 2017, 2018, and 2019 based on a novel bottom-up approach, which (i) conform with recent estimates, (ii) lie within the economic model bounds while (iii) delivering much narrower prediction intervals, and yet (iv) raise alarming concerns, given recent evidence (e.g., from climate-weather integrated models). By 2024, conservative point forecasts based on an exponential trend found for the network hashrate suggest a carbon footprint of 132.01 MtCO2e, similar to the combined annualized 2019 greenhouse gas emissions of Belgium (100 MtCO2e) and Denmark (32 MtCO2e). We demonstrate how machine learning methods can contribute to non-for-profit pressing societal issues, like global warming, where data complexity and availability can be overcome.

*“Energy Consumption of the Bitcoin Industry”*

We tackle Bitcoin’s energy consumption by modelling the Bitcoin mining industry. Due to miners’ competition and the Bitcoin protocol transparency, mining hardware suppliers extract all the mining surplus and receive most of miners’ expenses. In turn, by opposition to a common misconception, energy expenditures represent a small portion of miners’ costs. We show that our measure of energy consumption, although using a different approach, is closely correlated with other popular measures. Lastly, we show that the only driver of energy consumption is the bitcoin price therefore it will eventually stop from increasing exponentially.

**“Are We Becoming Greener? Life-Time Experiences and Responsible Investment”**
Milo BIANCHI, Toulouse School of Economics, Zhengjia LIU, Fudan University, and Sang WIANG, Shanghai University of Finance and Economics.

We study the determinants and the patterns of ESG investing by exploiting account-level data from the Shanghai Stock Exchange, which provide detailed information on individual investors’ characteristics and trading over time. We show that investors’ pro-social attitudes affect ESG demand and that these attitudes are shaped by economic and non-economic life-time experiences, such as growing up in a region with more pro-social values, being exposed to an increased level of pollution or to a natural disaster. Recent experiences tend to matter more, and non-economic experiences are particularly important to explain how investors change their attitudes during their trading life. We also show that investors display distinct trading patterns between their ESG and non-ESG stocks, which helps explaining stock market dynamics.

**Parallele Session D11 - Sea Level Rise Risk and Mortgage Lending Standards**
Qiping HUANG, University of Dayton, Memee LIU, Georgia Southern University, Xu GONG, Xiamen University and Chengbo FUB, University of Northern British Columbia.

This paper investigates how political uncertainty affects firms’ climate premium from a global point of view. We use the presidential election events in the United States as well as that from all countries with a stock market as proxies for political uncertainty. We find that the global stock markets respond significantly to political uncertainty induced by the U.S. presidential elections, but not so for elections from their home countries. Although we do not observe a significant change in return premium for firms with different levels of climate risk during the periods of political uncertainty, we find that firms with higher climate risk experience much higher return volatility and return correlation amid uncertainty associated with U.S. elections. The results are consistent with the literature that U.S. presidential election is a better indicator of international political uncertainty. At the same time, we uncover new evidence on how political uncertainty affects the riskiness of firms with high exposure to climate risk.

**Parallele Session C9 - Sentiment and Preferences**

*“Dependence Structure Among Carbon Markets Around the World: New Evidence from GARCH-Copula Analysis”*
Karshma ANSAHAM and Paolo MAZZAB, ESEG School of Management.

This paper investigates the dependence structure among carbon markets around the world through the application of different copulas. The analysis provides important insights into the relationship between carbon prices being traded across different exchanges across the world. The novelty of this study rests into assessing carbon allowances for both futures and spot prices across all the key carbon markets, such as the EU, RGGI, California, Quebec, South Korea, as well as the three oldest Chinese pilot carbon markets, Shenzhen, Guangdong and Hubei for the period 2011 to 2019 for future prices and 2015 to 2020 for spot prices. The results demonstrate an asymmetric relationship between most carbon markets. A low tail dependence has been noted between the EU and western carbon markets, while higher tail dependence has been registered with the eastern carbon markets. Further, carbon markets that have linkage agreement, ongoing cooperation or are geographically close tend to have positive and higher tail dependence. The paper points out to regional carbon clubs being formed as per the dependence structure.

**Parallele Session D10 - Climate Footprint of Bitcoin**

*“Sea Level Rise Risk and Mortgage Lending Standards”*
Qiping HUANG, University of Dayton, Chengbo FU, School of Business, University of Northern British Columbia, Memee LIU, Georgia Southern University, Salman TAYSON, San José State University.

We study the relationship between sea level rise (SLR) risk and access to residential mortgage credit at the census tract level from 2018 to 2020. Three different levels of SLR risk, ranging from imminent to long-term risks, are estimated using the elevations from sea level. We find significantly lower loan approval rates in census tracts that are exposed to all three different levels of SLR risks. Additionally, we find that the climate risk beliefs do not matter if the location is under imminent risk. However, in areas under medium or long-term risks, approval rates are affected by SLR only if climate beliefs are high. We also find that both, local and diversified banks reduce loan acceptance rates in locations that are under imminent risk, but local banks approve significantly more loans if the risks are more long-term to medium. The local bank effects are not driven by the size of banks. Overall, we uncover a significant impact of SLR risks on mortgage approval rates and we also find that the effects vary based on the level of SLR risks.
"Building Benchmarks Portfolios with Decreasing Carbon Footprints"  
Benoit MOJN and Luiz Anzau PEREIRA DA SILVA, Bank for International Settlements, Eric JONDEAU, University of Lausanne, HEC Lausanne, Swiss Finance Institute.

