

ISEFI 2019

7th INTERNATIONAL SYMPOSIUM ON ENVIRONMENT AND ENERGY FINANCE ISSUES

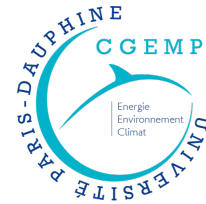
23 & 24 MAY



IPAG BUSINESS SCHOOL - 184 BD SAINT-GERMAIN - 75006 PARIS

IN PARTNERSHIP WITH





in partnership with



7th International Symposium on Environment and Energy Finance Issues (ISEFI-2019)

co-organized by IPAG Energy Economics Center, IPAG Business School and CGEMP, University of Paris Dauphine

May 23-24, 2019

IPAG Business School

184, Boulevard Saint-Germain, 75006 Paris

SUMMARY

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CONFERENCE OVERVIEW

The 7th International Symposium on Environment and Energy Finance Issues (ISEFI-2019), jointly organized by the IPAG Center for Energy Economics and Environment (*IPAG Business School*) and the Centre of Geopolitics of Energy and Raw Materials (*Paris Dauphine University*), will take place on 23-24 May 2019 in Paris, France. It aims to provide academics, policymakers, and practitioners with a valuable forum for discussion and critical analysis of the major issues and challenges that interrelate energy, environment, macroeconomics and financial markets.

The conference organizers welcome submission of both theoretical and empirical papers relating to all aspects of energy markets and their interactions with financial markets. The topics we will deal with this year are:

- Climate negotiations and scenarios for a +2° world
- Corporate finance analysis for energy companies
- Econometrics of energy markets
- Energy and climate models
- Energy and environment
- Energy derivatives: pricing and hedging
- Energy and financial market interactions
- Energy issues in developing and emerging markets
- Energy policies for low carbon transportation
- Energy prices: modeling and forecasting
- Energy risks: assessment and modeling
- Electricity networks, smart-grids, electricity demand
- Financial and economic analysis of energy markets
- Financial regulation of energy and environmental markets
- Finance and investment in renewable energy
- Intergenerational choices under global environmental change
- Hydroelectricity and water management
- Natural resources, risk, welfare and social preferences
- Oil and shale gas
- Poverty and environmental impacts of electricity price reforms
- Renewable and low carbon technologies policy
- Speculation and energy prices
- State regulation and energy governance
- Transportation charges in oil and natural gas industries

KEYNOTE SPEAKERS

Professor Matthew J. Kotchen *Yale University, United States*



Matthew Kotchen is a Professor of Economics at Yale University, with a primary appointment in the Yale School of Forestry & Environmental Studies and affiliated appointments in the Yale School of Management and the Department of Economics. He is also a faculty research fellow at the National Bureau of Economic Research (NBER).

Professor Kotchen's research interests lie at the intersection of environmental and public economics and policy. Ongoing projects employ both theoretical and empirical methods covering a range of topics, including energy, climate change, "green" markets, corporate social responsibility, development, and applied game theory. Kotchen joined the Yale faculty in 2009 and has held previous and visiting positions at Williams College, University of California (Santa Barbara and Berkeley), Stanford University, and Resources for the Future.

Professor Kotchen recently served as Deputy Assistant Secretary for Environment and Energy at that U.S. Department of the Treasury in Washington, DC. Kotchen also serves on the Environmental Economics Advisory Board of Science Advisory Board of the U.S. Environmental Protection Agency and has acted as the visiting chief economist of the Environmental Defense Fund (EDF).

KEYNOTE SPEAKERS

Professor Prakash Loungani

IMF Independent Evaluation Office & Vanderbilt University's Owen School of Management, United States



Prakash Loungani is an Assistant Director in the IMF's Independent Evaluation Office. He is also an Adjunct Professor at Vanderbilt University's Owen School of Management, a Senior Fellow at OCP Policy Center (a global think tank based in Rabat, Morocco) and a member of the advisory board of JustJobs Network based in New Delhi. During 2010-15 he was co-chair of the IMF's group on Jobs & Growth. Since 2012, he has been on various World Economic Forum councils on employment issues and real estate markets. He has 25 years of job experience at the IMF, the Federal Reserve System and the University of Florida. His research interests include: causes of unemployment; global housing markets; impacts of energy prices and climate change; and assessment of forecasting performance.

His articles have been published in top journals such as *Journal of Development Economics*, *Journal of Industrial Economics*, *Journal of Monetary Economics*, *Journal of Money, Credit, and Banking*, and *Review of Economics and Statistics*.

INVITED GUEST SPEAKERS

Professor Bassam Fattouh

Oxford Institute for Energy Studies & School of Oriental and African Studies, University of London, United Kingdom



Dr. Bassam Fattouh is the Director of the Oxford Institute for Energy Studies and Professor at the School of Oriental and African Studies, University of London. He specialises in international oil pricing systems, OPEC pricing power, security of Middle Eastern oil supplies, and the dynamics of oil prices and oil price differentials. He has published a variety of articles on oil and gas topics and his publications have appeared in academic and professional journals. Dr. Fattouh served as a member of an independent expert group established to provide recommendations to the 12th International Energy Forum (IEF) Ministerial Meeting for strengthening the architecture of the producer-consumer dialogue through the IEF. He also acts as an adviser to governments and industry, and is a regular speaker at international conferences.

Bassam Fattouh focuses his research on aspects of the international oil pricing system such as the relationship between the futures market and spot market, the relationship between OPEC and the market, the causes of oil price volatility and the dynamics of oil price differentials. He also focuses his research on the IOC-NOC relationship and its implications for investment behaviour. He has a strong background in the economic environment of the Middle East.

INVITED GUEST SPEAKERS

Professor Tom Kompas

Centre for Environmental and Economic Research, University of Melbourne, Australia



Tom Kompas is a Professor of Environmental Economics and Biosecurity in the School of Biosciences and the School of Ecosystem and Forest Sciences at the University of Melbourne. He is also the Foundation Director of the Australian Centre for Biosecurity and Environmental Economics (ACBEE) at the Australian National University (ANU), one of three Chief Investigator's in the Centre of Excellence for Biosecurity Risk Analysis (CEBRA) and Group Director of the Centre for Environmental and Economic Research (CEER) at the University of Melbourne. He has dedicated much of his recent time and work to public policy in Australia. Until recently, he was a part-time Senior Economist at the Australian Bureau of Agricultural and Resource Economics (ABARE), a Commonwealth Environment Research Facilities (CERF) project leader on biosecurity and Editor-in-Chief of the *Australian Journal of Agricultural and Resource Economics*.

Tom's research specialises in large-dimensional economic modelling, cost-benefit analysis and natural resource and environmental economics. His bioeconomic modelling and biosecurity research has been published in the world's leading international journals (including *Science*, *Proceedings of the National Academy of Sciences*, *Journal of Environmental Economics and Management*, *Land Economics*, *Nature Climate Change*, *Political Analysis*, *Fish and Fisheries*, *Journal of Agricultural Economics*, *Earth's Future*, *Environmental Modelling and Software*, *World Development*, *Economic Modelling*, *Conservation Letters*, *Water Resources Research*, and *Conservation Biology*), and his current work focuses on natural resource management and major biosecurity and climate change issues in Australia and internationally. In 2009, Tom received the 'CSIRO Medal for Research Achievement', in 2004, the 'Crawford Award for Research Excellence' from ABARE, and in 2011 the 'Eureka Prize for Water Research and Innovation'. In 2015, Tom became a Fellow of the Academy of Social Sciences in Australia and was the Director of the Crawford School of Public Policy at the ANU from 2009 to 2015.

ORGANIZING COMMITTEE

Anna Creti, *University of Paris Dauphine*
Khaled Guesmi, *IPAG Business School*
Lutz Kilian, *University of Michigan*
Duc Khuong Nguyen, *IPAG Business School & Indiana University*
Ingmar Schumacher, *IPAG Business School*
Eric Strobl, *Bern University, Switzerland & IPAG Business School*
Cees Withagen, *IPAG Business School & VU University*

SCIENTIFIC COMMITTEE

René Aid, *FIME-University of Paris Dauphine & EDF*
Albert Banal-Estanol, *Universitat Pompeu Fabra*
Derek Bunn, *London Business School*
Julien Chevallier, *University of Paris 8 & IPAG Business School*
Anna Creti, *University of Paris Dauphine and Ecole Polytechnique*
George Filis, *Bournemouth University*
Stéphane Goutte, *University of Paris 8*
Khaled Guesmi, *IPAG Business School*
Shawkat Hammoudeh, *Drexel University*
Fatih Karanfil, *University of Paris West Nanterre la Défense*
Lutz Kilian, *University of Michigan, United States*
Ted Loch-Temzelides, *Rice University, United States*
Matteo Manera, *University of Milano-Bicocca*
Olivier Massol, *IFP School*
Duc Khuong Nguyen, *IPAG Business School & Indiana University*
Michel Robe, *University of Illinois at Urbana-Champaign*
Andrea Roncoroni, *ESSEC Business School*
Luca Taschini, *London School of Economics*
Perry Sadorsky, *York University*
Ingmar Schumacher, *IPAG Business School*
Benoît Sévi, *University of Nantes*
Eric Strobl, *Bern University, Switzerland & IPAG Business School*
Stefan Trueck, *Macquarie University, Australia*
Cees Withagen, *IPAG Business School & VU University*
Jian Yang, *University of Colorado Denver*
Peng Zhou, *UCLA Institute of the Environment and Sustainability & Nanjing University of Aeronautics and Astronautics, China*

CONFERENCE VENUE

The ISEFI-2019 conference will take place at:

IPAG Business School

184, Boulevard Saint-Germain

75006 Paris

Phone: +33 (0)1 53 63 36 00

Fax: +33 (0)1 45 44 40 46



Contact for inquiries: Dr. Tri Vo (tri.vo@ipag.fr | +33 6 3364 7104)

Program at a Glance

Thursday, May 23, 2019

08:00am – 08:45am Registration & Coffee

08:45am – 09:00am Opening and Welcome Note

09:00am – 10:00am	Keynote Lecture I Professor Matthew J. Kotchen <i>Yale University, United States</i>	Amphitheatre
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10:00am – 10:30am Coffee Break

10:30am – 12:00pm Parallel Sessions A

10:30am – 12:00pm	Session A1: Oil Prices and Financial Markets I Chair: Duc Khuong Nguyen, <i>IPAG Business School, France</i>	Amphitheatre
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10:30am – 12:00pm	Session A2: Econometrics of Energy Markets I Chair: Christian Bogmans, <i>International Monetary Fund</i>	Room 2
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10:30am – 12:00pm	Session A3: Energy and Climate Models I Chairs: Cees Withagen, <i>IPAG Business School, France</i>	Room 3
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10:30am – 12:00pm	Session A4: Corporate Finance Analysis for Energy Companies Chair: Ilias Tsiakas, <i>University of Guelph, Canada</i>	Room 4
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12:00pm – 01:30pm Lunch Break

01:30pm – 03:00pm Parallel Sessions B

01:30pm – 03:00pm	Session B1: Oil Prices and Financial Markets II Chair: Tatsuyoshi Okimoto, <i>Australian National University, Australia, & Research Institute of Economy, Trade, and Industry (RIETI), Japan</i>	Amphitheatre
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01:30pm – 03:00pm	Session B2: Econometrics of Energy Markets II Chair: Charles Mason, <i>University of Wyoming, USA</i>	Room 2
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01:30pm – 03:00pm	Session B3: Intergenerational Choices under Global Environmental Change Chair: Ingmar Schumacher, <i>IPAG Business School, France</i>	Room 3
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01:30pm – 03:00pm	Session B4: Financial Regulation of Energy and Environmental Markets Chair: Kenneth Cortts, <i>Rotman School of Management, Canada</i>	Room 4
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03:00pm – 03:30pm Coffee Break

03:30pm – 05:00pm Parallel Sessions C

03:30pm – 05:00pm Session C1: Corporate Carbon Emissions: Pricing and Institutional Investors
Chair: Elizabeth Cooperman, *University of Colorado Denver, USA* Amphitheatre

03:30pm – 05:00pm Session C2: Econometrics of Energy Markets III
Chair: Mehmet Efe Biresselioglu, *Izmir University of Economics, Turkey* Room 2

03:30pm – 05:00pm Session C3: Emerging Issues in Energy Markets
Chair: Frederic Lantz, *IFP-School, France* Room 3

03:30pm – 05:00pm Session C4: Towards Sustainability
Chair: David Maddison, *University of Birmingham, UK* Room 4

05:00pm – 05:30pm Coffee Break

Invited Lecture I
Professor Bassam Fattouh
05:30pm – 06:15pm *Director of the Oxford Institute for Energy Studies & University of London, United Kingdom* Amphitheatre

07:30pm – 10:30pm Gala Dinner (House of Latin America)

Friday, May 24, 2019

08:00am – 09:00am Registration & Coffee

09:00am – 10:30am Parallel Sessions D

09:00am – 10:30am	Session D1: Natural Resources, Risk, Welfare and Social Preferences Chair: Baltasar Manzano, <i>Universidade de Vigo, Spain & KAPSARC, Saudi Arabia</i>	Room 1
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09:00am – 10:30am	Session D2: Global Carbon Emissions Chair: Joao Jalles, <i>International Monetary Fund</i>	Room 2
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09:00am – 10:30am	Session D3: Climate Finance Chair: Ted Temzelides, <i>Rice University, USA</i>	Room 3
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09:00am – 10:30am	Session D4: Socially Responsible Investments and Energy Transition Chair: Mark Sanders, <i>Utrecht University School of Economics, Netherlands</i>	Room 4
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10:30am – 11:00am Coffee Break

11:00am – 12:30pm Parallel Sessions E

11:00am – 12:30pm	Session E1: Electricity Markets Analysis Chair: Martin Heintzelman, <i>Clarkson University, USA</i>	Room 1
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11:00am – 12:30pm	Session E2: Econometrics of Energy Markets IV Chair: Hans-Jörg von Mettenheim, <i>IPAG Business School, France</i>	Room 2
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11:00am – 12:30pm	Session E3: Financial and Economic Analysis of Energy Markets Chair: Amanda Spisto, <i>European Commission DG Joint Research Centre, Netherlands</i>	Room 3
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11:00am – 12:30pm	Session E4: Finance and Investment in Renewable Energy Chair: Leila Dagher, <i>American University of Beirut, Lebanon</i>	Room 4
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12:30pm – 02:00pm Lunch Break

