

3rd International Symposium on Energy and Finance Issues (ISEFI-2015) March 20, 2015



3rd International Symposium on Energy and Finance Issues (ISEFI-2015)

*co-organized by IPAG Business School and CGEMP, University of
Paris Dauphine*

08:30am-6:30pm | March 20, 2015

IPAG Business School
184, Boulevard Saint-Germain, 75006 Paris

CONFERENCE SCOPE

The energy landscape has recently changed. Many European countries release new rules for the energy transition towards a less carbon-intensive production mix, while environmental markets are being reformed. Energy consumption in Asia is forecasted to have a rapid growth, thus attracting commercial transactions and investment waves. The United States exploits unconventional gas and oil to overcome their supply dependency, which instead is still at stake in Europe. In terms of energy supply security, the Ukrainian crisis has shown that energy efficiency and increased deployment of renewables have been so far insufficient to eliminate Europe's reliance on Russian gas supply. These phenomena altogether contribute to making more volatile energy prices, with sudden jumps in their levels. The debate about the financialization of energy commodities revamps both in the United States and in Europe. In countries where markets are not developed yet, like Africa, energy, water and raw materials remain at the hearth of several conflicts.

The emergence of these new aspects in energy markets requires new and more complex modeling approaches. The 2015 International Symposium on Energy and Finance Issues (ISEFI-2015), jointly organized by the IPAG Energy Economics Center ([IPAG Business School](#)) and the [Centre of Geopolitics of Energy and Raw Materials](#) (Paris Dauphine University), will shed lights on these issues, by bringing together researchers in economics, finance and econometrics.

KEYNOTE SPEAKERS

Prof. Lutz Kilian, *University of Michigan, United States*

Lutz Kilian, Professor of Economics, received his Ph.D. in Economics from the University of Pennsylvania in 1996 and his M.A. in Development Banking from The American University in 1988. He joined the faculty at Michigan in 1996. Prior to his Ph.D., he worked for the research department of the Inter-American Development Bank in Washington, DC. During 2001-03 he served as an adviser to the European Central Bank in Frankfurt/M., Germany. Professor Kilian has been a research visitor at the Federal Reserve Board, the European Central Bank, and the International Monetary Fund. He has also been a consultant for the International Monetary Fund, the Inter-American Development Bank, the World Trade Organization, the European Central Bank, the Bank of Canada, and the European Parliament, among others. Professor Kilian has published over 70 articles. Professor Kilian has been an Associate Editor of the *Journal of Business and Economic Statistics*, the *Journal of Development Economics*, and the *Journal of Economic Dynamics and Control*, among other journals. He is a research fellow of the Centre for Economic Policy Analysis, the Center for Financial Studies, and the Euro Area Business Cycle Network.

Prof. Matteo Manera, *University of Milano-Bicocca & FEEM, Italy*

Matteo Manera is a Professor of Econometrics at DEMS - Department of Economics, Management and Statistics, University of Milano-Bicocca, Italy. He is also senior research fellow at the Fondazione Eni Enrico Mattei (FEEM), Milano, Italy, where he has coordinated the research programme on International Energy Markets and he is currently leading the research projects on Financial Speculation in the Oil Markets and on Modelling and Forecasting the Price of Oil.

His research interests include: time series analysis; financial econometrics; energy econometrics; international markets for oil, gas and electricity; environmental Kuznets curves;

model selection (non-nested tests); analysis of dynamic factor demands; panel data models; models for qualitative and limited dependent variables. His current research activity is focussed on the econometric analysis of the impact of financial speculation on the energy futures markets.

He has published his work in several international journals, such as: *Applied Financial Economics*, *Bulletin of Economic Research*, *Economic Modelling*, *Empirica*, *Empirical Economics*, *Energy Economics*, *The Energy Journal*, *Energy Policy*, *Environmental Modelling and Software*, *Environmental and Resource Economics*, *Financial Research Letters*, *Journal of Economic Surveys*, *Journal of Futures Markets*, *Journal of Productivity Analysis*, *Resource and Energy Economics*.