In this paper, we build portfolios with decreasing carbon footprint, which passive investors can use as new Paris-consistent (PC) benchmarks and have the same risk-adjusted returns as business-as-usual (BAU) benchmarks. As the distribution of firms’ carbon intensity is very skewed, excluding a small fraction of highly polluting firms can massively reduce the carbon footprint of a portfolio of corporate stocks. We identify the worst polluters globally, exclude them from the portfolio, and reallocate the proceeds so as to keep sectoral and regional exposures similar to those of the BAU benchmark. This approach limits divestment from corporates in Emerging Countries that would result from implementing exclusions and reinvestment without the objective of preserving regional exposures. We show that reducing the carbon footprint of the portfolio by 54% in 10 years would be obtained by excluding sequentially up to 11% of the corporates, which together amount to less than 6% of the global market portfolio. While this reallocation preserves regional and sectoral exposures similar to those of the BAU benchmark, it does not change its risk-adjusted return. We define PC benchmarks portfolios at the global level, for Emerging Countries, Europe, North America, and the Pacific.

"Portfolio Construction with Climate Risk Measures"  
Thierry KONGALI, Amundi Asset Management and Thilo LE GUENEDAL, Amundi Asset Management, CREST.

Because of the 2015 Paris Agreement, the development of ESG investing and the emergence of net zero emission policies, climate risk is certainly the most important topic and challenge for asset owners and managers now and will remain so over the next five years. It considerably changes portfolio allocation and the investment framework of both passive and active investors. The goal of this paper is to conduct a survey of the various climate risk measures that are available in the asset management industry and the practices of portfolio construction that use these metrics. Therefore, the first part of this paper lists the different climate risk metrics - e.g., carbon footprint, carbon transition pathway, carbon transition and physical risks. The second part is dedicated to portfolio optimization, in particular portfolio decarbonization and portfolio alignment (Paris-based benchmarks and net zero carbon objective). Among the different findings, two are of great importance for investors. First, portfolio decarbonization is more difficult when we include scope 3 carbon emissions. Indeed, optimizing using the sum of scopes 1 and 2 emissions leads to a portfolio with more tracking error risk than using direct plus first tier indirect carbon emissions. Second, portfolio alignment is more complex than portfolio decarbonization. Since aligning portfolios with scope 3 is becoming the standard approach to climate portfolio construction, the impact on portfolio management may be substantial, and the divergence between carbon investing and traditional investing will increase.

" Tradable Analytics - Tracking ESG"  
Michel CROUSILLAT, NATIXIS, Dan GALAI, The Hebrew University of Jerusalem, Aner RAYON, Zirra, and Zvi WIENER, The Hebrew University of Jerusalem.

ESG (environment, social, and government) criteria became a significant factor in the investment universe. We develop an AI-based algorithm that uses public data, mainly Web-based information, to assign an E, S, and G ratings to companies. Using our scoring procedure we construct portfolios, each portfolio consists of 50 firms from the S&P 500 list, 50 firms with the highest scores and 50 with the lowest scores for 4 scoring categories: ESG, E, S, and G. We see consistent overperformance of high over low score portfolios (except in 2021 when the differences between the three portfolios were very small). We also see consistent overperformance of companies with high G-score over companies with low G-score. The data supports the hypothesis that G-indicators can identify better performing firms. We note over-performance of high vs. low 5-rated portfolios in 2018-2020. In 2021 the order has changed and the lowest 5-rated portfolio outperformed both the index and the highest 5-rated portfolio. We find that the E portfolios behave differently from the S and G, and note that usually significant investments are needed in order to improve the E score, which is not the case for S and G.

"Statistical Learning Methods for Predicting Corporate Carbon Emissions"  
Thibaut HEURTELUSE, Raul LEOTE DE CARVALHO and François SOUPÉ, BNP Paribas Asset Management.

We propose a new model for prediction corporate carbon emissions based on statistical learning techniques, which generates considerably better results than existing approaches. The model is based on one linear and one non-linear method only, which reduces the complexity of the model to the minimum required. An iterative approach to corrected data also significantly improves the results. As opposed to existing approaches, we propose the construction of a single global model instead of the construction of several sector models, which solves for the problem of lack of data in some sectors. We propose the model which can generate significantly better corporate carbon emission predictions for all sectors thanks to databases of larger size, 10,000 vs. 3,500 points. The model is currently used for predicting corporate emissions of scope 1 and 2 for about 15,000 companies at global level. And extension of the model to cover scope 3 is in progress.
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#RisksForum @LouisBachelier

Christian Gourieroux is a Professor at the Departments of Economics at the University of Toronto and at Toulouse School of Economics, and in charge of the chair «Regulation and Systemic Risks». He received a degree from ENSAE, the aggregation of Mathematics and obtained a thesis (Thèse d'état) from the University of Rouen. Christian Gourieroux has published 20 books and about 200 papers in Journals as Econometrica, Review of Economic Studies, Journal of Political Economy, and Journal of Econometrics, Review of Finance. Currently, he has been working on estimation and inference for noncausal processes and on the modelling and management of long run risk. Christian Gourieroux has received the silver medal from CNRS and honorary doctorates from the Universities of Montreal, Neuchatel and Mons.

Elsa Allman is a Climate Finance Expert and researcher within the Research and Risk Analysis Directorate of the French Prudential Supervision and Resolution Authority (ACPR), at the Banque de France. She holds a Ph.D. in Green Finance from Baruch College, City University of New York. Before her Ph.D., she worked five years within the ACPR’s Directorate of International Affairs on market risk regulatory topics. Her research focuses on climate risks, green bonds, ESG disclosure, ESG loans, and more generally climate finance and financial stability.

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Karishma Ansaram is Ph.D. Candidate in Climate Finance (at IESEG School of Management, France) with a particular focus on carbon markets around the world and holds an MSc in Carbon Finance (University of Edinburgh). She has been a research fellow on the NDC Financing in African Countries with Frankfurt School of Finance and Management and African Research Impact Network (ARIN). She also coordinates the Finance & Market Working Group at YOUNGO (official Youth Constituency at UNFCCC). She follows climate finance streams on an international level closely through her attendance to Pre COP-26 in Milan, COP26 in Glasgow, drafting policy papers and more.
Camille BAILY
CerFIm, University of Namur

Camille Baily is a PhD candidate at the University of Namur (UNamur), in Belgium. She obtained a M.Sc degree in Economics from the Université Catholique de Louvain and the University of Namur in 2017. After spending two years as teaching assistant at the University of Namur, she obtained a four-year grant from the Fonds National de la Recherche Scientifique (FNRS) to complete her PhD. Her research project, entitled “Climate Change: Economic Impact and Challenges for the Financial System” is at the crossroads of financial econometrics and sustainable finance.