02:00pm – 03:00pm	Invited Lecture II Professor Tom Kompas <i>Centre for Environmental and Economic Research, University of Melbourne, Australia</i>	Amphitheatre
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03:00pm – 03:30pm Coffee Break

03:30pm – 05:00pm Parallel Sessions F

03:30pm – 05:00pm Session F1: Energy and Climate Models II Room 1
Chair: Fabien Roques, *University Paris-Dauphine, France & Compass Lexecon*

03:30pm – 05:00pm Session F2: Energy Prices: Modeling and Forecasting Room 2
Chair: George Filis, *Panteion University of Social and Political Sciences, Greece & Bournemouth University, UK*

03:30pm – 05:00pm Session F3: Commodity Finance Room 3
Chair: Julien Chevallier, *University Paris 8 & IPAG Business School, France*

05:00pm – 05:00pm Closing

Detailed Program

Thursday, May 23, 2019

08:00am – 08:45am Registration & Coffee

08:45am – 09:00am Opening and Welcome Note

09:00am – 10:00am	Keynote Lecture I Professor Matthew J. Kotchen <i>Yale University, United States</i>	Amphitheatre
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10:00am – 10:30am Coffee Break

10:30am – 12:00pm Parallel Sessions A

10:30am – 12:00pm	Session A1: Oil Prices and Financial Markets I	Amphitheatre
	Chair: Duc Khuong Nguyen, <i>IPAG Business School, France</i>	

10:30am – 11:00am **Oil Price Shocks and Cost of Debt - Evidence from U.S. Oil Firms**
Christoph Funk, *Macquarie University, Australia*
Karol Kempa, *Frankfurt School of Finance & Management, Germany*
Johannes Lips, *Justus-Liebig University of Giessen, Germany*

11:00am – 11:30am **Oil Shocks, Commodity Prices, and Exchange Rates**
Shuming Bai, *University of Texas Permian Basin, USA*
Kai Koong, *Tuskegee University, USA*

11:30am – 12:00pm **Oil Price Shocks and EMU Sovereign Yield Spreads**
Michail Filippidis, *University of Portsmouth, UK*
George Filis, *University of Bournemouth, UK*
Renatas Kizys, *University of Portsmouth, UK*

10:30am – 12:00pm	Session A2: Econometrics of Energy Markets I	Room 2
	Chair: Christian Bogmans, <i>International Monetary Fund</i>	

10:30am – 11:00am **Income Elasticity of Demand versus Consumption: Implications for Energy Policy Analysis**
Hamed Ghoddusi, *School of Business, Stevens Institute of Technology, USA*
Alexander Rodivilov, *School of Business, Stevens Institute of Technology, USA*
Mandira Roy, *Massachusetts Institute of Technology, USA*

11:00am – 11:30am **Bitcoin and its Mining on the Equilibrium Path**
Ladislav Kristoufek, *Charles University Prague, Czech Republic*

11:30am – 12:00pm **When will Global Energy Demand reach a Saturation Point? A Long-run Analysis, 1850-2017**
Christian Bogmans, *International Monetary Fund*
Lama Kiyasseh, *International Monetary Fund*
Akito Matsumoto, *International Monetary Fund*
Andrea Pescatori, *International Monetary Fund*

10:30am – 12:00pm	Session A3: Energy and Climate Models I Chairs: Cees Withagen, <i>IPAG Business School, France</i>	Room 3
10:30am – 11:00am	The Disamenity Impact of Solar Farms: A Hedonic Analysis <u>David Maddison</u> , <i>University of Birmingham, UK</i> Reece Ogier, <i>Transformational Change Specialist, Consultant at minbip Ltd., UK</i> Allan Beltran, <i>University of Birmingham, UK</i>	
11:00am – 11:30am	Real Effects of Climate Policy: Financial Constraints and Spillovers <u>Söhnke M. Bartram</u> , <i>University of Warwick, UK</i> Kewei Hou, <i>The Ohio State University and CAFR USA</i> Sehoon Kim, <i>University of Florida, USA</i>	
11:30am – 12:00pm	The Social Cost of Carbon and the Ramsey Rule <u>Cees Withagen</u> , <i>IPAG Business School, France</i>	
10:30am – 12:00pm	Session A4: Corporate Finance Analysis for Energy Companies Chair: Ilias Tsiakas, <i>University of Guelph, Canada</i>	Room 4
10:30am – 11:00am	How Do Firms Respond to Uncertain Carbon Prices? Evidence from Internal Carbon Pricing Practices <u>Arjan Trinks</u> , <i>University of Groningen, Netherlands</i> Machiel Mulder, <i>University of Groningen, Netherlands</i> Bert Scholtens, <i>University of Groningen, Netherlands</i>	
11:00am – 11:30am	How relevant is Corporate GHG Information about Firms in and outside the EU-Emissions Trading Scheme? An Econometric Analysis of Information Asymmetry and Firm Value Effects <u>Ingmar Juergens</u> , <i>German Institute for Economic Research, Germany</i> Malte Hessenius, <i>Humboldt University Berlin, Germany</i>	
11:30am – 12:00pm	Does Portfolio Decarbonization Make Economic Sense? On Carbon Emissions and Firm Profitability A. Marcel Oestreich, <i>Brock University, Canada</i> <u>Ilias Tsiakas</u> , <i>University of Guelph, Canada</i>	
12:00pm – 01:30pm	Lunch Break	
01:30pm – 03:00pm	Parallel Sessions B	
01:30pm – 03:00pm	Session B1: Oil Prices and Financial Markets II Chair: Tatsuyoshi Okimoto, <i>Australian National University, Australia</i> , & <i>Research Institute of Economy, Trade, and Industry (RIETI), Japan</i>	Amphitheatre
01:30pm – 02:00pm	Oil Prices and Firm Returns in an Emerging Market: The Case of Turkey <u>Esin Cakan</u> , <i>University of New Haven, USA</i> Sercan Demiralay, <i>City College, Greece</i> Vedat Ulusoy, <i>Yeditepe University, Turkey</i>	
02:00pm – 02:30pm	Joint Dynamics of Stock Market Returns and Exchange Rates to	

Oil Shocks

Ravipa Rojasavachai, *University of New South Wales, Australia*

Li Yang, *University of New South Wales, Australia*

02:30pm – 03:00pm

Uncertainty and Sign-dependent Effects of Oil Market Shocks

Bao H. Nguyen, *Australian National University, Australia & University of Economics Ho Chi Minh City, Vietnam*

Tatsuyoshi Okimoto, *Australian National University, Australia, & Research Institute of Economy, Trade, and Industry (RIETI), Japan*

Trung Duc Tran, *University of Melbourne, Australia*

01:30pm – 03:00pm

Session B2: Econometrics of Energy Markets II

Room 2

Chair: Charles Mason, *University of Wyoming, USA*

01:30pm – 02:00pm

Energy Commodity Futures and a Wavelet-based Risk Assessment

Theo Berger, *University of Bremen, Germany*

Robert L. Czudaj, *Chemnitz University of Technology, Germany*

02:00pm – 02:30pm

Predicting Commodity Currency Returns using Commodity Price Changes

Ilyes Abid, *ISC Paris, France*

Khaled Guesmi, *IPAG Business School, France & University of Ottawa, Canada*

Ibrahim Jamali, *American University of Beirut, Lebanon*

02:30pm – 03:00pm

Jump Processes in International Soybean Markets

Charles Mason, *University of Wyoming, USA*

Luca Taschini, *London School of Economics, UK*

Neil Wilmot, *University of Minnesota Duluth, USA*

01:30pm – 03:00pm

Session B3: Intergenerational Choices under Global Environmental Change

Room 3

Chair: Ingmar Schumacher, *IPAG Business School, France*

01:30pm – 02:00pm

Progress Update on Approaches to Mobilising Institutional Investment for Sustainable Infrastructure

Dirk Röttgers, *OECD, France*

Aayush Tandon, *OECD, France*

Christopher Kaminker, *University of Oxford, UK*

02:00pm – 02:30pm

Discounting, Inclusive Wealth and Sustainability

Rintaro Yamaguchi, *National Institute for Environmental Studies, Japan*

02:30pm – 03:00pm

Connectedness to Nature, Urbanization and the Environment

Emeline Bezin, *Paris School of Economics (PSE), France*

Ingmar Schumacher, *IPAG Business School, France*

01:30pm – 03:00pm

Session B4: Financial Regulation of Energy and Environmental Markets

Room 4

Chair: Kenneth Cortts, *Rotman School of Management, Canada*

01:30pm – 02:00pm

U.S. Carbon Tax Design: State Energy Profile, Household Income, and Urban/Rural Effects

Stephen Bird, *Clarkson University, USA*

Charles Maitland, *Clarkson University, USA*

02:00pm – 02:30pm **An Empirical Analysis of the Brazilian Transmission Service Operators Incentive Regulation**

Aline Veroneseda Silva, *Universidade Federal de Minas Gerais, Brazil*
Matheus Machado de Almeida, *Falconi Consulting, Brazil*
Marcelo Azevedo Costa, *Universidade Federal de Minas Gerais, Brazil*

02:30pm – 03:00pm **Uplift Charges and Incentives to Invest in Energy Storage**

Kenneth Corts, *Rotman School of Management, Canada*

03:00pm – 03:30pm Coffee Break

03:30pm – 05:00pm Parallel Sessions C

03:30pm – 05:00pm Session C1: Corporate Carbon Emissions: Pricing and Institutional Investors **Amphitheatre**
Chair: Elizabeth Cooperman, *University of Colorado Denver, USA*

03:30pm – 04:00pm **Institutional Investors and Corporate Carbon Emissions: An International Examination**

José Azar, *IESE Business School & C.E.P.R., Spain*
Miguel Duro, *IESE Business School, Spain*
Igor Kadach, *IESE Business School, Spain*
Gaizka Ormazabal, *IESE Business School & C.E.P.R., Spain*

04:00pm – 04:30pm **How Can We Explain the Past Trends in Transport CO₂ Emissions in France?**

Aurélien Bigo, *Centre de Recherche en Économie et Statistique, France*

04:30pm – 05:00pm **Internal Corporate Carbon Pricing: An Analysis of Carbon Emission Reductions for U.S. Companies**

Elizabeth Cooperman, *University of Colorado Denver, USA*
John Byrd, *University of Colorado Denver, USA*

03:30pm – 05:00pm Session C2: Econometrics of Energy Markets III **Room 2**
Chair: Mehmet Efe Biresselioglu, *Izmir University of Economics, Turkey*

03:30pm – 04:00pm **Volatility Modelling using GARCH for Solar Energy in the United States**

Martina Assereto, *University College Dublin, Ireland*

04:00pm – 04:30pm **Wind Power Modelling for Time Series with Missing Data**

Ria Grindel, *Fraunhofer Institute of Industrial Mathematics, Germany*

04:30pm – 05:00pm **Is LNG the Global Viable Alternative for Diversification? A Mathematical Modelling Approach**

Mehmet Efe Biresselioglu, *Izmir University of Economics, Turkey*

03:30pm – 05:00pm Session C3: Emerging Issues in Energy Markets **Room 3**
Chair: Frederic Lantz, *IFP-School, France*

03:30pm – 04:00pm **The Value of Saving Oil in Saudi Arabia**

Jorge Blazquez, *Oxford Institute of Energy Studies, UK*
Lester C. Hunt, *University of Portsmouth, UK & KAPSARC, Saudi Arabia*

	Baltasar Manzano, <i>Universidade de Vigo, Spain, & KAPSARC, Saudi Arabia</i> <u>Axel Pierru</u> , <i>KAPSARC, Saudi Arabia</i>	
04:00pm – 04:30pm	Forecasting the Economic Attractiveness of Energetic Retrofitting Investments in Residential Dwellings on a Regional Level <u>Tränkler Timm</u> , <i>University of Augsburg, Germany</i>	
04:30pm – 05:00pm	A Brazilian Long-Term Oil Refining Analysis within the Energy Transition in The Transportation Sector <u>Frederic Lantz</u> , <i>IFP-School, France</i>	
03:30pm – 05:00pm	Session C4: Towards Sustainability Chair: David Maddison, <i>University of Birmingham, UK</i>	Room 4
03:30pm – 04:00pm	Upstream Fiscal Regimes Incentives for Captured CO2-EOR <u>Akil Zaimi</u> , <i>Independent Petroleum Economist</i>	
04:00pm – 04:30pm	Improving the Assessment of Cobalt Criticality via the Analysis of Its Value Chain: Preliminary Results <u>Raphael Danino-Perraud</u> , <i>University of Orléans & Bureau des Recherches Géologiques et Minières, France</i> <u>Aurélie Gaudieux</u> , <i>University of Orléans & Bureau des Recherches Géologiques et Minières, France</i> <u>Fenintsoa Andriamasinoro</u> , <i>Bureau des Recherches Géologiques et Minières, France</i>	
04:30am – 05:00pm	Testing the Emission Reductions Claims of CDM Projects using Benford's Law <u>Matthew Cole</u> , <i>University of Birmingham, UK</i> <u>David Maddison</u> , <i>University of Birmingham, UK</i> <u>Liyun Zhang</u> , <i>University of Birmingham, UK</i>	
05:00pm – 05:30pm	Coffee Break	
05:30pm – 06:15pm	Invited Lecture I Professor Bassam Fattouh <i>Director of the Oxford Institute for Energy Studies & University of London, United Kingdom</i>	Amphitheatre