CONFERENCE CO-CHAIRS & ORGANIZERS

Anna Creti, *University of Paris Dauphine & Ecole Polytechnique*
Marc Joëts, *IPAG Business School & University of Paris West Nanterre la Défense*
Duc Khuong Nguyen, *IPAG Business School*

SCIENTIFIC COMMITTEE

René Aid, *FIME-University of Paris Dauphine & EDF, France*
Derek Bunn, *London Business School, UK*
Julien Chevallier, *University of Paris 8, France*
Anna Creti, *University of Paris Dauphine and Ecole Polytechnique, France*
Lorna Greening, *Colorado School of Mines, USA*
Shawkat Hammoudeh, *Drexel University, USA*
Fatih Karanfil, *University of Paris West Nanterre la Défense, France*
Matteo Manera, *University of Milano-Bicocca, Italy*
Duc Khuong Nguyen, *IPAG Business School, France*
Luca Taschini, *London School of Economics, UK*
Benoît Sévi, *University Grenoble Alpes - Grenoble II, France*

PUBLICATION OPPORTUNITY

A selection of high-quality papers submitted to the ISEFI-2015 Symposium will be published in a Special Issue of **Energy Economics** under the Guest-Editorship of Anna Creti, Marc Joëts, Lutz Kilian, and Matteo Manera.



All papers must conform to the journal's content scope and will be processed through the journal's standard editorial review procedures. The theme of this Special Issue is “*Energy, Commodities and Geopolitics: Modeling Issues*”.

CONFERENCE VENUE AND PRACTICAL INFORMATION

IPAG Business School

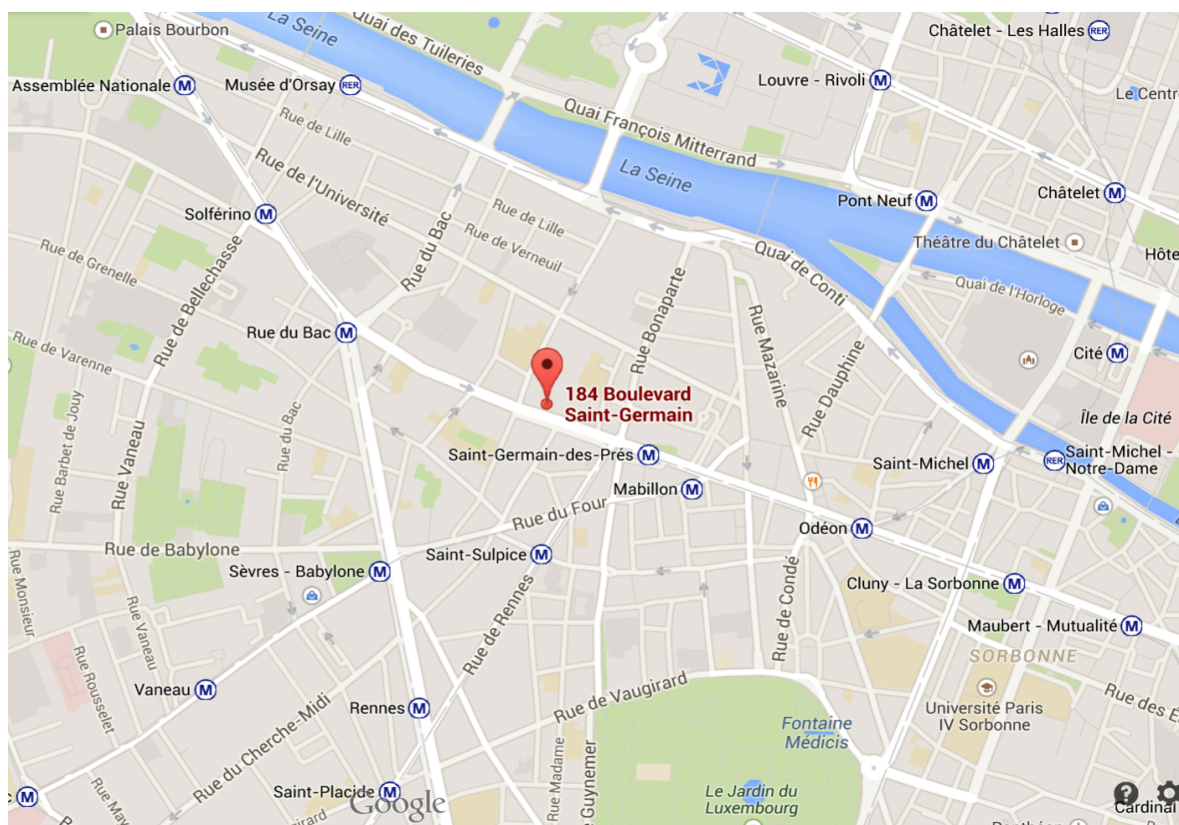
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Program at a Glance