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University of Hamburg

Johannes A. Barg is a research associate and PhD candidate at the Chair of Corporate Finance and Asset Management at the University of Hamburg, and a research fellow at the Hamburg Financial Research Center (HIFC). His research interests include Corporate Finance, Corporate Governance, Sustainable Finance, and Venture Capital. Johannes holds a B.Sc. and M.Sc. in Business Mathematics from the University of Hamburg with study visits to the University of Southampton (United Kingdom) and the Lund University (Sweden). In addition to his academic education, Johannes gained professional experience in the consulting and investment banking industry.

Thibaud BARREAU
Data Scientist, ILB Datalab / Pladifes project

Data scientist specialized in sustainable finance and applied mathematics, Thibaud graduated from Centrale Lyon with a specialization in finance and from Kungliga Tekniska Högskolan (KTH), in Stockholm, with a Master of Science in “Applied and Computational Mathematics”, in 2020. He has worked on several data science projects as well as others mixing applied mathematics and green finance for banks (Crédit Agricole) and other practitioners (Euronext). The topics were quite diverse, including statistical analysis, optimisation, alignment measure. He was also Stéphane VOGI’s sherpa at the European Commission for the EU Green Taxonomy for over a year. He is now actively participating in the launching of PLADIFES, a new equipEx aiming at providing academics and sustainable practitioners a better access to ESG data, by filling the gaps currently existing in the ESG data market.

Alicia BASSIERE
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Alicia Bassière holds a degree in economics from the Toulouse School of Economics and the Institut d’Économie et Gestion (IEG) in Toulouse, France. She is a PhD student specialising in the electricity market and its role in the energy transition. She is interested in the energy transition more generally, including issues of energy dependency, the relationship to transport and heating of buildings. She is a member of the Board of the French Association of Energy Economists and of the Shifters Association.

Louis BERTUCCI
Institut Louis Bachelier

Louis Bertucci is a researcher at Institut Louis Bachelier (ILB) (Paris, France). He received a PhD in financial economics from the University of Paris-Dauphine in 2019. Since 2017, his work has been almost entirely focused on the fundamental analysis of blockchain protocols. His interests are in consensus protocols, decentralized payment networks, decentralized finance and other related topics. At ILB, he is the scientific coordinator of the Finance and Insurance Reloaded Program (FIR). He has also been teaching Blockchain Economics at Dauphine since 2020.

Milo BIANCHI
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Milo Bianchi is Professor of Finance at the Toulouse School of Economics. His current research agenda focuses on fintech and on sustainable finance, with specific focus on individual investors. His work has been published in leading economics and finance journals including Journal of Finance, Review of Economic Studies, Journal of Economic Theory, and Management Science. Milo is a junior member of the Institut Universitaire de France, director of the FIT-IN Initiative, and member of the Sustainable Finance and the Digital Finance Centers at TSE. Milo has received his PhD from the Stockholm School of Economics and he has held research positions at various institutions including MIT, Paris School of Economics, University College London, and Shanghai University of Finance and Economics.

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Christophe Bisixé is a professor of finance at Toulouse Capitole University. He holds a research master’s degree in computer science, and a research master’s degree in finance. He received his doctorate in economics from Aix-Marseille University in 1994. He spent a year as an economic fellow at the U.S. Securities and Exchange Commission, in Washington D.C., working on U.S. markets regulation issues. His research has been published in international academic journals such as European Financial Management, Management Science, the Journal of Finance and the Review of Financial Studies. His recent work focuses on blockchain and cryptocurrencies.

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Paris School of Economics, CNRS

Catherine Bobtcheff is researcher at CNRS and professor at the Paris School of Economics. She is an actuary and she holds a PhD from the Toulouse School of Economics. Her main research fields concern applied economic theory, finance and insurance and industrial organization. Her recent publications focus on insurance, the dynamics of investments and strategic interactions. More specifically, in the field of economics of science and using game theory models in a dynamic framework, Catherine Bobtcheff studied the interactions between competition and the quality of innovations as well as the effects of the publication of negative results on welfare. Part of her work also relates to insurance, in particular the systemicity of the insurance industry and the insurance of systemic risks. In 2018, she received the Eloi Fieschi Institute of Finance (EIF) Best Young Researcher in Finance and Insurance.

Eric BOUYÉ
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Eric Bouyé is Manager, Head of Product, Knowledge, and Research at the World Bank Treasury. He is a member of the leadership team of the Asset Management and Advisory Department, in charge of managing $70 billion assets and providing advisory and training for 75 clients consisting of central banks, public pension funds, and sovereign wealth funds. Eric has 23 years of experience in capital markets and asset management. Prior to joining the Bank, Eric was Senior Strategist at the Fonds de Réserve pour les Retraites (FRR). He was previously Director at Société Générale in Europe and Asia. Eric holds a Ph.D. in Finance from Bayes Business School, University of London, a Master in International Economics and Finance, University of Bordeaux, and an MSc. in Banking and Finance, University of Birmingham.
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Fanny Cartellier is a 2nd year PhD student at CREST in applied mathematics. She works on modelling the impact of climate-related risks and their uncertainty on the financial system under the direction of Peter Tankov and Christian-Yann Robert. Her mixed academic training from sciences in mathematics and finance, with a speciality in financial mathematics, provides her with a precious understanding of contemporary issues in finance, as well as with the quantitative tools that are necessary to model them. Her current work focuses on climate stress testing and modelling the impact of transition risks on financial institutions from a macro point of view.