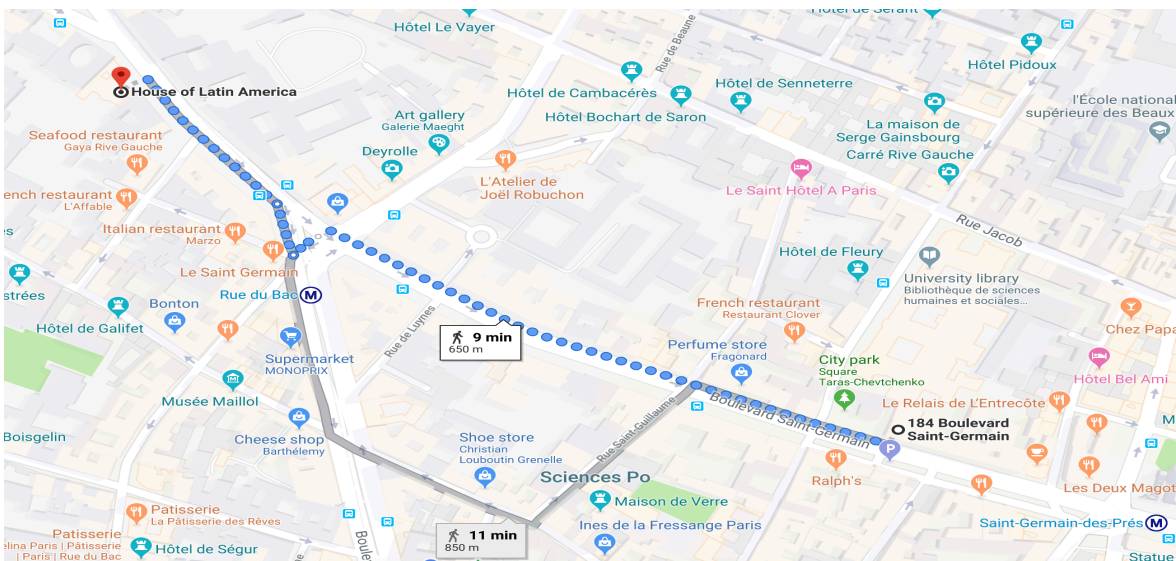
Gala Dinner

GALA DINNER

Time: 7:30pm - 10:30pm

Address: 217 boulevard Saint Germain, 75007 Paris

Walking distance from the conference venue: 650m



Friday, May 24, 2019

08:00am – 09:00am Registration & Coffee

09:00am – 10:30am

Parallel Sessions D

09:00am – 10:30am

Session D1: Natural Resources, Risk, Welfare and Social Preferences

Room 1

Chair: Baltasar Manzano, *Universidade de Vigo, Spain* & *KAPSARC, Saudi Arabia*

09:00am – 09:30am

Technology Shocks and the Prebisch-Singer Hypothesis

Paolo Agnolucci, *University College London, UK*

Vincenzo De Lipsis, *University College London, UK*

09:30am – 10:00am

A Risk-Hedging View to Vertical Integration in the Refinery Capacity

Hamed Ghoddusi, *School of Business, Stevens Institute of Technology, USA*

Franz Wirl, *University of Vienna Oskar-Morgenstern-Platz, Austria*

10:00am – 10:30am

Saudi Arabia's Economic Reforms within Vision 2030: Insights from a Dynamic Stochastic General Equilibrium Model

Baltasar Manzano, *Universidade de Vigo, Spain* & *KAPSARC, Saudi Arabia*

Jorge Blazquez, *Oxford Institute for Energy Studies, UK*

Marzio Galeotti, *University of Milan, Italy* & *KAPSARC, Saudi Arabia*

Axel Pierru, *KAPSARC, Saudi Arabia*

Shreekar Pradhan, *KAPSARC, Saudi Arabia*

09:00am – 10:30am

Session D2: Global Carbon Emissions

Room 2

Chair: Joao Jalles, *International Monetary Fund*

09:00am – 09:30am

Impact of International Carbon Credits on the Returns and Volatilities in Regular Emissions Trading Schemes

Claire Gavard, *CES, Université Paris 1 Panthéon-Sorbonne, France*

Djamel Kirat, *University of Orléans* & *CNRS, France*

09:30am – 10:00am

Role of Economic Growth, Trade Openness, Financial Development & FDI in Forecasting Emissions: Evidence from G6

Muhammad Ali Nasir, *Leeds Beckett University, UK*

Toan Luu Duc Huynh, *University of Economics Ho Chi Minh, Vietnam* & *WHU – Otto Beisheim School of Management, Germany*

Duc Khuong Nguyen, *IPAG Business School, France*

10:00am – 10:30am

Consumption versus Production-based Emissions and Economic Activity: The Role of World Trade

Gail Cohen, *National Academies of Sciences, USA*

Jun Ge, *International Monetary Fund*

Joao Jalles, *International Monetary Fund*

Prakash Loungani, *International Monetary Fund*

Ricardo Marto, *International Monetary Fund*

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10:00am – 10:30am	A Cost-Benefit Analysis of the Jones Act: The Case of the Petroleum Product Tanker Market <i>Ken Medlock, Rice University, USA</i> <i>Anna Mikulska, Rice University, USA</i> <i>Ted Temzelides, Rice University, USA</i>	
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10:00am – 10:20am	How to Fill the ‘Financing Gap’ for the Transition to Low-carbon Energy in Europe? <i>Friedemann Polzin, Utrecht University School of Economics, Netherlands</i> <i>Mark Sanders, Utrecht University School of Economics, Netherlands</i>	
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11:00am – 11:20am	Analysis of the Historical Pass through of Carbon Cost to Electricity Prices in France and Central Western European Power Markets <u>Yuanjing Li</u> , <i>University Paris-Dauphine, France & Compass Lexecon</i> Fabien Roques, <i>University Paris-Dauphine, France & Compass Lexecon</i>	
11:20am – 11:40am	Price Elasticity of Residential Electricity Demand in Vietnam 2012-2016 Minh Ha-Duong, <i>CIREC, France & Vietnam Initiative for Energy Transition, Vietnam</i> Hoai Son Nguyen, <i>National Economics University Hanoi & Vietnam Initiative for Energy Transition, Vietnam</i> <u>Hoang Anh Nguyen-Trinh</u> , <i>CleanED/USTH, Vietnam Initiative for Energy Transition, Vietnam & CIREC, France</i>	
11:40am – 12:00pm	Microgrid Sizing with Incentive-based Demand Response Program: A Hierarchical Game Approach <u>Racine Diatta</u> , <i>University of Nantes, France</i>	
12:00pm – 12:20pm	Willingness to Pay for Microgrids to Enhance Community Resilience Chelsea Hotaling, <i>Clarkson University, USA</i> Stephen Bird, <i>Clarkson University, USA</i> <u>Martin Heintzelman</u> , <i>Clarkson University, USA</i>	
11:00am – 12:30pm	Session E2: Econometrics of Energy Markets IV Chair: Hans-Jörg von Mettenheim, <i>IPAG Business School, France</i>	Room 2
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Baltasar Manzano, *Universidade de Vigo, Spain & KAPSARC, Saudi Arabia*

11:30am – 12:20am **Analysing Financial Flows for the Development of Coal-Fired Power Plants**
Niccolò Manych, *Mercator Research Institute on Global Commons and Climate Change, Germany*
Jan Christoph Steckel, *Mercator Research Institute on Global Commons and Climate Change, Germany*

12:00am – 12:30pm **The Role of Shale Gas. Between Energy Security and Climate Objectives**
Amanda Spisto, *European Commission DG Joint Research Centre, Netherlands*
Anca Costescu, *Dir. Energy Transport and Climate, Netherlands*

11:00am – 12:30pm Session E4: Finance and Investment in Renewable Energy **Room 4**
Chair: Leila Dagher, *American University of Beirut, Lebanon*

11:00am – 11:30am **The Effectiveness of Policy Support in Promoting Green Bonds: Empirical Evidence**
Dina Azhgaliyeva, *National University of Singapore, Singapore*
Zhanna Kapsalyamova, *Nazarbayev University, Kazakhstan*

11:30am – 12:00pm **Harnessing the Potential of Consumer (Co-)Ownership in Renewables in the Asian Energy Transition – a Comparative Study of Pakistan and India**
Jens Lowitzsch, *Europa-Universität Viadrina Frankfurt, Germany*
Junaid Alam Memon, *Pakistan Institute of Development Economics, Pakistan*
Satyendra Nath Mishra, *Xavier University Bhubaneswar, India*

12:00pm – 12:30pm **What can GCC Countries Learn from Well-established Green Power Markets in Other Countries?**
Leila Dagher, *American University of Beirut, Lebanon*
Layal Mansour, *American University of Beirut, Lebanon*

12:30pm – 02:00pm Lunch Break

02:00pm – 03:00pm **Invited Lecture II**
Professor Tom Kompas
Centre for Environmental and Economic Research, University of Melbourne, Australia **Amphitheatre**

03:00pm – 03:30pm Coffee Break

03:30pm – 05:00pm **Parallel Sessions F**

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Chair: Fabien Roques, *University Paris-Dauphine, France & Compass Lexecon*

03:30pm – 04:00pm **Tradable Climate Liabilities: A Thought Experiment**
Justin Leroux, *HEC Montréal, Canada*

Etienne Billette De Villemeur, *University of Lille, France*

- 04:00pm – 04:30pm **Cost and Benefits of Deep Decarbonization in Russia: A Thought Experiment**
John Laitner, *Economic and Human Dimensions Research Associates, USA*
Oleg Lugovoy, *Russian Presidential Academy of National Economy and Public Administration, Russia*
Vladimir Potashnikov, *Russian Presidential Academy of National Economy and Public Administration, Russia*
- 04:30pm – 05:00pm **Compensation of Electricity Intensive Industrials for Indirect CO₂ Costs: Modelling the Evolution of the CO₂ Emission in Central West Europe**
Fabien Roques, *University Paris-Dauphine, France & Compass Lexecon*
Hélène Laroche, *University Paris-Dauphine, France & Compass Lexecon*
Yuanjing Li, *University Paris-Dauphine, France & Compass Lexecon*

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Chair: George Filis, *Panteion University of Social and Political Sciences, Greece & Bournemouth University, UK*

- 03:30pm – 04:00pm **Navigating the Oil Bubble: A Non-Linear Heterogeneous-Agent Dynamic Model of Futures Oil Pricing**
Giulio Cifarelli, *Università di Firenze, Italy*
Paolo Paesani, *Università degli Studi di Roma "Tor Vergata", Italy*

- 04:00pm – 04:30pm **Lithium Industry on the Behavior of U.S. Crude Oil Prices. A Fractional Cointegration VAR and Continuous Wavelet Transform Analysis**
Manuel Monge, *Francisco de Vitoria University, Spain*

- 04:30pm – 05:00pm **Oil Price Volatility Forecasts: Evidence from Objective-based Evaluation Functions**
Stavros Degiannakis, *Panteion University of Social and Political Sciences, Greece & Bournemouth University, UK*
George Filis, *Panteion University of Social and Political Sciences, Greece & Bournemouth University, UK*

03:30pm – 05:00pm Session F3: Commodity Finance Room 3
Chair: Julien Chevallier, *University Paris 8 & IPAG Business School, France*

- 03:30pm – 04:00pm **How the Financial Market Can Dampen the Effects of Commodity Price Shocks**
Myunghyun Kim, *Bank of Korea, South Korea*
- 04:00pm – 04:30pm **Investigation of the Link between Renewables Energy and Oil Markets**
Gaye Del Lo, *University of Lorraine, France*
- 04:30pm – 05:00pm **A Dynamic Conditional Regime-Switching GARCH CAPM for Energy and Financial markets**
Christian Urom, *Federal University Ndufu-Alike Ikwo, Nigeria & University Paris 8, France*
Julien Chevallier, *University Paris 8 & IPAG Business School, France*
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LIST OF ABSTRACTS

Session A1: Oil Prices and Financial Markets I

Oil Price Shocks and Cost of Debt - Evidence from U.S. Oil Firms

Christoph Funk, *Macquarie University, Australia*

Karol Kempa, *Frankfurt School of Finance & Management, Germany*

Johannes Lips, *Justus-Liebig University of Giessen, Germany*

This paper analysis the relationship between (adverse) oil price shocks and the costs of debt of U.S. oil firms. In particular, we analyse how oil firms, which we differentiate along the oil industry's value chain, respond to oil-price shocks and how these shocks affect their borrowing decision and creditworthiness perceived by banks and capital markets. For U.S. oil firms we collect (i) data on individual syndicated loans taken and (ii) bonds issued and combine this data with data from these firms' corporate financial statements. Thus, we can analyse how a company's (financial) characteristics, e.g. firm size, profitability, leverage / indebtedness, affect the credit spread of loans and bonds, i.e. the cost of debt. In addition to these firm characteristics, we consider the oil price and, in particular, oil price shocks – considering both the 2008 and the 2014 oil price shock – and their effects on the firms' costs of debt. Overall, we find that the credit market tightens in the immediate aftermath of both oil price shocks, i.e. the amount of loans issued decreases, while their interest rates increased. This effect is confirmed by the firm-level analysis. Even after controlling for loan/bond and firm characteristics, oil prices, in particular oil price shocks, have an effect on a firm's cost of debt.

Oil Shocks, Commodity Prices, and Exchange Rates

Shuming Bai, *University of Texas Permian Basin, USA*

Kai Koong, *Tuskegee University, USA*

This paper investigates the impact of oil price shocks and of commodity currency volatility on commodity prices for top ten commodity exporters and importers from January 1991 to December 2018. The period comprises the two cycles of oil and commodity boom and bust as well as the global economic growth and financial crisis. We employ both the vector auto-regressions and the GARCH-DCC models. The results show that (i) commodity prices respond to aggregate demand shocks positively and significantly; (ii) positive oil supply shocks adversely impact commodity prices; (iii) commodity prices move in tandem with oil prices; (iv) commodity exchange rates can explain the price movements in oil and commodities; (v) positive oil price shocks benefited commodity exporters more than importers; and (vi) commodity currencies can explain the price movements in oil and commodities more robustly than otherwise. This is plausible as exchange rates are forward-looking whereas commodity prices are more responsive to short-term supply and demand equation. Major results were magnified during the financial crisis and oil-commodity bust periods. The results have implication for policy makers, commodity producers and exporters as well as commodity investors.

Oil Price Shocks and EMU Sovereign Yield Spreads

Michail Filippidis, *University of Portsmouth, UK*

George Filis, *University of Bournemouth, UK*

Renatas Kizys, *University of Portsmouth, UK*

This study brings together for the first time the disaggregation of the oil price, a time-varying environment and the sovereign yield spreads in the EMU, which is on aggregate the largest

oil-importer of the world. In particular, we examine the time-varying correlation between oil price shocks and the 10-year sovereign yield spread of core and periphery countries in the EMU, by employing a scalar-BEKK framework. The main findings reveal that the correlations between sovereign yield spreads and oil price shocks are indeed time-varying and show heterogeneity among the three oil price shocks. Moreover, there is an exception during the peak-time of the Great Recession, when all correlations are negative, regardless of the origin of the oil price shock. Furthermore, even though the correlation patterns are constantly low or zero prior to the Great Recession, a change is revealed in the post-2008 period, when correlations become moderate and more volatile. Finally, we report weak differences in the correlation behaviour between core and periphery countries to different oil price shocks.