08:30am – 08:50am	Registration & Continental Breakfast	Amphitheatre
08:50am – 09:00am	Opening and Welcome Note By Anna Creti (<i>Université Paris Dauphine-LEDA CGEMP and Ecole Polytechnique</i>), Marc Joëts (<i>IPAG Business School & University of Paris West</i>), and Duc Khuong Nguyen (<i>IPAG Business School</i>)	Amphitheatre
09:00am – 10:00am	Keynote Lecture I By Professor Lutz Kilian , <i>University of Michigan, USA</i>	Amphitheatre
10:00am – 10:30am	Coffee Break	Amphitheatre
10:30am – 12:00am	Parallel Session A Session A1 Session A2 Session A3	Amphitheatre Room 1 Room 2
12:00am – 01:45pm	Lunch Break	Restaurant
01:45pm – 02:45pm	Keynote Lecture II By Professor Matteo Manera , <i>University of Milano-Bicocca & FEEM, Italy</i>	Amphitheatre
02:45am – 03:00pm	Coffee Break	Amphitheatre
03:00pm – 04:30pm	Parallel Session B Session B1 Session B2 Session B3	Amphitheatre Room 1 Room 2
04:30pm – 04:45pm	Coffee Break	Amphitheatre
04:45pm – 06:15pm	Parallel Session C Session C1 Session C2	Room 1 Room 2
06:15pm – 06:20pm	Concluding Remarks	Amphitheatre

Detailed Program

08:30am – 08:50am Registration and Continental Breakfast

08:50am – 09:00am Opening and Welcome Note

09:00am – 10:00am	Keynote Lecture I “Understanding the decline in the price of oil since June 2014” Professor Lutz Kilian, <i>University of Michigan, USA</i>	Amphitheatre
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10:00am – 10:30am Coffee Break

10:30am – 12:00am Parallel Sessions A

10:30am – 12:00am	Session A1: Speculation and Energy Prices Chair: Benoît Sévi , <i>University Grenoble Alpes - Grenoble II & IPAG Business School, France</i>	Amphitheatre
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10:30am – 11:00am **Fundamentals, derivatives market information and oil price volatility**
 Michel Robe, *American University, USA*
 Jonathan Wallen, *American University, USA*

11:00am – 11:30am **Information flows across the futures term structure: Evidence from crude oil prices**
 Delphine Lautier, *University Paris Dauphine, France*
 Franck Raynaud, *Ecole Polytechnique Federale de Lausanne, Switzerland*
 Michel Robe, *American University, USA*

11:30am – 12:00am **Do hedgers speculate? Evidence from energy futures markets using mixed-frequency data**
 Yannick Le Pen, *University Paris Dauphine, France*
[Benoît Sévi](#), *University Grenoble Alpes - Grenoble II & IPAG Business School, France*
 Marie Bessec, *University Paris Dauphine, France*

10:30am – 12:00am	Session A2: Geopolitics of Energy Security I Chair: Benjamin Sovacool , <i>Aarhus University, Denmark</i>	Room 1
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10:30am – 11:00am **Do sovereign wealth funds help oil-producing countries to smooth the pass through of oil shocks to their exchange rates?**
[Dramane Coulibaly](#), *University of Paris West, France*
 Helene Raymond, *University of Paris West, France*
 Luc-Désiré Omgba, *University of Paris West, France*

11:00am – 11:30am **Security of European gas supply: Disruption scenarios from main suppliers**
[Sergio Giaccaria](#), *Institute for Energy and Transport, The Netherlands*
 Tilemahos Efthimiadis, *Institute for Energy and Transport, The Netherlands*
 Teodora Diana Corsatea, *Institute for Energy and Transport, The Netherlands*
 Ricardo Bolado-Lavin, *Institute for Energy and Transport, The Netherlands*