Hasan CERHOZI
Moody’s ESG Solutions

As Vice President for Impact & ESG Methodology Development at Moody’s ESG Solutions, Hasan leads methodology development efforts within impact and sustainable finance themes. Prior to his role, Hasan lead the research of the climate risk assessment team of MESG focusing on impact, risk and opportunity metrics. Hasan has a Master’s degree in International Energy from Institut d’Études Politiques de Paris and is an expert on carbon footprinting and transition risk analysis. In his previous experiences, Hasan worked in the electric and gas sector as an energy analyst focusing on energy subsidies for fossil fuels, and in regulatory incentives for the development of renewable energy technologies.

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Anna Creti is Full Professor at Université Paris Dauphine, Paris, Director of the Climate Economics Chair (Un. Dauphine) and the Economics of Gas Chair (U. Dauphine, Toulouse School of Economics, IFPEN, Ecole des Mines). She is Research Fellow, Ecole Polytechnique, Paris and external Affiliate, Siebel Institute, Berkeley. Anna holds a PhD from the Toulouse School of Economics and a post-doc from the London School of Economics. She has extensively studied competition and regulation of network utilities (telecommunications, baks, gas, electricity...), as well as the link between energy, climate and environmental regulation. Anna has numerous publications in top economic journals and she also intervenes in several medias.

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Toulouse School of Economics

Christian Gollier’s research spans the fields of economics of uncertainty, environmental economics, finance, consumption, insurance and cost-benefit analysis, with a particular interest in long-term sustainable effects. He founded the Toulouse School of Economics with Jean Tirole in 2007 and has been its director since 2009 (with a break in 2015–2016). He has published over a hundred articles in international scientific journals. He has also published 7 books on risk, including «The Economics of Risk and Time» (MIT Press), which won the Paul A. Samuelson Award (2001). In 2012, he published a book entitled «Pricing the Planet’s Future» with Princeton University Press, which he presented at the 6th Arrow Lecture at Columbia University. Christian Gollier is one of the authors of the 4th and 5th reports of the Intergovernmental Panel on Climate Change (IPCC, 2007 and 2013). In addition, he regularly advises several governments on their public investment assessment policies. He is President of EAERE, the European Association of Environmental Economists. His recent book for the general public, «Le Climat après la fin du mois» (PUF 2019), deals with the importance of taking action on climate change and has been very successful in France.

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Paul Karehnke is an Associate Professor of Finance at ESCP Business School. He received a joint PhD from Université Paris-Dauphine and Tilburg University in 2014. Prior to joining ESCP in 2018, he was a Lecturer and then a Senior Lecturer at the University of New South Wales in Sydney (Australia). His research interests include asset pricing, investments, behavioral finance, and choice under risk. His work has been published in journals such as the Journal of Financial Economics, Journal of Financial and Quantitative Analysis, Management Science, and Review of Finance. He has also served as a referee for top-tier finance and economics journals, and he is currently an associate editor at the Journal of Empirical Finance.

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Laurent Lamy is currently a research fellow at CRED. His work has largely focused on auctions and procurement. He has published in leading general economic journals, including the American Economic Review, the Journal of Political Economy and the Journal of the European Economic Association. He received his PhD in economics from EHESS-École des Ponts et Chausées, and earned engineering degrees from École Nationale des Ponts et Chausées and from École Polytechnique.

Théo LE GUENEDAL
Amundi Asset Management, CREST

Théo Le Guenedal joined the Quantitative Research team of Amundi in December 2018 after his internship dedicated to the performance of ESG investing in the equity market. He is currently working on a broader research project on the “Integration of ESG Factors and Climate Risks in Asset Allocation Strategies”. At this occasion, Théo and his co-author Vincent Bouchet received the GRASFI Best Paper Prize for Research on Climate Finance (sponsored by Imperial College London), for their paper “Credit Risk Sensitivity to Carbon Price”. Prior to that, Théo graduated from École Centrale Marseille with a specialization in Mathematics, Management, Economics and Finance. He also holds a master’s degree in Mathematics and Applications from Aix-Marseille University. In 2017, Théo was awarded the postgraduate diploma “Engineers for Smart Cities” from the Mediterranean Institute of Risk, Environment and Sustainable Development and a master’s degree in Economic Management from the School of Economics and Business of Nice Sophia-Antipolis University.

Clara LAGE
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Clara Lage is a postdoc researcher at École Polytechnique, at CMAP (Center of Applied Mathematics). Her work focuses on Convex Optimization and Stochastic Optimization. She is particularly interested in applications in the fields of Energy and Finance. She has a Ph.D. from the Department of Applied Mathematics of Panthéon Sorbonne University and from the Department of Mathematics of IMPA (Applied and Pure Mathematics Institute).

Paul HADJI-LAZARO
Université Sorbonne Paris Nord

Paul Iadji-Lazarou is a PhD student in ecological economics at Université Sorbonne Paris Nord. His research focuses on how environmental-related economic issues can be addressed by combining Input-Output analysis and Monetary-Financial analysis. He studied development and energy economics at Toulouse School of Economics, Université Paris-Dauphine and Université Paris-Saclay. He has had various working experiences in economic and energy research and policies (Centre d’Études prospectives et d’informations, Agence Française de Développement, Enerdata).

Clara Lage is a postdoc researcher at École Polytechnique, at CMAP (Center of Applied Mathematics). Her work focuses on Convex Optimization and Stochastic Optimization. She is particularly interested in applications in the fields of Energy and Finance. She has a Ph.D. from the Department of Applied Mathematics of Panthéon Sorbonne University and from the Department of Mathematics of IMPA (Applied and Pure Mathematics Institute).