Session A2: Econometrics of Energy Markets I

Income Elasticity of Demand versus Consumption: Implications for Energy Policy Analysis

Hamed Ghoddsi, *School of Business, Stevens Institute of Technology, USA*

Alexander Rodivilov, *School of Business, Stevens Institute of Technology, USA*

Mandira Roy, *Institute for Data, Systems, and Society, Massachusetts Institute of Technology, USA*

The income elasticity of consumption depends not only on the demand function but also on the characteristics of the supply function. If the supply of the underlying good (e.g., gasoline, natural gas, or housing) is not completely elastic, the income elasticity of equilibrium consumption will be less than the income elasticity of demand, with the difference depending on the shapes of both the demand and supply functions. We show that if supply is sufficiently inelastic, extending the individual level estimates of the income elasticity of demand to aggregate values can produce biased estimates with erroneous and misleading policy implications, even if the original elasticity estimate was unbiased. This point is particularly important when extrapolating the impact of national income on aggregate emissions.

Bitcoin and its Mining on the Equilibrium Path

Ladislav Kristoufek, *Charles University Prague, Czech Republic*

Bitcoin as a major cryptocurrency has come up as a shooting star of the 2017 and 2018 headlines. After exploding its price twenty times just in the twelve months of 2017, the tone has changed dramatically in 2018 after major price corrections and increasing concerns about its mining power consumption and overall sustainability. The dynamics and interaction between Bitcoin price and its mining costs have become of major interest. Here we show that these two quantities are tightly interconnected and they tend to a common long-term equilibrium. Mining costs adjust to the cryptocurrency price with the adjustment time of several months up to a year. Current developments suggest that we have arrived at a new era of Bitcoin mining where marginal (electricity) costs and mining efficiency play the prime role. Presented results open new avenues towards interpreting past and predicting future developments of the Bitcoin mining framework.

When will Global Energy Demand reach a Saturation Point? A Long-run Analysis, 1850-2017

Christian Bogmans, *International Monetary Fund*

Lama Kiyasseh, *International Monetary Fund*

Akito Matsumoto, *International Monetary Fund*

Andrea Pescatori, *International Monetary Fund*

In recent years the increase in energy efficiency in advanced economies has raised the possibility of reaching a saturation point in the global demand for energy. Against this backdrop, we investigate the presence of an S-shaped relation between energy and income as well as the pace of energy efficiency that could, ultimately, induce saturation in energy demand. To this end, we present a novel historical panel dataset that includes annual energy consumption (million tons of oil equivalent) for a total of 70 countries covering the years 1850-2017. This dataset ties together several (historical) data sources and includes all the major primary energy sources, including coal, oil, gas, nuclear, hydro, and biofuels. Using this unbalanced panel of 70 countries, we test the presence of an S-shaped relationship between energy demand and per capita income, controlling for the size of the country (i.e., population and land area), and proxy variables for fossil fuel endowments. Our results strongly support the presence of an S-shaped relationship between (per capita) energy and (per capita) income.

The saturation point for energy demand, however, being estimated at \$324,000 (2011 USD) looks, at current technology, still very far into the future. Energy saving technologies, however, can anticipate actual saturation by shifting down the energy-income curve as providing the same energy services (such as heating, cooling, transportation) require less energy. Our findings show that there has been about 1.0 percent gain in energy efficiency each year between 1971 and 2015, globally, and a somewhat lower gain of about 0.5 percent between 1850 and 1970. If we, thus, assume that the globally energy efficiency keeps increasing at its recent historical rate, the saturation point previously estimated declines to about \$74,000. In conclusion, our estimates suggest that energy saturation is still far into the future, and the main driver of future energy demand hinges on the dynamics of middle-income countries.

Session A3: Energy and Climate Models I

The Disamenity Impact of Solar Farms: A Hedonic Analysis

David Maddison, *University of Birmingham, UK*

Ogier Reece, *Transformational Change Specialist, Consultant at minbip Ltd., UK*

Beltran Allan, *University of Birmingham, UK*

Photovoltaic solar farms are areas of land upon which an array of interconnected panels converts sunlight directly into electricity. Little is known about the extent of any disamenity impact from photovoltaic solar farms despite numerous examples of communities objecting to their construction. This paper analyses the disamenity impact of photovoltaic solar farms on households in England and Wales as revealed by changes in property prices. Using a property fixed-effects model we find that properties in the same 6-digit postcode as an operational solar farm suffer a reduction in prices which is statistically significant at the one percent level of significance.

Real Effects of Climate Policy: Financial Constraints and Spillovers

Söhnke M. Bartram, *University of Warwick, UK*

Kewei Hou, *The Ohio State University and CAFR USA*

Schoon Kim, *University of Florida, USA*

We document that localized policies designed to mitigate climate risk can lead to regulatory arbitrage by firms, resulting in unintended consequences. Using detailed plant level data, we investigate the impact of the most extensive regional climate policy in the United States, the California cap-and-trade program, on corporate real activities such as greenhouse gas emissions and plant ownership. We show that industrial plants governed by the policy reduce emissions in California when the parent company is financially constrained, but that these firms internally reallocate their emissions to plants located in other states. Similarly, constrained firms are more likely to reduce ownership in Californian plants and increase ownership in plants outside California. In contrast, unconstrained firms generally do not adjust plant emissions and ownership either in California or in other states. Overall, firms do not reduce their total emissions when part of their assets are affected by the regulation, but in fact increase them if financially constrained. The results document real spillover effects stemming from resource reallocations by constrained firms to avoid regulatory costs, undermining the effectiveness of localized policies. Our study has important implications for the current debate on global climate policy agreements.

The Social Cost of Carbon and the Ramsey Rule

Cees Withagen, *IPAG Business School, France*

The objective of this paper is to critically assess the use of simple rules for the social cost of carbon (SCC) employing a rudimentary form of the Ramsey Rule. Two interrelated caveats apply. First, if climate change poses a serious problem, it is hard to justify an exogenous constant growth rate of consumption. Second, to derive the SCC one needs full knowledge of the entire future. Popular assumptions to get around this, such as assuming current GDP is optimal, are difficult to justify.

Session A4: Corporate Finance Analysis for Energy Companies

How Do Firms Respond to Uncertain Carbon Prices? Evidence from Internal Carbon Pricing Practices

Arjan Trinks, *University of Groningen, Netherlands*

Machiel Mulder, *University of Groningen, Netherlands*

Bert Scholtens, *University of Groningen, Netherlands*

This paper challenges the hypothesis that uncertainty about future costs of emitting carbon depresses investment. An environment in which carbon is constrained and carries an uncertain future price motivates firms not to postpone low-carbon investments but rather to bring forward low-carbon investments in anticipation of future carbon price scenarios. Using a novel dataset on internal carbon pricing practices adopted by firms across a wide range of sectors and countries over the period 2014-2017, we find that stringency of climate policies and uncertainty about future carbon prices is associated with higher internal carbon pricing adoption rates and higher internal carbon price levels. We identify these effects using transparent measures of policy stringency (e.g., national emission reduction pledges) and carbon price uncertainty (dispersion in internal carbon prices). We further find that adoption leads to a reduction of market risk exposure. Overall, we reject the hypothesis of a negative relationship between uncertainty and investment. An important policy implication of our findings is that low-carbon investment is accelerated when carbon price signals are sufficiently stringent and credible.

How relevant is Corporate GHG Information about Firms in and outside the EU-Emissions Trading Scheme? An Econometric Analysis of Information Asymmetry and Firm Value Effects

Ingmar Juergens, *German Institute for Economic Research (DIW Berlin), Germany*

Malte Hessenius, *Humboldt University Berlin, Germany*

The underlying epistemic driver of our analysis is to better understand whether the disclosure of GHG information could help reinforcing the price signal of carbon risk and climate policy and this contribute to incentivising corporate emission reductions via the capital market channel. In our paper, we empirically estimate the link between firm level disclosure of greenhouse gas (GHG) emissions on one hand and information asymmetry on the other hand; and the relationship between GHG emission levels and firm value. Based on a dataset of EU publicly listed firms, we apply a pooled regression with a Heckman 2-step model for comparing information asymmetry of disclosing and non-disclosing firms. We find statistically and economically significant negative relationships between information asymmetry and disclosure; and between the level of carbon emissions and firm value. In a second step, we test whether the GHG emission level has an effect on the market value of disclosing firms and we find disclosing firms with lower GHG emission levels are characterised by higher market value. For sectors with installations under the EU ETS, we find a significantly stronger effect on firm value.

Does Portfolio Decarbonization Make Economic Sense? On Carbon Emissions and Firm Profitability

A. Marcel Oestreich, *Brock University, Canada*

Ilias Tsiakas, *University of Guelph, Canada*

We assess whether portfolio decarbonization makes economic sense by investigating the relation between firm profitability and reported carbon emissions. Using annual data from individual S&P 500 firms, we find that the cross-sectional relation between profitability and carbon emissions is strongly negative: firms with high carbon emissions tend to have the

lowest profitability and vice versa. In contrast, the time-series relation is predominantly positive: for low-emission firms profitability increases over time with higher emissions, whereas for high-emission firms profitability remains unaffected over time with higher emissions. These findings are robust to industry effects.

Session B1: Oil Prices and Financial Markets II

Oil Prices and Firm Returns in an Emerging Market: The Case of Turkey

Esin Cakan, *University of New Haven, USA*

Sercan Demiralay, *City College, Greece*

Vedat Ulusoy, *Yeditepe University, Turkey*

This study examines the oil price effect on Turkish stock market as an emerging country on firm level from 2005 to 2015. After controlling short term interest rate, nominal exchange rate and crude oil price, we find that firms behave differently to a change in oil prices. We form and test three hypotheses of Narayan and Sharma (2011) and elaborate the following findings: i) variations in oil prices do not significantly affect Turkish firm returns. Out of 153, only 38 firms are affected significantly by oil price after controlling exchange rate and interest rate; ii) oil prices influence stock returns of Turkish firms, suggesting that under reaction and gradual information diffusion hypotheses may hold. iii) small and middle-sized firms are more affected negatively from oil price changes, where large-sized firms affected more positively. 50 firms show response to an oil shock with a lag; iv) The herding behavior exists in the stock market and it rises with an increase in oil prices. The empirical findings of this study have potential implications and offer significant insights for both practitioners and policy makers.

Joint Dynamics of Stock Market Returns and Exchange Rates to Oil Shocks

Ravipa Rojasavachai, *University of New South Wales, Australia*

Li Yang, *University of New South Wales, Australia*

In this paper, we take into account the interaction between stock market returns, exchange rates, and oil price shocks in the model to consider the simultaneous response of stock market returns and exchange rates to local and global oil shocks and examine the difference between oil-exporting and oil-importing countries. We decompose global oil price shocks into demand and supply shocks, using a structural vector autoregressive model (SVAR) developed by Kilian (2009), and decompose local oil price shocks into demand and supply shocks following Ready's (2018). Our findings show that local and global oil price shocks have different impacts on both stock market returns and exchange rates depending on the level of oil dependence of each country and the source of oil price changes. When the spillover effects are allowed for, changes in oil prices driven by local demand shocks have positive effects on stock market returns in both oil-exporting and oil-importing countries while global demand shocks have negative effects. But both global and local supply shocks have positive impact on stock market returns for oil-exporters while the results are mixed for oil-importers. Interestingly, local supply shocks have a significantly stronger impact than global supply shocks. For the effect on currencies, local demand and supply shocks contribute to an appreciation of local currency. Moreover, global demand shocks lead to the U.S. dollar appreciation while there is depreciation in the U.S. dollar following global supply shocks. Overall, we document important contemporaneous linkages across stock market returns and exchange rates to oil shocks.

Uncertainty and Sign-dependent Effects of Oil Market Shocks

Bao H. Nguyen, *Australian National University, Australia & University of Economics Ho Chi Minh City, Vietnam*

Tatsuyoshi Okimoto, *Australian National University, Australia, & Research Institute of Economy, Trade, and Industry (RIETI), Japan*

Trung Duc Tran, *University of Melbourne, Australia*

This paper investigates the oil market reaction to its fundamental shocks in different regimes characterised by uncertainty in the market. We do so by first proposing a novel oil uncertainty

index that is measured by the conditional volatility of the unpredictable component of oil prices. Then, we employ a nonlinear model to show that both supply and oil-specific demand shocks have negligible impacts in low oil price uncertainty regime but sizable effects in high oil price uncertainty regime. We also find that the effects of oil supply shocks on real economy are asymmetric, but oil specific demand shocks are not.

Session B2: Econometrics of Energy Markets II

Energy Commodity Futures and a Wavelet-based Risk Assessment

Theo Berger, *University of Bremen, Germany*

Robert L. Czudaj, *Chemnitz University of Technology, Germany*

This paper provides an in-depth assessment of energy commodity futures on applied risk measurement. We provide a thorough empirical study on deconstructed energy futures returns and present a novel wavelet-based portfolio strategy. First, we examine the dependence structure between energy futures and show that energy futures are described by different dependence regimes in the short-run and in the long-run. Then, the out-of-sample portfolio study unveils that daily portfolio management is mostly driven by short-run information. Furthermore, we also find that information inherent in long-run trends outperform the information included in short-run trends and underlines the usefulness of the wavelet approach for portfolio management.

Predicting Commodity Currency Returns using Commodity Price Changes

Ilyes Abid, *ISC Paris, France*

Khaled Guesmi, *IPAG Business School, France & University of Ottawa, Canada*

Ibrahim Jamali, *American University of Beirut, Lebanon*

In this paper, we assess the out-of-sample predictive accuracy of models with commodity factors, nonlinear and linear models for the returns on Norwegian Krone, Canadian, New Zealand and Australian Dollars against the US Dollar at short (i.e., one month) and long (i.e., two and three years) horizons. More specifically, we extract two factors from a panel of twenty-one individual commodity future price changes using Bayesian shrinkage techniques and assess their predictive power using a predictive regression for the returns on each of the four commodity currencies. The out-of-sample statistical forecast accuracy of the latter predictive regression is compared to that of nonlinear and linear models with fundamentals such as Purchasing Power Parity, Uncovered Interest Parity and Taylor rule models. The benchmark against which all models are compared is the random walk. Our preliminary findings suggest that the nonlinear models and the models with commodity factors outperform the linear models with fundamentals at long horizons. We discuss the practical importance of our findings for policymakers and portfolio managers.