Léa GRISÉY
Banque de France, Network for Greening the Financial System (NGFS)

Léa Griséy has been working as an insurance supervisor within the French Supervisory Authority for 4 years, before joining the NGFS Secretariat at the Banque de France in 2020. She was first in charge of the NGFS Workstream on Supervision, and, since July 2020, has been in charge of the NGFS Workstream on bridging the data gaps.

Théo LE GUENEDAL
Amundi Asset Management, CREST

Théo Le Guenedal joined the Quantitative Research team of Amundi in December 2018 after his internship dedicated to the performance of ESG investing in the equity market. He is currently working on a broader research project on the “Integration of ESG Factors and Climate Risks in Asset Allocation Strategies”. At this occasion, Théo and his co-author Vincent Bouchet received the GRASFI Best Paper Prize for Research on Climate Finance (sponsored by Imperial College London), for their paper “Credit Risk Sensitivity to Carbon Price”. Prior to that, Théo graduated from École Centrale Marseille with a specialization in Mathematics, Management, Economics and Finance. He also holds a master’s degree in Mathematics and Applications from Aix-Marseille University. In 2017, Théo was awarded the postgraduate diploma “Engineers for Smart Cities” from the Mediterranean Institute of Risk, Environment and Sustainable Development and a master’s degree in Economic Management from the School of Economics and Business of Nice Sophia-Antipolis University.

Amanda LEBIC
Moody’s ESG Solutions

Amanda Lebic is Senior Product Manager of Climate Transition Risk products at Moody’s ESG Solutions. In this role, Amanda leads the collection and analysis of data aimed to identify and quantify Climate Transition Risk, such as Carbon footprint data (Scope 1, 2 and 3 GHG emissions) and Temperature Alignment. Prior to this role, she was Specialized Researcher and Production Team Manager of the Climate Team at Vigeo Eiris, where she started her career in 2019. Amanda holds a Master’s degree in Climate Sciences from the University of Bern.

Emmanuel JURCZENKO
EDHEC

Emmanuel Jurczenko is Professor of Finance and Director of Graduate Finance Programmes at EDHEC Business School. Emmanuel primary research interests are quantitative portfolio management and asset pricing. He is interested in issues related to factor and risk-based investing, climate investing, and private markets. Before joining EDHEC Business School, Emmanuel was a tenured associate professor of finance at ESCP Business School. He received a PhD in economics from Université Paris Panthéon-Sorbonne. Emmanuel worked in fund of funds at ABN-AMRO and served as academic consultant for various asset management companies.

Christian GOLLIER
Toulouse School of Economics

Christian Gollier’s research spans the fields of economics of uncertainty, environmental economics, finance, consumption, insurance and cost-benefit analysis, with a particular interest in long-term sustainable effects. He founded the Toulouse School of Economics with Jean Tirole in 2007 and has been its director since 2009 (with a break in 2015–2016). He has published over a hundred articles in international scientific journals. He has also published 7 books on risk, including «The Economics of Risk and Time» (MIT Press), which won the Paul A. Samuelson Award (2001). In 2012, he published a book entitled «Pricing the Planet’s Future» with Princeton University Press, which he presented at the 6th Arrow Lecture at Columbia University. Christian Gollier is one of the authors of the 4th and 5th reports of the Intergovernmental Panel on Climate Change (IPCC, 2007 and 2013). In addition, he regularly advises several governments on their public investment assessment policies. He is President of EAERE, the European Association of Environmental Economists. His recent book for the general public, «Le Climat après la fin du mois» (PUF 2019), deals with the importance of taking action on climate change and has been very successful in France.

Thomas GROUX
CREST

PhD candidate at CREST and financial engineer at MIRDAV, a sustainable asset manager, his research focuses on quantitative and sustainable finance. Thomas Groux currently concentrates his efforts to answer empirical issues about the effect of climate risks on financial returns. He is also studying the impact of sustainable equity strategies on firms’ decarbonization and adaptation toward a more sustainable economy.
Clément LE BLANC
École des Ponts, ParisTech

Clément Leblanc is a Ph.D. candidate at CIRED (International Research Center on the Environment and Development). He is working on subsidy mechanisms for electricity generation from solar and wind and focuses on risk management and strategic behavior related to contract and auction design for these mechanisms. Before that, he studied at ENSAE Paris, specialized in environmental economics at AgroParisTech, and worked for two years in a consulting firm specializing in environmental issues.

Zhichao LI
Durham University

Zhichao Li is a PhD student and a teaching associate at the business school of Durham University. She is also an ACCA (Association of Chartered Certified Accountants) affiliate. She received her master’s degree in accounting and finance from the University of Warwick in 2018, and her bachelor’s degree in accounting from the Schuam University in 2017. Her current research focuses on financial reporting and disclosures, financial analysts, and corporate social responsibility. She presented and discussed papers regularly at a range of major finance and accounting conferences.

Antoine MANDEL
University Paris 1 Panthéon-Sorbonne

Professor of mathematical economics at the Sorbonne and co-founder of the climate risk consultancy CLIMAFIN. With over fifteen years of experience in climate impact research, he is leading an interdisciplinary and international research team that has developed cutting-edge models for the analysis of economic and financial impacts of climate change and has led large-scale risk assessment for global financial and policy institutions. Antoine Mandel is a fellow of two of the leading global think tanks on climate policy, climate strategies and the global climate forum.

Jocelyn MARTEL
Professor of Finance, ESSEC

Jocelyn Martel is Full Professor of Finance at the ESSEC Business School. His fields of expertise are financial theory, firm valuation and bankruptcy and corporate restructuring. He joined ESSEC Business School on a full-time basis in 2009 after having spent 13 years at the University of Cergy-Pontoise (UCP) during which he also occupied a visiting position at ESSEC. He is currently Head of the ESSEC – Amundi Chair in Asset & Risk Management, Deputy Director of the European Financial Data Institute (EUROFIDAI) and Co-President of the Paris December Finance Meeting.

Jean-Stéphane MÉSORNIER
Banque de France, Sciences Po

Jean-Stéphane Mésornier is a Senior Research Advisor at Banque de France and an Associated Professor of finance at Sciences Po. He was previously Head of the Financial Economics Research Division (2009-2015), then Deputy Director for Microeconomic and Structural Analysis (2015-2021) at Banque de France. He graduated as an economist-engineer at École Centrale Paris in 1995. He also holds a PhD in economics from University Paris Sorbonne Paris Nord and the Habilitation (HDR) from ENS Paris-Saclay. His current research focuses on financial reporting and disclosures, financial analysts, and corporate social responsibility. He presented and discussed papers regularly at a range of major finance and accounting conferences.

Benoît MOJON
Bank for International Settlements

Benoit Monjo was appointed Head of Economic Analysis on 1 September 2018. Before joining the BIS, he worked at the Bank of France. He was Head of the Monetary Policy Division from 2008 until 2011. He then became Director of Monetary and Financial Studies and a member of the Eurosystem Monetary Policy Committee. Previously, he held research positions at the Federal Reserve Bank of Chicago (2007-08) and the European Central Bank (1998-2006). He holds a PhD in economics from the University of Paris Nanterre. He taught at the University of Aix-Marseille (2004-08) and Sciences-Po (2008-10) and was an adjunct professor at École Polytechnique (2011-18) and INSEAD (2018). Fields of interest:

- Monetary policy
- Macroeconomics
- Financial stability and macro-prudential issues

Irene MONASTEROLO
Professor of Climate Finance, EDHEC Business School and EDHEC-Risk Institute

Irene Monasterolo is Professor of Climate Finance at EDHEC Business School and EDHEC-Risk Institute in Nice (FR) and senior research fellow at the Vienna University of Economics and Business (Austria) and Boston University (USA). Irene holds a PhD in Agri-food economics and statistics from the University of Bologna (IT) and two post doctoral experiences on climate finance.

Irene’s research is contributing to understand the role of finance in the achievement of the climate targets in both high income and developing countries, and the assessment of climate-financial risks and opportunities in the low-carbon transition. She has co-developed the climate stress-test of the financial system, which embeds climate scenarios in asset pricing and investors’ risk assessment, and was published in Nature Climate Change and Science. The Climate Stress test methodology included in the CLIMAFIN tool has been applied by several (public and private) financial institutions to assess investors’ exposure to climate physical and transition risks.

Irene has also co-developed the EIRIN Stock-Flow Consistent macro-financial model to analyze the implications of climate policies (fiscal, monetary, prudential) on green investments, financial stability and inequality. Currently, with the EIRIN model, Irene is supporting the World Bank in the analysis of the macro-financial criticality of compounding COVID-19 and climate risk, and is collaborating with the European Central Bank at the analysis of the double materiality of climate risk in the EU economy and banking sector (forthcoming as European Central Bank working paper).

Irene is contributing to the G24 V20 countries’ Task Force on Climate, Development, and the IMF led by Boston University’s Global Development Policy Center, as well as to the World Bank’s Crisis Risk Analytics project of the Global Risk Financing Facility aimed to assess the macroeconomic and financial implications of compounding COVID-19 and climate physical risks.

Irene’s research has been published on leading academic journals, such as Science and Nature Climate Change, as well as on non-academic journals (e.g. Le Monde, UNPRI). She has co-edited the first special issue on Climate Risks and Financial Stability (published on Journal of Financial Stability in 2021). Irene has co-authored the G20’s T-20 chapter on Sustainable Finance, and climate finance chapters of the Financial Stability Review of the European Insurance and Occupational Pension Authority (EIOPA) and of the Austrian National Bank (OeNB). Irene’s co-authored methodologies for climate financial risk assessment and climate stress test have been applied by leading international financial institutions, central banks and financial regulators, including the World Bank, the European Central Bank, the European Banking Authority, the European Insurance and Occupational Pension Authority, the European Systemic Risk Board. Irene is editor of Ecological Economics.

Alain MONFORT
CREST

Alain Montfort is emeritus professor at ENSAE/CREST. In the past, he has been Director of Studies of ENSA, Director of the Research Department of INSEE, Director of the CREST, and Head of the Chair of Statistics at the CNAM. He is author or co-author of eight books and of more than one hundred articles. He has also been associate editor of several international reviews and co-editor of Econometrica.
Jean-Paul Renne is a professor of economics at HEC Lausanne, which he joined in 2015. Previously, he worked as a senior economist at the Banque de France and as the head of operational research at the French debt management office (French Treasury). Jean-Paul Renne holds a Ph.D. in Applied Mathematics from Paris-Dauphine University. His research interests are yield curve and credit risk models, non-linear time series models and climate-risk-based scenarios, and interest rates pass-through models.

Julien Royer is a PhD candidate in Applied Mathematics at the Center for Research in Economics and Statistics (CREST) and ENSAE. His research focuses on Financial Econometrics and his academic work deals with the memory property of financial time series and its implication for volatility modeling, risk measures inference and portfolio construction. He holds a master’s degree in Economics and Financial Engineering from Paris Dauphine University and a master’s degree in Quantitative Finance and Risk Management from ENSAE. Prior to his doctoral research, Julien was a systematic strategies strategist at Société Générale CIB in New York and he is currently a quantitative researcher at BBT Investment Managers, a subsidiary of Amundi.

Mathilde Salin is a PhD student in economics at CIRED (AgrariaMinTech, Université Paris-Saclay) and the Climate change center of the Banque de France. Her research focuses on how biodiversity-related transition policies could be sources of risks and transformations for the French financial system. She studied development and environmental economics at the Paris School of Economics and Université Paris Saclay, and she is a former student from the Ecole normale supérieure de Paris. She has had various working experiences in economic and environmental research and policies (France Stratégie, Chaire énergie et prospérité, Assemblée Nationale, Institut des politiques publiques).