Jump Processes in International Soybean Markets

Charles Mason, *University of Wyoming, USA*

Luca Taschini, *London School of Economics, UK*

Neil Wilmot, *University of Minnesota Duluth, USA*

Several recent policies have been promulgated to reduce reliance on fossil fuels in the the United States (US) transportation sector. To achieve these ambitious goals, it seems highly likely that US refiners will have to accommodate significant inflows of soybeans imported from Brazil; important large-scale (irreversible) investments will also be required. These investments are subject to substantial uncertainty, underscoring the importance of characterizing the stochastic nature of soybean prices. In this paper we investigate the potential presence of jumps in two key prices: the spot price for soybeans, in Brazil, and ethanol produced from soybeans, also in Brazil. We find compelling empirical evidence for the importance of jumps in both markets. The presence of jumps in these markets has important implications for large scale infrastructure investments, as would be necessary to produce ethanol-based motor vehicle fuels.

Session B3: Intergenerational Choices under Global Environmental Change

Progress Update on Approaches to Mobilising Institutional Investment for Sustainable Infrastructure

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The large need for investments in sustainable infrastructure will require investments from the private sector, including institutional investors. This working paper contributes to scaling up investments by analysing public project-level interventions for projects involving institutional investors. It presents findings from an updated database on institutional investments in environmentally sustainable infrastructure with project-level intervention by the public sector. The database contains 152 observations from projects in G20 countries between 2010 and 2018. The database includes, among others, details on channels of finance as well as tools and techniques used by public actors to mitigate financial risks of investors and enable transactions. The data show that renewable electricity, and specifically the wind sector, dominate sustainable institutional investments with public intervention. More than two-thirds of projects in the database are financed through an intermediary who finances unlisted project equity. Findings further show that almost all projects benefit from a risk-mitigating public intervention and in almost half of the cases more than one. Transaction enablers are used in a quarter of cases and rarely without risk mitigants present.

Discounting, Inclusive Wealth and Sustainability

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Capital approach to sustainability focuses on whether wealth as an aggregate of capital assets is not on the decline over time. Although sustainability hinges on how we frame intergenerational ethics, the role of discounting in this sustainability assessment has not been extensively studied yet. This paper rebuilds the produced, human, and natural capital framework, in which the role of discounting in shadow prices of capital assets is clarified. We uncover how relevant parameters - such as the pure rate of time preference, elasticity of marginal utility, consumption and natural capital growth rates, marginal regeneration of natural capital - affect human and natural capital income discount rates, shadow prices, and the level and change in inclusive wealth. Numerical examples for selected countries demonstrate that, among other results, under a plausible set of parameters and assumptions, human capital income discount rates are likely higher than forest capital income discount rates.

Connectedness to Nature, Urbanization and the Environment

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The transmission of preferences. Some empirical studies find: early experiences in nature and social interactions are strong determinants of a kid's and subsequently adult environmental attitude (Chawla, 2007). The point is that if you don't live close to nature, meaning in an urban region, then it is harder for you to be connected to nature than for someone who lives in a rural part. If you are not connected to nature, then you won't care about nature. Thus, being disconnected from nature as a child translates into a low incentive to support the environment when adult. We model this transmission of preferences together with socialization from adults to their offspring in an overlapping generations model.

Session B4: Financial Regulation of Energy and Environmental Markets

U.S. Carbon Tax Design: State Energy Profile, Household Income, and Urban/Rural Effects

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Charles Maitland, *Clarkson University, USA*

Carbon taxes are gaining attention as an effective carbon pricing policy instrument that can reduce anthropogenic greenhouse gas emissions and reduce the threat of climate change. Designing an optimal carbon tax policy involves several considerations. The distribution of carbon tax revenue is arguably the most important aspect of an effective and feasible policy because voters are sensitive to the distributional impacts of economic policies. Revenue recycling methods can affect their perceived fairness of a policy. Three levels of revenue return policies, from no return to full return, were tested. However, other factors may have strong impacts. The nature of a given State's energy profile (coal / gas / nuclear etc.), urban or rural demographics, and income can all potentially affect the response to carbon taxes. We consider the social acceptability of carbon taxes by examining the degree of revenue return, and also the residential economic impact of each policy for household groups categorized by state, income, and residence in an urban or rural area. As other researchers have found, the results suggest that a revenue neutral policy that returns 100% of carbon tax revenue is the most socially acceptable, but it is important to break down the impacts by demographic subgroups.

Uplift Charges and Incentives to Invest in Energy Storage

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This paper considers the role of uplift charges (charges added to the wholesale price of electricity in quasi-deregulated electricity markets) in creating incentives for the adoption of energy storage technologies. It considers, in particular, how the formula determining uplift charges can create a wedge between incentives to invest in storage and incentives to invest in distributed generation, leading to inefficient overinvestment in distributed generation. This has important implications for efforts to mitigate greenhouse gas emissions because investments in distributed generation tend to be in technologies that are more emissions-intensive than those that generate the power acquired for storage. This preliminary paper considers two very simple models to illustrate this phenomenon in the context of two specific types of policies regarding uplift charges: first, whether they apply to power sold into grid-level energy storage resources; second, whether they are uniform per-kWh charges or are time-varying.

An Empirical Analysis of the Brazilian Transmission Service Operators Incentive Regulation

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Brazil started a reform in its electricity market in the final years of the 1990's. Gradual changes in the regulatory policy were implemented in order to improve the power of incentives. In the energy transmission segment, mild results regarding costs reduction were achieved. The major changes in this segment occurred after arbitrary interventions of the government, in 2012. Such interventions raised the perceived risk by investors. Notwithstanding the negative impacts of this event in the transmission market, the regulatory framework finally improved its incentive power. In this paper, the results of incentive regulation for Brazilian transmission companies regarding operational costs are analyzed. The effectiveness of the regulatory signs

is discussed. It is shown that, despite the immediate losses that the arbitrary changes imposed to the system, long term impact tends to be positive.

Session C1: Corporate Carbon Emissions: Pricing and Institutional Investors

Institutional Investors and Corporate Carbon Emissions: An International Examination

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This paper examines the role of institutional investors in the reduction of corporate carbon emissions. First, we compare and contrast firms' carbon emission with their assessed environmental performance used in prior studies. Using a large sample of international firms, we document that the high assessment of a firm's environmental performance fails to transmit into lower future carbon emissions. Second, we study how carbon emissions relate to institutional ownership and document that carbon emissions are not related to overall institutional ownership. However, we do find that institutional ownership by the “Big 3” (BlackRock, Vanguard, and State Street) is associated with lower carbon emissions, suggesting that environmental outcomes may be driven by institutional investors' financial incentives. In contrast, institutions' social incentives, proxied by their domicile environmental social norms, have an effect only on the broader (and more subjective) assessment measures of environmental performance.

How Can We Explain the Past Trends in Transport CO₂ Emissions in France?

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In order to decrease the CO₂ emissions of the transport sector by 2050, the French strategy for clean mobility development is based on a set of measures decomposed in five key drivers of transport CO₂ emissions: transport demand, modal shift, vehicle load factor, energy efficiency and carbon intensity of the energy. This paper aims to better understand the past trends of these drivers and their relative contribution to the evolution of transport CO₂ emissions. The five factors are then used in a decomposition analysis of the transport emissions (in the same form as the Kaya identity) from 1960 to 2015, both for passenger and freight transports. The past trend shows a growth in transport CO₂ emissions from 32 to 125 MtCO₂ between 1960 and 2015, after a peak at 135 MtCO₂ in the early 2000s. This trend is explained mainly by the increasing transport demand both for passenger and freight transports, before an inversion of these factors at the beginning of the 2000s. Modal shift towards road transports followed the same trend, but participating to the increase of CO₂ emissions with a lower contribution. The occupancy rate decreased for passenger cars (thus participating in the CO₂ emissions growth), but the loading rate increased for road freight (more tons are transported by vehicle) and almost all the other transport modes. Finally, energy efficiency participated regularly in the emission reduction, whereas the impact of the carbon intensity of the energy was marginal on the global period. This last point contrasts with the national strategy that relies highly on the decarbonization of the energy mix to achieve the emission reduction target. On the contrary, transport demand, which is the main explaining factor in the past and will certainly remain as crucial in the near future, seems to be absent from the political debate and lacks of ambitious measures to address transport CO₂ emissions.

Internal Corporate Carbon Pricing: An Analysis of Carbon Emission Reductions for U.S. Companies

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A growing trend among corporations is to utilize an internal carbon price to make energy-related investment decisions, with a rise from 100 in 2014 to about 1,400 companies at the end of 2017 reporting to the CDP they do or plan to use internal carbon pricing in the next two years (CDP 2018). Utilizing an internal carbon price tilts investments away from high-carbon emissions projects toward low-carbon emission alternatives. In this study we investigate whether early internal pricing adopters in the U.S. show any future carbon emission reductions, and whether reductions, if they occur, are related to the use of an internal carbon price. Our analysis uses CDP emissions data from 2011 through 2016 for 201 U.S. companies, with 52 currently reporting that they use an internal carbon price and another 30 planning to use a carbon price within the next two years. Examining changes in industry-adjusted carbon emissions intensity, we find strong evidence in support of an internal carbon price being associated with emissions reductions with one measure, but only weak evidence with the second metric. These mixed results may reflect the short period of time for U.S. companies in applying internal carbon pricing and the range of ways it is being applied.

Session C2: Econometrics of Energy Markets III

Volatility Modelling using GARCH for Solar Energy in the United States

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In this paper we model the financial volatility related to utility-scale solar photovoltaics (PV). An accurate estimate of such volatility will play a crucial role to investors in correctly evaluating the financial risks associated with these investments. We identify two main sources of volatility a solar energy project is exposed to: electricity prices and policy uncertainty related to Solar Renewable Energy Credit (SREC) prices. We model each source of uncertainty using univariate generalized autoregressive conditional heteroskedastic (GARCH) econometric models and combinations of GARCH models with different weighting schemes. Our period of study covers eleven years, and the chosen models or combinations of models are evaluated by carrying out in-sample and out-of-sample comparisons. We find that GJR-GARCH is the best performing model for electricity price forecasts, while Bayesian model averaging (BMA) and constrained least squares (CLS) are stable combination methods that provide superior forecasts for SREC prices. The results are robust to a reduced sample analysis. We believe this paper is the first attempt to consider different sources of volatility to solar PV and the first to apply combinations of GARCH models to SREC prices.

Wind Power Modelling for Time Series with Missing Data

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Many wind power time series show patterns of regular or irregular periods of missing data, which manifest themselves through consecutive hours of zero power. Nonetheless, incorporation of this knowledge is rarely found in application, even though it obstructs the usage of standard maximum likelihood techniques. We study the effect on forecasting wind power when adapting the time series modelling to this pattern.

Is LNG the Global Viable Alternative for Diversification? A Mathematical Modelling Approach

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Together with an increasing concern towards environmental issues such as climate change, global warming and air quality, natural gas emerged as a vital option among the fossil fuels supporting renewable energy in ongoing global energy transition. However, increasing natural gas demand triggers import dependency in consumer countries due to its regional limited availability and transportation limitations. Therefore, in the last years, LNG emerged as an important option for consumer countries to reach out distant suppliers, allowing to increase their diversification efforts and to decrease their overwhelming dependence to a single supplier country. This study utilizes mathematical modelling and scenario approach to assess the future expectations of the global LNG market, considering three parameters: (1) demands, (2) relative prioritization of costs and risks, and (3) the degree of commitment of countries to current LNG sourcing plans. By doing so, it also assesses whether LNG currently and in the future is a major option to enhance diversification efforts of the countries in terms of security of supply. For this aim, a mixed-integer linear mathematical model constructed and executed under various scenarios reaching to 45 instances of the experimental design. The results demonstrate that global LNG market is rather more sensitive to risks perceptions compared to costs. Moreover, based on the current demand scenarios, LNG is not the viable but marginal alternative for desired level of diversification.

Session C3: Emerging Issues in Energy Markets

The Value of Saving Oil in Saudi Arabia

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Saudi Arabia has one of the highest levels of per capita oil consumption in the world, but attempts are now being made by Saudi policymakers to significantly reduce this. Thus, a relevant policy question is what is the value of saving a barrel of oil in Saudi Arabia? The instinctive answer is that the value saved is the difference between the international market price and the domestic price. However, for Saudi Arabia, this answer is insufficient for several reasons. First, the current administered domestic price of oil is set below international market levels, which leaves room for improved economic efficiency. Second, Saudi Arabia is not a marginal producer of oil but a critical player in the international oil market; a shift in Saudi exports affects international oil prices and consequently the country's revenue from oil exports. Third, there are different ways to reduce the domestic consumption of oil. This paper explores policies that reduce the domestic consumption of oil in Saudi Arabia, increasing the amount of oil that would ultimately be exported and assesses the impact on welfare and carbon emissions (however, given the long-run perspective adopted here, it does not address the optimal timing to export the oil that is saved). Among the various methodologies to do this, we opt for a general equilibrium model. Our results suggest that oil-saving policies would lead to positive welfare gains and a reduction in domestic carbon emissions. The most relevant insight for policymakers is that a barrel of oil saved in the Saudi economy leads to an increase in welfare ranging between \$6 to \$56 for an international oil price of \$52.9 per barrel, depending on the policy, and a decrease in domestic CO₂ emissions from 150 kg to 368 kg.

Forecasting the Economic Attractiveness of Energetic Retrofitting Investments in Residential Dwellings on a Regional Level

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This paper presents a forecast model for investment and energy bill savings potential on a regional level for residential dwellings based on real-world data for Germany. Residential heating is one of the main drivers of energy consumption in many countries and bears enormous energy efficiency potential. However, renovation rates are well below the required level to achieve ambitious international climate goals. Often this underinvestment situation is ascribed to uncertainties of private and professional decision makers on the economic viability of energy efficiency measures. This paper analyzes the economic attractiveness of geographic regions from an investment perspective by taking into account the geographical variations in weather, construction costs and condition of the local building stock on a postcode level. Based on Monte Carlo simulations and state-of-the-art stochastic processes of respective risk factors, the presented forecast model derives distributions of investment potential, energy bill savings and net present values of energy efficiency measures on postcode level. The results indicate that the economic attractiveness of energy efficiency investments highly depends on the geographical region of a dwelling, especially because of large variations in construction costs and weather. Potentially these insights not only improve decision-making of private and professional investors, but may also advance policymaking.