Caterina Santi is Assistant Professor in International Finance at HEC Liège, Belgium. Her research focuses on Climate Finance, Empirical Asset Pricing, and Behavioural Finance. Before joining HEC Liège, Caterina was lecturer in Finance at the Cork University Business School, Ireland. She holds a PhD Economics from the Scuola Superiore Sant’Anna, Italy. During her PhD she did a research visit at the Department of Finance at the Vrije Universiteit Amsterdam, and at the Department of Economics at the University of Technology Sydney.

Fabiola Schneider is a doctoral researcher at University College Dublin’s Michael Smurfit Graduate Business School, Fabiola focuses on sustainable finance as a way to progress the UN’s SDG agenda. Her research revolves around the climate emergency and sustainable transitions, with papers on financing in the fossil fuel sector published in ABS 3 and 4 star journals. Moreover, Fabiola has publications on ESG reporting and impact investing in progress. She complements her research with engagement on the European Commission’s Platform on Sustainable Finance, the expert panel tasked to advise on the EU Taxonomy for Sustainable Activities, and on the UN’s Race To@Z consultation group on Fossil Fuel Transitions & Non CO2 gases. Additionally, Fabiola is enthusiastic about projects at the intersection of data science, finance and sustainability. For example, she is Co-Lead at GreenWatch which applies AI to detect greenwashing. Another passion of Fabiola is equality, diversity and inclusion as obvious in her role on UCD’s EDI team.
Mandeep SINGH  
Centre for Climate Finance and Investment (CCFI), Imperial College Business School

Mandeep joined the Centre for Climate Finance and Investment at the Imperial College Business School after finishing his PhD in Banking and Finance at the University of New South Wales. His research interests are climate finance, banking, and empirical asset pricing. His current work focuses on the implications of climate-related factors for credit markets and investors. Previously, Mandeep worked as a Senior Analyst for the Reserve Bank of Australia.

George SKIAPOPOULOS  
Queen Mary University of London, and University of Piraeus

George Skiapopoulos is a Professor of Finance at the Department of Banking and Financial Management of the University of Piraeus, and at the School of Economics and Finance of Queen Mary University of London. He is the Director and co-Founder of the Institute of Finance and Financial Regulation (www.iffr.gr) and an Honorary Senior Visiting Fellow at Bayes Business School City, University of London. He is also a member of the Group of Economic Advisers to the European Securities Markets Authority (ESMA), the supra-national supervisor of European financial markets. He has published in academic journals, including the Management Science, Journal of Financial and Quantitative Analysis, Journal of Business and Economic Statistics, Journal of Banking and Finance, and the Journal of Financial Markets. He has been awarded research grants by the Chicago Mercantile Exchange Foundation Group, the J.P. Morgan Research Centre in Commodities at University of Denver Colorado, the Athens Derivatives Exchange, and the Portuguese Foundation for Science and Technology (FCT). His work has been featured in media outlets including Wall Street Journal and Forbes and it has policy impact being presented in forums like the European Parliament, EBA and EIDPA.

Arthur STALLA-BOURDILLON  
Banque de France

Arthur Stalla-Bourdillon is an economist at the International Macroeconomics Directorate of Banque de France (Bdf), and is also a 4th PhD student in Finance at Université Paris Dauphine, under the supervision of Gaëlle Le Fol. Previous to that, he worked 3 years at the Financial Stability Directorate of Bdf. He holds two master degrees, one from HEC Paris, with a specialization in quantitative economics, and one from the Paris School of Economics. His research focuses on time series econometrics, financial markets and financial contagion.

Peter TANKOV  
CREST, ENSAE, IP Paris, and Green and Sustainable Finance (GSF) Programme, Institut Louis Bachelier

Peter Tankov is professor of quantitative finance and head of the finance/risk management track at ENSAE. He graduated from Ecole Polytechnique (X98) and was professor at the University of Paris Diderot and lecturer at Ecole Polytechnique. His research focuses on quantitative energy finance and green finance. He works on topics related to electricity markets, energy mix scenarios, forecasting and risk management for the renewable energy industry. He is the author of more than 45 research papers and a reference book on stochastic modeling with jumps. He is a member of the scientific board of the Louis Bachelier Institute where he is also the scientific leader of the interdisciplinary research program on Green and Sustainable Finance (GSF). He sits on the board of the international research network GRASFI on sustainable finance.

Andrea TARELLI  
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Andrea Tarelli is Assistant Professor in the Department of Mathematics for Economic, Financial and Actuarial Sciences at the Catholic University of Milan. He holds a PhD in Finance from EDHEC Business School and MSc degrees in Electronics Engineering from Politecnico di Milano and Politecnico di Torino. He has been post-doctoral research fellow at Bocconi University. He held teaching positions at EDHEC Business School and research roles at EDHEC-Risk Institute. Previously, he worked in the structured products group at JP Morgan (London), as well as in the equity volatility trading team at Société Générale (Paris). His research interests are asset pricing, asset allocation, and financial econometrics, with publications in leading academic journals, such as the Journal of Financial Economics, Journal of Money, Credit and Banking, Journal of Economic Dynamics and Control, Journal of Corporate Finance, and European Journal of Operational Research.

Lucian TAYLOR  
Professor of Finance, Wharton School, University of Pennsylvania

Lucian Taylor's primary areas of research are empirical corporate finance and asset management. His research focuses on three main themes: sustainable investing, skill in fund management, and structural estimation in corporate finance. His articles have appeared in the Journal of Finance, Journal of Financial Economics, Review of Financial Studies, as well as nonacademic outlets such as the Financial Times, Wall Street Journal, CNN Money, and Forbes. Lucian Taylor's research has received the Fama/DFA Prize for best paper in the Journal of Financial Economics, the AQR Insight Award for Distinguished Paper, and others. He is an associate editor at the Journal of Financial Economics and Review of Finance. Since joining Wharton, Lucian Taylor has taught Venture Capital and the Finance of Innovation to undergraduate, MBA, and executive MBA students. Lucian earned his AB from Princeton University and MBA and PhD in Finance from the University of Chicago Booth School of Business.

Eric VANSTEENBERGHE  
ACPR

Eric Vansteenberghe is a Research Economist at the Banque de France – ACPR, where he joined the research unit after several projects in bank stress testing in Paris and Frankfurt (ECB). Eric teaches Quantitative Methods at University of Paris 1 Panthéon-Sorbonne. His research interests are devoted to crowdlending, climate change and reinsurance.

Zvi WIENER  
The Hebrew University of Jerusalem

Professor Zvi Wiener is the former dean of the Hebrew University Business School (2016-2020). He is an expert in risk management, financial engineering and the valuation of complex financial products. Zvi is one of the founders of PRMIA (Professional Risk Managers' International Association, see www.prmia.org), has served as a co-chair of the worldwide Education and Standards Committee of PRMIA and is currently a co-director of PRMIA Israel. His research was published in leading financial journals including the Journal of Finance, the Review of Financial Studies, Journal of Banking and Finance, Journal of Derivatives, Journal of Corporate Finance and many others and can be found at his academic website: http://pluto.mscu.huji.ac.il/~zwiener. Zvi was a Visiting Professor at the Washington University in St. Louis and the University of Southern California in Los Angeles. In 2014 he was awarded the Teya Prize for research on dividend policy. In 2012 he received PRMIA award for Outstanding Service and Leadership, in 1997 he received the Alon Fellowship and in 1994 the Rothschild Fellowship. In the years 1996, 2005, 2003, 2015 and 2016 he received research grants from the Israel Academy of Sciences. Zvi Wiener has a rich consulting experience. He consulted the Ministry of Finance, the Bank of Israel, the Israel Securities Authority, the Tel Aviv Stock Exchange, credit rating companies, banks, insurance firms and pension funds, as well as leading law firms on various financial issues. In addition, Zvi is an angel investor in several young companies.
Lina XIE  
University of Groningen

Lina Xie is currently a third year PhD student in Climate Finance at the Department of Economic, Econometrics and Finance at the University of Groningen, working with Professors Bert Scholtens and Swarnodeep Homroy. Her doctoral research is directed at financial intermediation and climate finance. Her research concentrates on climate-related activities of public financial institutions, such as the efficiency of the climate finance allocation of multilateral development banks and the climate change awareness of domestic public financial institutions in OECD countries.

Ban ZHENG  
HSBC Asset Management

Ban Zheng is the Head of Data Science in the Quantitative Equity Research team within HSBC Asset Management in Paris. He has been working within the financial industry since 2009. In his role, Ban is in charge of the development of quantitative strategies and the application of data science for portfolio management. Before joining HSBC Asset Management in 2019, Ban worked as a quantitative researcher for Lyxor Asset Management from 2013 and for Natixis Corporate and Investment Banking from 2009 to 2013. Ban holds a PhD in applied mathematics from Telecom Paris (France), a master’s degree in market finance from ENSAE ParisTech (France) and an engineering degree from Ecole Polytechnique (France). Ban is a research fellow and lecturer at Ecole Polytechnique in France and Central University of Finance and Economics in China. He has also co-published books and research articles on subjects related to big data, quantitative management and ESG investing.

Tianhao YAO  
HEC Paris

Tianhao Yao is a PhD student in finance at HEC Paris. His research interests lie in asset management, ESG investment, and sustainable finance. He holds a MSc with distinction in Statistics from University College London.

Jean-Michel ZAKOIAN  
CREST

The right information is a key tool to master all the market data and have a global vision of this sector reportage, special file, research work...

Since 1926, Groupe Revue Banque’s publications have been a reference for professionals in banking, insurance and finance. Each journal analyzes the news: professional views, interviews, expert review, On a daily basis, 56 expert journalists analyse the news to provide all financial professionals with the high value-added information (alerts, articles, analyses, in-depth reports, etc.) that is essential to their activity. Recognised both for the quality of the information it disseminates and for its expertise in the new media, L’AGEFI is constantly adapting its information media to technological developments and consumption patterns.

About L’AGEFI
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About The Journal of Asset Managements
The Journal of Asset Management is, since more than twenty years, an internationally renowned forum for academic and applied research in the field of investment management. It has established itself as a valuable bridge connecting innovative research, best practices and regulatory interests. Two special issues have appeared to date following the Financial Risks International Forum, in close cooperation with the Scientific Committee of the Louis Bachelier Institute, featuring articles that have been presented. The intention is to build a new special issue this year.
About the Caisse des Dépôts Group:

Caisse des Dépôts and its subsidiaries form a public long-term investor group serving the general interest and economic development of local areas. It combines five areas of expertise: social policy (pensions, professional training, disability, old age, health), asset management, monitoring subsidiaries and strategic shareholdings, business financing (with Bpifrance) and Banque des Territoires.

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About CNP Assurances:

“Let’s insure a more open world”
We are convinced that it is by being open to social and societal changes and by listening to all stakeholders that we will generate new ideas and positive protection solutions that are useful to individuals and society.

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About Autorité des marchés financiers - AMF

The AMF is an independent public authority responsible for ensuring that savings invested in financial products are protected, providing investors with adequate information and supervising the orderly operation of markets.

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About Investir l’Avenir

The investments of the future, also known as the programme d’investissement d’avenir (PIA), is an investment programme of the French state for higher education and research. It was initiated in 2010 and is still ongoing in 2022.

About Autorité des marchés financiers - AMF

The French National Research Agency (ANR) is a public administrative institution under the authority of the French Ministry of Higher Education, Research and Innovation. The agency funds project-based research carried out by public operators cooperating with each other or with private companies.

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About Direction générale du Trésor

The DG Trésor mission is to advise the government and act in the service of an innovative and inclusive French economy, promoting sustainable growth in a more efficient Europe in the face of global challenges.

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