A Brazilian Long-Term Oil Refining Analysis within the Energy Transition in The Transportation Sector

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The oil consumption should represent a reduced share of the total primary consumption during the next decades to limit the Green House Gas Emissions. Nevertheless, the crude oil consumption will likely remains important, given the crude oil availability and stranded refineries' assets. However, the world oil market is passing by a transition phase, which is spurred by several factors, such as the transformation in urban mobility, the existing refining assets (closure of production capacity), and weak refining margins with low crude price. In this context, Brazil is in a situation with both an important crude oil availability and an ambitious environmental policy with a significant biofuel supply. In this context, the objective of this study is to analyze, through the development of a linear programming optimization model, the evolution of the Brazilian oil refining industry and the carbon emissions at the level country athwart oil products demand scenarios and environmental policies in the long-term.

Session C4: Towards Sustainability

Upstream Fiscal Regimes Incentives for Captured CO₂-EOR

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Several preliminary scoping studies have identified a significant potential for captured CO₂ for EOR projects outside North America. In countries where severe upstream fiscal terms can constitute an obstacle for such projects when they are profitable before tax, incentives should be considered. We compare several incentive schemes by running simulations on a realistic CO₂-EOR project inspired by the Denver unit of the Wason US field. The economic approach is based on incremental Net Present Values (NPV). This requires dual simulations of a base case and CO₂-EOR case because the calculus is not linear and cannot be run on a single incremental costs and production case. The design of the incentive package is challenging for the host country. The incentive package should sufficiently improve the company NPV without reducing the State NPV in most situations that are likely to occur. By looking at both oil company and host country incremental NPVs, we show that improvement in cost deductions, through accelerated capex depreciation and uplift, are better suited for the host country than tax rate reductions. We also explore an upstream tax recycling scheme for financing CO₂ purchase costs.

Improving the Assessment of Cobalt Criticality via the Analysis of Its Value Chain: Preliminary Results

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This paper presents the importance of analyzing the cobalt value chain as a complement to existing criticality studies for this metal on European or global scales. Better knowledge of the steps and stakeholders involved in the cobalt value chain and of the principles underlying their interactions may provide better understanding of cobalt market dynamics. This paper introduces a value chain approach as a tool for identifying specific bottlenecks in the cobalt market in which risks are likely to arise.

Testing the Emission Reductions Claims of CDM Projects using Benford's Law

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Benford's Law suggests that the first digits of numerical data are heavily skewed towards low numbers. Data that fail to conform to Benford's Law when conformity is to be expected may have been manipulated. Using Benford's Law we conduct digital frequency analysis on the emissions reductions claims of Clean Development Mechanism projects. Digital frequency analysis indicates that although emissions reductions claims made in project design documents do not conform to Benford's Law, data on certified emissions reductions do. The nonconformity of data on emissions reductions claims contained in project design documents is more apparent in some countries than others. Benford's Law offers a rapid, low-cost means of identifying possible instances of data manipulation.

Session D1: Natural Resources, Risk, Welfare and Social Preferences

Technology Shocks and the Prebisch-Singer Hypothesis

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We explore the relationship between innovation, productivity and price in the mining sector of an important primary commodity, iron ore, using an innovative nonlinear SVAR approach. Our results shed lights on two distinct but related lines of research: the current evidence on the Prebisch-Singer hypothesis, by showing the importance of its main channel, the dominance of technological innovation over resource depletion as a determinant of the price of iron ore, and the role played by market integration; the current empirical understanding of the effects of competition on productivity and price, by showing the existence of an interaction between productivity changes and market structure

A Risk-Hedging View to Vertical Integration in the Refinery Capacity

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Should oil-rich countries invest in the oil refinery industry? This is a crucial policy question for such economies. We offer theoretical models for a vertical integration strategy based on a risk-hedging view. The first model highlights the trade-off between return and risk-reduction features of upstream/downstream sectors. The dynamic model demonstrates the volatility of total budgetary revenue of each sector. Our theory-guided empirical analysis shows that though the average markup in the refining sector is significantly smaller than the profits in the upstream, downstream investment can provide some hedging value. In particular, the more stable and mean-reverting refining margins provide a partial revenue cushion when crude oil prices are low. We discuss the risk-hedging feature of the refinery industry when the crude oil market faces supply versus demand shocks.

Saudi Arabia's Economic Reforms within Vision 2030: Insights from a Dynamic Stochastic General Equilibrium Model

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Axel Pierru, *KAPSARC, Saudi Arabia*

Shreekar Pradhan, *KAPSARC, Saudi Arabia*

Saudi Arabia is implementing an important economic reform plan, Vision 2030, to diversify the economy and reduce its dependence on oil. In this paper we analyze some of the policies envisaged in the Vision 2030 plan, in particular the introduction of value added taxes, the reform of domestic energy prices, the deployment of a significant amount of renewable energy and the plans to increase the participation of the local population in the labor market. We analyze these policies in a Dynamic General Equilibrium model that includes several production sectors (tradeable, non-tradeable, energy services, electricity, oil and gas) as well as Saudi and expat households. We analyze the transitional dynamics effects, as well as the welfare gains derived from these policies.

Session D2: Global Carbon Emissions

Impact of International Carbon Credits on the Returns and Volatilities in Regular Emissions Trading Schemes

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Article 6.4 of the Paris Agreement establishes a new market mechanism, the design of which still needs to be defined. In this context, we conduct an empirical analysis of the impact of international carbon credits on regular emissions trading schemes, in particular on the returns and volatilities. We take advantage of the European experience with accepting Certified Emissions Reductions (CER) for compliance in the second phase of the EU ETS. Our causality analysis uses vector-autoregressive models on the prices of European allowances (EUA) and CER. We also examine the dynamic conditional correlation between the risks of the carbon permits. We find an absence of cointegration between the two price series. This is explained by the difference in their long-term dynamics. The causality analysis shows a unidirectional link from EUA to CER in the short-term: the EUA daily price variations influence the CER returns, but the latter have no impact on the former. 60% of the CER volatility is explained by the EUA volatility and a shock in the EUA price is always transmitted to the CER price. On the opposite, we find no effect of the CER price variations on the EUA price. The dynamic conditional correlation between the EUA and CER price risks is estimated to be around 0.8, which is comparable to what is observed between commodities that have a high degree of substitutability. In order to ensure the good functioning of these policy instruments, we suggest limiting the volume of international credits that can be issued annually.

Role of Economic Growth, Trade Openness, Financial Development & FDI in Forecasting Emissions: Evidence from G-6

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Abstract: In the context of role debate on curbing CO₂ emissions Post-Paris Agreement, this study investigates the role of economic growth, financial development, trade openness and FDI in explaining and forecasting CO₂ emissions. In so doing, we drew on the data from G-6 economies and applied a rich-set empirical approaches including FMOLS & DOLS Estimation and System-GMM estimation and forecasting. Our key results suggest strong evidence of cointegration between economic growth, financial development, FDI, trade and CO₂ emissions in the G-6 countries. The economic growth, capital market expansion, and trade openness found to be major drivers of emissions. There was weak evidence of the Environmental Kuznets Curve. The stock market capitalisation and FDI has a weak but negative impact on emissions. The forecast performance was quite good for the USA, Japan and Canada which are the largest per capita emitters among G-6. Our findings have profound policy implications in terms of meeting the climate commitments.

Consumption versus Production-based Emissions and Economic Activity: The Role of World Trade

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Decoupling evidence between greenhouse gas (GHG) emissions and real gross domestic product (GDP) has been mixed and generated much debate. This paper uses data for 168 countries between 1990 and 2014 to show that, in order to get a clear picture of decoupling, it is important to distinguish cycles from trends: there is an Environmental Okun's Law (a cyclical relationship between emissions and real GDP) that often obscures the trend relationship between emissions and real GDP. Our results suggest that, controlling for the cyclical relationship between the two variables, the trends show evidence of decoupling in richer nations (particularly in Europe), but not yet in emerging markets. The picture changes somewhat, however, if we take into consideration the effects of international trade, that is, if we distinguish between production-based and consumption-based emissions. Once we add in their net emission transfers, the evidence for decoupling amongst the richer countries gets weaker.

Session D3: Climate Finance

Foreign Direct Investment and the Environment: Disentangling the Impact of Greenfield Investment and Merger and Acquisition Sales

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We examine the effect of greenfield (GF) investment and mergers and acquisitions (M&A) on the environment and industry emissions of CO₂. We identify significant differential and income effects with various data classifications modes of entry. Evidence from full sample reveals that GF investment increases pollution, supporting the pollution haven hypothesis while M&As decrease it, in line with the halo effect hypothesis. GF investment flowing into poorer countries worsen the environment, while M&As flowing to industrialized economies reduce pollution. Entry-mode also is present at the level of industry emissions. GF investment in developed economies decrease pollution in transport industry but increase it in other industrial combustion and transport industry when they flow into poorer countries. Inflows of M&As into developed countries reduce emissions in building, power industry and other industrial combustion but they increase pollution from transport industry and power industry in developing countries. Poorer countries only benefit from M&As inflows that reduce building emissions and rich countries are hurt only by GF investment that increase emissions from power industry.

Estimating the Elasticity of Substitution between Capital and Energy from Abatement Cost Curves: The case of the French Industry

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Top-down models on climate change usually rely on elasticities of substitution estimated on historical data and are defined as fixed parameters. Considering the long period of simulation on decarbonization performed by these models, holding this assumption could lead to biased results. We propose a methodology that aims linking bottom-up information on technology potential of emissions abatement and energy savings. Ultimately, the integration of this information would allow us to calibrate the elasticity of substitution between capital and energy. We conclude that elasticities can be non-constant and could depend on the input share ratio in the production function.

A Cost-Benefit Analysis of the Jones Act: The Case of the Petroleum Product Tanker Market

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The Jones Act regulates all maritime commerce in U.S. waters and between U.S. ports. It requires that all goods transported between U.S. ports be carried on ships carrying the U.S. flag. In addition, the ships must be constructed in the United States, owned by U.S. citizens, and crewed by U.S. citizens and U.S. permanent residents. The Jones Act is clearly a protectionist measure that adds to the cost of maritime transportation. As it is part of U.S. law, it is also used as justification for other countries to adopt similar protectionist measures, leading to a global deadweight welfare loss. This is becoming increasingly relevant for the energy sector, as liquefied natural gas (LNG) has turned natural gas into a global commodity, much like oil. For example, despite the increasing U.S. LNG exports resulting from the shale revolution, there is not a single U.S. flagged LNG carrier, a fact attributed to the costs

associated with the Jones Act. Despite the importance of the Act, there is little economic literature devoted to a rigorous evaluation of the costs and benefits that it generates. In this paper we propose a comparison of the welfare effects associated with maritime services in the presence and in the absence of the Jones Act.

Session D4: Socially Responsible Investments and Energy Transition

Attitudes of SMEs towards the Elements of Eco-Efficiency: The Turkish Case

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Eco-efficiency is achieved by creating more value with less environmental impact. Thus, eco-efficiency serves environmentally sustainable economic growth or green growth. Since the Small and Medium Sized Enterprises (SMEs) are responsible for most of the production in the industrial output, their adoption of and awareness about elements of eco-efficiency is crucial for green growth. In this study, we investigate the attitudes of the Turkish SMEs for three items of eco-efficiency: (i) increasing resource efficiency investments, (ii) producing more environmentally compatible “green” products or services, and (iii) consuming energy generated from renewable sources. To this end, we utilize data on the Turkish SMEs from the 2017 wave of the Flash Eurobarometer, Small and Medium Sized Enterprises, Resource Efficiency and Green Markets (GESIS) dataset. Our analysis of 299 SMEs from Turkey reveals that many firms indicate administrative and legal procedures as barriers to resource efficiency investments. The findings also demonstrate that most of the SMEs rely on their financial resources to become more resource-efficient. However, they are still in need of external support such as new technologies, grants, subsidies or consultancy. One interesting observation is that actions towards resource efficiency have not created desired cost reductions concerning production. Only 9 percent of the firms declared that their costs decreased significantly. The results on the attitudes of Turkish SMEs towards on-site energy generation from renewables demonstrate that the Turkish SMEs do not put much emphasis on achieving eco-efficiency through energy from renewables. The findings also reveal that the majority of the firms are reluctant to produce green products or services. One reason for this finding could be a lack of incentives. A vast majority of the SMEs believe that the presence of financial incentives for future projects would help them develop new green products or services. These findings imply that there is a distance between the Turkish SMEs and the elements of eco-efficiency. As SMEs construct a sizeable portion of the output in the economy, these findings show that the contribution of SMEs to environmentally sustainable economic growth will be lacking in the coming years unless further actions are taken, and supports are given by the Turkish government.

ESG Transparency and Investment: Signaling and the Power of Social Responsibility on Performance

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This paper illustrates the impact of Environmental Social and Governance (ESG) disclosure in corporate equity performance. Over the past decade there has been an increasing concern about the ethical impact of investment decisions. Hence, ESG factors have gained increased relevance in the corporate management process. In this study, we use an extensive data set of European ESG disclosure scores to demonstrate that ESG investing is associated with improved stock performance. Using a sample covering the 2005-2016 period of European Corporate and ESG compliance data a factor analysis demonstrates that ESG compliance scores become highly important in the asset allocation process.

Renewable Energy Investment Risks: Dynamics over Time and Drivers

Florian Egli, *Energy Politics Group, ETH Zurich, Switzerland*

Building an energy system compatible with the Paris Agreement requires large-scale investment in renewable energy technologies (RET). Understanding the dynamics of RET investment risk is therefore crucial to make capital flows consistent with a Paris-compatible energy system. This study draws on RET project data and 40 investor interviews in Germany, Italy, and the UK. We show that risk premiums and investment risks have declined for solar PV and onshore wind in all three countries. Increasing technology reliability at lower cost, data availability, better assessment tools and credible and stable policies were crucial to lower investment risk. We identify the five most relevant risk types (curtailment, policy, price, resource, technology), show their changes over time and use quantitative text analysis of interview transcripts to identify the drivers behind. While technology and policy risks have declined substantially over time, curtailment and price risks are becoming more important, which policymakers should keep in mind when designing policies.

How to Fill the ‘Financing Gap’ for the Transition to Low-carbon Energy in Europe?

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Many organisations and researchers have produced models to explore energy transition pathways. In these models, existing investment flows are contrasted with predictions for investments needs to indicate a “financing-gap” for the European energy transition. These gaps are seldom discussed in the light of available private sources of finance necessary for an economically feasible energy transition. This is remarkable, as 90% of current clean energy investments are privately financed. This article investigates the role of funding sources such as R&D grants, public-private instruments, private and public equity and debt in addressing financing needs in existing mitigation scenarios. The authors draw on an in-depth analysis and comparison of the main scenarios being employed to forecast investments until 2050 as well as an analysis of the literature on the sources of finance for renewable energy. Long-term projections do not capture the supply or demand of specific sources of finance needed to cover the whole innovation chain. Our analysis reveals that under the individual investment and lending criteria/mandates the money is available. However, policy uncertainty strongly distorts investment decision making. Especially institutional investors and lenders such as pension funds and banks shy away from investments in the energy transition because of expected (policy) discontinuities and the risk of stranded assets. They arguably cannot engage as they invest predominantly “other people's money”. Moreover, more risk-bearing equity capital to finance the early stages of innovative clean energy technologies are needed to complement existing large-scale investments in existing technologies to allow for an effective and efficient mitigation that is in line with the major scenarios. Based on the analysis we develop a matrix that indicates the role for different sources of finance and new intermediation channels in the energy transition and how they need to be engaged.

Session E1: Electricity Markets Analysis

Analysis of the Historical Pass through of Carbon Cost to Electricity Prices in France and Central Western European Power Markets

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In this paper, we estimate the carbon pass-through rate in the French and Central Western European power market with a linear econometric model using data of French electricity EU ETS forwards over the period of 2011-2018. We find that the period 2011-18 can be split into seven sub-periods with identified structural breaks and that the estimated carbon pass-through rate varies between 0.53 and 1.23 depending on the period considered. The paper contributes to the understanding of the drivers of the carbon cost pass-through by identifying the key events that are associated with these structural breaks, and providing the first and the most up-to-date empirical evidence of this pass through over the period of 2011-2018.

Price Elasticity of Residential Electricity Demand in Vietnam

2012-2016

Minh Ha-Duong, *CIREN, France & Vietnam Initiative for Energy Transition, Vietnam*

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We estimated the short-run and long-run price elasticities of Vietnam residential electricity demand. We used two different data sets: a pool data set for short-run elasticity and a panel data set for long-run elasticity. These were constructed from the three Vietnam Household Living Standard Surveys 2012, 2014 and 2016. We found that 1/ Households electricity demand is elastic in the short-run. This contradicts to the studies made in other countries, but agrees with Phu (2017) results in Vietnam, with different data and method. 2/ The long-run elasticity appeared positive, a surprise which may be caused by the lack of price variation in the long run data set. 3/ Households in Vietnam respond fully to marginal price rather than to average price.

Microgrid Sizing with Incentive-based Demand Response Program: A Hierarchical Game Approach

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The annual average energy consumption in the EU households has increased over the past decade. This increase is particularly due to the growing number of uncontrollable loads such as lighting or new electronic devices, in which energy consumption from devices in standby mode are estimated between 5 - 11% of the total household energy consumption. In the context of Demand Side Management (DSM), uncontrollable loads have a tendency to be mostly related to Energy Efficiency than that of Demand Response. Energy savings or load curtailments in domestic uncontrollable loads are typically achieved by the use of efficient appliances, which are based on innovative technical aspects. Conversely, the behavioral aspect is accomplished by the own consumer's decision to eliminate/switch of standby energy consumption. The availability of economic incentive in load curtailment for domestic uncontrollable loads is essential for the potential sources of energy savings with the focus on the behavioral aspect side. To this end, this paper investigates a sequential non-cooperative game approach through an incentive-Based Demand Response program. More precisely, a Peak Time Rebate game is played between an aggregator and a household. The aggregator aims to choose which of the two decisions it opts for: the Historical Sizing system (HS) which

is financially expensive in term of investment and where the household's preference toward load curtailment is not considered, i.e. no DR game is played. In this option, the system will remain over-sized as long as incentive does not exist. Another option is to Under-Size the system (US) with less expensive investment but Demand Response game is needed in order to compensate capacity shortage when necessary, particularly in peak period. In this case, the aggregator proposes a rebate rate which aims is to convey an economic signal to the household in order to be willing to curtail loads when requested. The results shows that the US system becomes an Optimal Sizing (OS) system as long as bound conditions for incentive makes DR program effective. The OS corresponds to the system in which both players optimize their payoffs from the DR program. The paper demonstrates that the amount of load curtailment largely depends on the household's characteristics (the willingness factor for load curtailment, α , and the potential proportion of energy saving from fixed loads?) with respect to the historical electricity price. Moreover, the results contribute to point out the presence of adverse selection and moral hazard at the household side when the assumption of perfect information is relaxed.

Willingness to Pay for Microgrids to Enhance Community Resilience

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Given the important role that electricity plays in powering society, and the significant risk that extreme weather and other events pose in disrupting electricity supply, the idea of community-scale microgrids has come to the forefront to enhance electrical grid resiliency and provide critical services to local communities during extended outages. In this paper, a discrete choice experiment is used to evaluate willingness to pay (WTP) for a microgrid that would power several critical services during an extended power outage. With a sample of 939 respondents from New York State, results indicate that, overall, there is a positive willingness to pay for microgrid services, including hospital and emergency services, potable water, shelters, and retail outlets. The average willing to pay for a microgrid that provides all of these services at full levels is approximately \$22 per month per household. WTP is also found to vary with some sociodemographic, personality, energy use characteristics.

Session E2: Econometrics of Energy Markets IV

Impact of Crisis on Shift-Contagion in Energy Markets

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This paper presents an analysis of shift-contagion in energy markets, testing whether linkages between returns in energy markets increase during crisis periods. The research presented herein demonstrates how common-movement between energy markets increases due to (i) shift-contagion across energy markets, reflected by structural transmission of shocks across markets and (ii) larger common shocks operating through standard cross-market interdependences. A regime switching model was developed to detect shift-contagion across energy markets. In the approach adopted herein, the occurrence of shift-contagion is endogenously estimated rather than being exogenously assigned. The results show that shift-contagion has been a major feature of energy markets over the last decade. Evidence is presented which demonstrates that the linkages between energy markets do not appear to be stable.

Modelling of Frequency Containment Reserve Prices with Econometrics and Artificial Intelligence

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The forecasting of control reserve prices is essential in order to participate reasonably in the auctions. Having identified a lack of related literature, we therefore deploy approaches based on auto-regressive and exogenous factors originating from econometrics and artificial intelligence and set up a forecasting framework. We use SARIMA and SARIMAX models as well as neural networks and forecast based on a rolling one-step forecast with re-estimation of the models. It turns out, that the combination of auto-regressive and exogenous factors yields the better results compared to approaches solely considering auto-regressive or exogenous factors. Further, the artificial intelligence approach outperforms the econometric approach in terms of forecast quality, whereas for the further use of the generated models, the econometric approach has advantages in terms of interpretability.

Forecasting Electricity Price under Seasonal Long-Run Temporal Dependence: A New Hybrid Model

Heni Boubaker, *Institute of High Commercial Studies of Sousse, Tunisia & IPAG Business School, France*

Electricity prices are characterized by numerous complex features such as non-stationarity, non-linearity, most volatility, high frequency, mean reversion and multiple seasonality, which make forecasting complex. Nevertheless, an accurate price forecasting is indispensable and crucial to electricity market participants. To improve the prediction accuracy using each model's unique features, this research proposes a hybrid approach that combines the k-factor GARMA process, wavelet transform and the local linear wavelet neural network (LLWNN) methods, to form the so-called k-factor GARMA-WLLWNN model. The performance of the proposed hybrid model is evaluated using data from Polish electricity markets, and it is compared with the dual generalized long memory k-factor GARMA-G-GARCH model and the individual WLLWNN, to verify the robustness of our proposed hybrid model. The empirical results prove that the proposed hybrid method is the most suitable forecasting technique and may be a solution for better predicts electricity market.

Session E3: Financial and Economic Analysis of Energy Markets

Evaluating the Impact of Oil Price Volatility on Investor Revenues: Real Options in a Real World

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Despite all the developments in real options and stochastic oil prices modeling, the upstream oil industry still uses smooth price scenarios in its investment decision models. We explore this situation by considering a single field development by an International Oil Company (IOC). The IOC computes a 10% after tax Net Present Value (NPV) at a flat price scenario for its development decision and encounters stochastic prices with volatility and structural breaks if the field is developed. We generate stochastic yearly oil price sequences under a Geometric Random Walk (GRW) and a two-regime Markov switching geometric mean reverting process (GMS). For each process, we simulate different development decision flat prices choices. They vary from risk tolerant (averse) IOC strategies that use a decision price multiplier to the oil price in the decision year “>1” (“<1”). At a low (high) price multiplier the field is less often developed and the stochastic price sequence in case of development starts at higher (lower) levels. Under the GRW, choosing a risk averse strategy leads, in case of development, to higher future prices and in turn higher expected NPVs. When we take into account the no development cases, we observe, in a certain field breakeven price interval, dominant risk averse strategies. The option to delay development has a value. In the GMS process, the initial price of the stochastic process has no influence on the expected NPVs. Then, at high (low) asset breakeven price, the expected NPVs in case of development are all negative (positive) regardless of the decision strategy. The difficulty to choose an appropriate stochastic price model, probably explains why IOC still use flat price scenarios for their development decisions. Nevertheless, stochastic price processes generate tortuous price paths that enable to explore other scenarios, and allow to analyze a new type of sensitivity to the oil price. This can be helpful for IOCs to analyze their price risk exposure. It can also be used by States of host countries for the design of their upstream fiscal regime.

Analysing Financial Flows for the Development of Coal-Fired Power Plants

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Regardless global agreements on climate change the world sees a renaissance of coal, foremost driven by countries in South, East and South-East Asia. The development of new coal-fired power plants is often conducted by means of international financial support from banks and investors. We analyse these financial flows between countries and regions for direction, regional patterns, magnitude, drivers and occurring emissions. While many Non-Annex I countries, e.g. China and India, are known for extensive construction of plants, we find that other countries, especially Annex I parties like the United States, Western European countries and Japan, play major roles in providing financing and investment for coal-fired power plants. The data furthermore displays a trend towards more foreign participation in the development of new plants which we follow up by examining the relationship of DI and OFDI in the sector. The question of responsibility of different countries (especially Annex I parties) is analysed by calculating the respective emissions from financing of coal plants. Based on the results we examine feasible policy instruments to cease international financial flows.

The Role of Shale Gas. Between Energy Security and Climate Objectives

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The aim of this study is to assess the global impacts of a potential shale gas development in European countries with particular focus on the regional environmental impacts of different CO₂ reduction trajectories. This analysis is complemented with the assessment of some energy security indicators (flexibility, resilience and robustness) with a twofold aim: understand the role of shale gas development in contributing to the energy security and understand whether (energy) security and environmental protection are two possible complementary purposes of energy and climate policy. This analysis is carried out through the JRC Energy Trade Model, a global energy and technology model for long term policy analysis. Results show that despite the environmental targets in each CO₂ reduction scenario are achieved, regional differences arise showing that some countries that are worst off both in terms of environmental quality and level of energy security.

Session E4: Finance and Investment in Renewable Energy

The Effectiveness of Policy Support in Promoting Green Bonds: Empirical Evidence

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The importance of green finance is increasing. Private finance is crucial for renewable energy deployment. The literature providing empirical evidence on the effectiveness of policy instruments in promoting green finance is limited. Recently some countries adopted policies not only affecting real sector, but also financial sector, with the aim to support green financial instruments, such as green bonds. This paper investigates the effectiveness of several policy instruments in supporting green finance. Using monthly data from different sources, mainly Bloomberg and International Energy Association, across 44 green bond issuing countries over the period 2013-2017, this paper provides an empirical assessment of the implications of policy support on green bonds issuance. The contribution of this paper is that we distinguish between policies affecting real sector and policies supporting green finance, such as guidelines for green bonds issuance and subsidies for green bond labelling. The empirical results provide the list of policy instruments, which are efficient in promoting green bonds. The results can be beneficial for policy makers from central banks.

Harnessing the Potential of Consumer (Co-)Ownership in Renewables in the Asian Energy Transition – a Comparative Study of Pakistan and India

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The developing Asia has an important role, both in terms of its energy markets and its CO₂ emissions. Half of humans without access to electricity and some 70% lacking access to clean cooking fuels are from this region being the most populated geography on the earth (Bhattacharyya and Palit 2018). Although the developing Asia also aspires clean energy and is making substantial efforts and investments to promote renewables (Sovacool and Drupady 2012; FS-UNEP 2018), there seems little scholarly or policy concern on the direction that its Energy Transition may or should take. Financed by the European Commission's Horizon 2020 programme in April 2018 the project SCORE (Supporting Consumer Ownership in Renewable Energy) was launched with the aim to facilitate consumers to become (co-)owners of RE in three European pilot regions employing a Consumer Stock Ownership Plan (CSOP). Focusing on the EU the project also investigates to what extent CSOPs can be implemented in other parts of the world and – in the context of the so called “follower city approach” – entices replication. While demand for energy in developing countries is growing, access to energy is crucial for improving the quality of life. Non-EU countries, in particular those where rural areas have limited access to energy, e.g. in Asia, Africa and Latin America, may be interested in the benefits of consumer ownership. With this background and motivation this paper has the following objectives: (1) Analyse the extent to which India and Pakistan are prepared to introduce consumer (co-)ownership models in their Energy Transition, including the regulatory framework and potential barriers in consumer-led diffusions of renewables; (2) Investigate case studies to understand what lesson these countries may learn from each other and from the European innovations (technological, institutional and financial) and experiences in supporting consumers (co-)ownership of renewables and how those experiences translate to huge diversity in the developing Asia; (3) Drawing on the case studies put forward suggestions for pilot CSOP projects in Pakistan and India in cooperation with the H2020 project SCORE.

What can GCC Countries Learn from Well-established Green Power Markets in Other Countries?

Leila Dagher, *American University of Beirut, Lebanon*
Layal Mansour, *American University of Beirut, Lebanon*

Renewable energy purchases are typically either part of a compliance-based (government-mandated) program or belong to one of the voluntary green power programs. The latter category includes utility green pricing, utility renewable contracts, unbundled RECs, competitive suppliers, community choice aggregations, power purchase agreements, and community solar. Table 1 shows a description of each of the products and to which customer class(es) it is available. Voluntary green power by definition is the voluntary purchase of RE by retail electricity customers over and above what is required from utilities by the government.

In terms of sales, the compliance-based market dominates the voluntary green power market in all countries. For example, in 2017 the voluntary market represented about 26% of all U.S. renewable energy sales. As of 2018, 33 countries have a government-mandated RE requirement. In the voluntary market, the largest two markets are the utility green pricing programs and the RECs. Green pricing programs were first offered in the 1990s in several countries where consumers can voluntarily pay a premium for each kWh consumed to cover additional cost of generating electricity from a renewable energy source (RES) (Dagher et al., 2017), while RECs are credits that represent environmental and other non-power attributes of renewable electricity and are measured in single MWh where the owner of the REC can legally claim to have purchased renewable energy. Within the U.S., the commercial and industrial sectors constitute most of the voluntary market for RECs, while the residential sector's REC purchases accounting for only 1% of all REC sales.

While the first unbundled retail REC product was sold in 1998, the first mention of "certificate trading" was in California in 1995 and some European countries had already introduced tradable attribute certificates in 1997 (EPA, 2019). The number of countries that have adopted RECs since then has increased to 16 in 2005 and by 2017 there were more than 30 countries that have adopted RECs (REN21, 2017). These countries include, among others, the United States, Canada, Australia and India.

Session F1: Energy and Climate Models II

Tradable Climate Liabilities: A Thought Experiment

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We envision the creation of a climate liability market to address climate change. Each period, countries are issued liability commensurate to their emissions of the period. Liability bearers are required to pay over time, as climate harm materializes. Revenues are used to compensate participating countries in proportion of climate harm. Because liabilities are traded like financial debt among participants, the mechanism achieves a unique carbon price through decentralization of the choice of a discount rate as well as beliefs about the severity of the climate problem. We discuss properties of such a mechanism along the dimensions of efficiency, fairness, exposure to risk, commitment, participation, as well as implementation challenges.

Cost and Benefits of Deep Decarbonization in Russia: A Thought Experiment

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With the new Paris climate agreement, 184 of 197 nations have committed to lower emissions of planet-warming greenhouse gases. The intent is to limit global temperature growth within 2 degrees Celsius (°C), with a hopeful target of 1.5°C. At the same time, a special report from the International Panel on Climate Change (IPCC) indicates that large emission reductions, in fact, must be achieved by 2030 if the temperature increase is to remain below 1.5°C. This goal requires every country to radically cut their greenhouse gas emissions by rebuilding both their energy supply and end-use sectors. Even bigger challenges confront those countries which export fossil fuel resources as they also must find new sources of economic activity to replace revenues that will be lost from the significantly-reduced energy sales. The overall economic impact of this transformation is hard to quantify. On the one hand, decarbonization requires an initial set of large-scale policy, program, and research and development expenditures. It will also entail higher upfront investments in energy efficiency and alternative energy resources. Based on conventional wisdom, these outlays will create an initial burden on the economy. On the other hand, the additional infrastructure investments will also stimulate economic activity, reduce future energy expenditures and also provide an array of other non-energy benefits. In this paper, we propose a “thought experiment” that explores the idea of prospective positive net economic impacts of decarbonization strategies for an energy producing nation. Our results suggest that the positive productivity benefits of decarbonization strategies can overcome negative costs in both the short- and long-terms. We also note additional effects that are consistent with officially announced long-term goals of modernization and reducing the Russian economy's dependence on revenues from energy and raw-material exports.

Compensation of Electricity Intensive Industrials for Indirect CO₂ Costs: Modelling the Evolution of the CO₂ Emission in Central West Europe

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The compensation of indirect CO₂ costs induced by electricity price increases for electricity intensive users in Europe involves estimating an emission, which corresponds to pass-through rate of carbon cost to electricity price. As the electricity mix in Europe decarbonises with the

retirement of some thermal plants and growth of renewables, this emission factor is expected to decrease and so will the level of compensation for indirect CO₂ costs. We use a European power market dispatch model to simulate the evolution of the emission factor over the period of 2019-2025 in a base case scenario that is representative of future dynamics of Central-West European (CWE) power and carbon markets. Our forecast suggests that the emission factor the CWE region shows a decrease from 0.63t/MWh in 2019 to 0.50t/MWh in 2025 because of the changes in the generation mix. We conduct four sensitivity analysis to the key parameters including variation of demand, nuclear availability and nuclear capacity in order to account for uncertainties and find that the emission factor remains in the range 0.48-0.52t/MWh for 2025 validating the robustness of the base case results.

Session F2: Energy Prices: Modeling and Forecasting

Navigating the Oil Bubble: A Non-Linear Heterogeneous-Agent Dynamic Model of Futures Oil Pricing

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We analyze short-term futures oil pricing over the 2003-2016 time-period in order to analyze the bubble-like dynamics, which characterizes the 2007-2009 years according to a large body of recent literature. Our investigation, based on a flexible three-agent model (hedgers, fundamentalist speculators and chartists), confirms the presence of a bubble price pattern, which we attribute to the strong destabilizing behaviour of fundamentalist speculators (e.g. hedge funds). The inclusion of the 2009-2016 sub-period, in spite of sharp and unexpected fluctuations in oil prices and a significant increase in the influence of geopolitical factors, fails to invalidate our financial interpretation.

Lithium Industry on the Behaviour of U.S. Crude Oil Prices

Manuel Monge, *Francisco de Vitoria University, Spain*

Is lithium really becoming a substitute of oil? Lithium has an increasingly strategic role as clean technologies emerge. The most important use of lithium is in rechargeable lithium-ion batteries for electric vehicles and hundreds of electronic devices. This paper contributes to the literature, studying the dynamics of lithium industry and West Texas Intermediate (WTI) crude oil prices in time-frequency domain. I use methodology based on Continuous Wavelet Transform (CWT) and the results indicate that both time series are highly related in the longterm, where WTI crude oil prices dependence on lithium industry increased, starting early 2014 and reaching the high levels of dependence in the year 2015.

Oil Price Volatility Forecasts: Evidence from Objective-based Evaluation Functions

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Contrary to the current practice that mainly considers stand-alone statistical loss functions, the aim of the paper is to assess oil price volatility forecasts based on objective-based evaluations functions, given that different forecasting models may exhibit superior performance at different applications. To do so, we forecast implied and several intraday volatilities and we evaluate them based on economic decisions for which these forecasts are used. In this study we confine our interest on the use of such forecasts from financial investors. More specifically, we consider four well established trading strategies, which are based on volatility forecasts, namely (i) trading the implied volatility based on the implied volatility forecasts, (ii) trading implied volatility based on intraday volatility forecasts, (iii) trading straddles in the United States Oil FundETF and finally (iv) trading the United States Oil FundETF based on implied and intraday volatility forecasts. We evaluate the after-cost profitability of each forecasting model for 1-day up to 66-days ahead. Our results convincingly show that our forecasting framework is economically useful, since different models provide superior after-cost profits depending on the economic use of the volatility forecasts. Should investors base their choice of the forecasting models given the information extracted from the statistical loss functions, then their choice would lead to a sub-optimal position. Thus, we maintain that volatility forecasts should be evaluated based on their economic use, rather than statistical loss functions. Several robustness tests confirm these findings.

Session F3: Commodity Finance

How the Financial Market Can Dampen the Effects of Commodity Price Shocks

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Commodities have begun to function as an asset class during the past decade, as trading in commodity derivatives has increased massively since the mid-2000s. This paper studies the role of commodities as an asset class in accounting for the recently lessened impacts of commodity price shocks on the economy, by constructing a model with a financial accelerator and with financial intermediaries that own two assets - tied to commodities as well as to capital. Simulation results of the model show that financial intermediaries' holdings of commodities as assets have contributed to the recent reduction in the effects of commodity price shocks.

Investigation of the Link between Renewables Energy and Oil Markets

Gaye Del Lo, *University of Lorraine, France*

This paper examines the link between oil and renewable energy markets. For this, we identify on the one hand, high and low oil volatility state using regime switching EGARCH (1,1) model and analyze their effects on renewable energy market. On the other hand, we develop a methodology in order to identify oil positive and negative shocks and investigate their implications in renewable energy market. We show that: 1) state shifts are clearly present in oil and renewable energy data. 2) The volatility linkages among oil and renewable energy markets are regime-dependent. In fact, the volatility linkage is positive and significant in the high-volatility state and not significant in the low-volatility state. 3) The results reveal that renewable energy market reacts positively to oil prices extreme upward movement and negatively to oil prices extreme downward movement. These results have several implications in terms of policies, portfolio optimization and risk management.

A Dynamic Conditional Regime-Switching GARCH CAPM for Energy and Financial Markets

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This paper develops a methodology for estimating a conditional CAPM with time-varying betas and regime changes in conditional variance dynamics. Our research goal is related to documenting the strength of the market factor alone in the financial and commodity markets. Among stocks, there are significant time variations in betas across our models and regimes. This empirical feature is even more pronounced among prominent stocks such as the USA, the UK, Germany, France, China, and Malaysia. Among commodities, we find significant variations in betas, but the direction of the relation with market returns for crude oil, gold, copper, tin, rubber, aluminum and platinum is the same across two of our models. This result also holds for aggregate markets where most variations are found in the MS-GARCH model. Secondly, the mean filtered volatility results from the regime switching GARCH-CAPM shows that the most volatile stock (Turkey) is more than twice and thrice respectively, more volatile than the most volatile commodity (Rhodium) and aggregate market (World). Lastly, we demonstrate that the regime switching model delivers better estimates of one-day-ahead Value-at-Risk and that Expected Shortfall is highest for China but least for Latvia.

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	H	
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	K	
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	L	
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	M	
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Manuel	Monge	<i>Francisco de Vitoria University, Spain</i>
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Thi Hoai An	Nguyen	<i>Paris 8 University, France</i>
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	O	
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	P	
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Dinh Tri	Vo	<i>IPAG Business School, France & University of Economics HCMC, Vietnam</i>
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	W	
Cees	Withagen	<i>IPAG Business School, France & Vrije Universiteit Amsterdam, Netherlands</i>
Christoph	Wegener	<i>IPAG Business School, France & Leuphana University, Germany</i>
	Z	
Akil	Zaimi	<i>Independent Petroleum Economist</i>

LIST OF PARTICIPANTS BY COUNTRY

	Australia	3
	Brazil	1
	Canada	2
	Czech Republic	1
	France	27
	Germany	9
	Greece	1
	Ireland	1
	Italy	1
	Lebanon	2
	Netherlands	4
	Nigeria	1
	Saudi Arabia	1
	Singapore	1
	South Korea	1
	Spain	4
	Switzerland	1
	Tunisia	1
	Turkey	2
	United Kingdom	7
	United States	16
	Vietnam	2

ACKNOWLEDGEMENTS

Dear Participants,

I would like to welcome you to the International Symposium on Environment and Energy Finance Issues (ISEFI–2019).

The Symposium includes this year 23 sessions and 71 presentations. I believe that it will provide a forum for rich discussion on a variety of topical issues relating to recent developments in, among other topics, environment, low-carbon transformation policies, climate change, energy finance.

Special thanks go to the members of the Scientific Committee for selecting the presentations that have been included in the program and to all participants for contributing to the success of this event.

I hope to see you again in our upcoming events: 10th IRMBAM (July 2019), 7th PFMC (December 2019), 8th ISEFI (May 2020).

Frédéric Teulon
Executive Head of Research
IPAG Business School

ISEFI-RELATED BUSINESS FORUM

In conjunction with the 7th International Symposium on Environment and Energy Finance Issues, a business- and policy-driven forum on the cutting-edge theme of “*Energy Transition, New Economic Models, and New Financing Channels*”. The Forum features, among the others, high-profile policymakers, main industrial groups, municipalities, professional investors and top-notch researchers to shape the future of energy transition.

WWW.ISEFI-SYMPOSIUM.ORG



The poster features a blue button in the top right corner with the text "S'inscrire". The main title "ISEFI 2019" is prominently displayed in large grey letters, with "7th International Symposium on Environment & Energy Finance Issues" below it. The event details "Paris - 02 juillet 2019" and "Salle Beffroi de Montrouge" are listed, along with "Métro ligne 4". The organizing institution "Ipag Business School" is noted in the bottom right corner. The background shows a stylized sun logo and a mountain landscape under a cloudy sky.

The registered participants of the ISEFI2019 Symposium are cordially invited to attend the Forum. A free participation pass is granted upon request to isefi@sciencesconf.org.

Date: 02 July 2019

Time: 09 :00am – 06 :00pm

Venue: Beffroi de Montrouge, Avenue de la République, 92120 Montrouge, France



UPCOMING CONFERENCES

PFMC 2019 - Call for papers

9th Paris financial Management Conference (PFMC)

<https://pfmc2019.sciencesconf.org>

The conference will take place at IPAG Business School, 184 boulevard Saint Germain, 75006 Paris (December 16-18, 2019).

Deadline for the submissions: July 31, 2019

Keynote Speakers:

- Renée B Adams, *Professor of Finance, Saïd Business School, University of Oxford*
- Gustavo Manso, *Professor of Finance, Haas School of Business, University of California at Berkeley*

ISEFI 2020 - Call for papers

The call for paper will be launched in September 2019.

8th International Symposium on Environment and Energy Finance Issues (ISEFI)

<https://isefi.sciencesconf.org/>

The conference will take place in May 28-29, 2020.

Deadline for the submissions: March 6, 2020

IRMBAM 2020 - Call for papers

<https://ipag-irm.sciencesconf.org/>

The 11th International Research Meeting on Business and Management (IRMBAM) will take place in Nice at IPAG Business School, 4 boulevard Carabacel (July 6-8, 2020).

The IRMBAM meeting includes a Subconference in Environmental Economics.

Deadline for the submissions: April 5, 2020

PRACTICAL INFORMATION

Registration and information desk

The registration and information desk is open throughout the entire Conference.

Badges

The name badge given to you when you registered ensures your admission to the Conference. Please make sure you wear it all times. It is important to wear your name badge also at the lunch and at the social events.

Wi-Fi connection

Wi-Fi connection is available at the symposium from May 23 morning to May 24 until the closing.

Program changes

General announcements, changes and updates to the program will be displayed at the registration desk.

Lunch breaks

Café Louise, 155 Boulevard Saint-Germain, 75006 Paris

Useful contacts

Conference's desk: Tri Vo (tri.vo@ipag.fr, +33 6 3364 7104).

Taxis

Taxis bleus:	36.09.
Taxis G7:	01.47.39.47.39.
Alpha taxis:	01.45.85.85.85.

Instructions for presentations

The duration of sessions is 90 minutes with 3 papers allocated per session (except for a few sessions of 4 papers), allowing 15-20 minutes presentation time and 10 minutes for discussion. All sessions are supported by data projector facilities, and upon your arrival, you can upload your presentation using a USB flash memory.

Session chairs make sure that the time available is divided equally over the papers to be presented.

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70 researchers in economics, finance and
management

3 500 students

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- Economics
- Finance

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