11:30am – 12:00am **Energy security in the BRICS economies from 1990 to 2010: A quantitative assessment of trends and recommendations**

10:30am – 12:00am	Session A3: Econometric Analysis of Energy Markets I	Room 2
	Chair: <u>Frédéric Lantz</u> , <i>IFP-School, France</i>	
10:30am – 11:00am	Revisiting current accounts and oil price fluctuations nexus: application for Canada <u>Blaise Gnimassoun</u> , <i>University of Paris West, France</i> <u>Marc Joëts</u> , <i>IPAG Business School & University of Paris West, France</i> <u>Tovonony Razafindrabe</u> , <i>University of Paris West, France</i>	
11:00am – 11:30am	The seven sisters versus OPEC: The mystery of the petroleum market structure <u>Jose Noguera</u> , <i>University of Santiago de Chile, Chile</i>	
11:30am – 12:00am	Analysis of the volatility's transmission on the oil markets <u>Frédéric Lantz</u> , <i>IFP-School, France</i> <u>Jereon Rombouts</u> , <i>ESSEC Business School, France</i> <u>Jean-Pierre Indjehagopian</u> , <i>ESSEC Business School, France</i>	
12:00am – 01:45pm	Lunch Break	
01:45pm – 02:45pm	Keynote Lecture II “How does Stock Market Volatility React to Oil Shocks” <u>Professor Matteo Manera</u> , <i>University of Milano-Bicocca & FEEM, Italy</i>	Amphitheatre
02:45am – 03:00pm	Coffee Break	
03:00pm – 04:30pm	Parallel Sessions B	
03:00pm – 04:30pm	Session B1: Derivative Pricing in Energy Markets	Amphitheatre
	Chair: <u>Delphine Lautier</u> , <i>University Paris Dauphine, France</i>	
03:00pm – 03:20pm	Static mitigation of volumetric risk <u>Rachid Id Brik</u> , <i>ESSEC Business School, France</i> <u>Andrea Roncoroni</u> , <i>ESSEC Business School, France</i>	
03:20pm – 03:40pm	Analyzing and forecasting the unbalancing sign in the Italian electricity market <u>Francesco Lisi</u> , <i>University of Padova, Italy</i> <u>Enrico Edoli</u> , <i>Phinergy Srls, Padova, Italy</i>	
03:40pm – 04:00pm	The dynamics of risk premiums in Australian electricity futures markets <u>Stefan Trueck</u> , <i>Macquarie University, Australia</i> <u>Rangga Handika</u> , <i>Universitas Indonesia, Indonesia</i>	

04:00pm – 04:20pm	Volatility in electricity derivative markets: the Samuelson hypothesis revisited Delphine Lautier, <i>University Paris Dauphine, France</i> Edouard Jaeck, <i>University Paris Dauphine, France</i>
03:00pm – 04:30pm	Session B2: Finance and Investment in Renewable Energy Room 1 Chair: Anna Creti , <i>Université Paris Dauphine-LEDA CGEMP and Ecole Polytechnique, France</i>
03:00pm – 03:20pm	Impacts of subsidized renewable electricity generation on spot market prices in Germany: Evidence from a GARCH model with panel data Thao Pham , <i>CGEMP, Université Paris Dauphine, France</i> Killian Lemoine, <i>Développement, Institutions et Mondialisation, France</i>
03:20pm – 03:40pm	Investment prospects of renewable and non-renewable power generation in China Yuanjing Li , <i>IPAG Business School & Université Paris Dauphine, France</i> Yusuf Guener, <i>Nürtingen-Geislingen University, Germany</i>
03:40pm – 04:00pm	Defining the abatement cost in presence of learning-by-doing: application to the fuel cell electric vehicle Anna Creti, <i>Université Paris Dauphine-LEDA CGEMP & Ecole Polytechnique, France</i> Alena Kotelnikova, <i>Ecole polytechnique, France</i> Guy Meunier, <i>Ecole Polytechnique & INRA, France</i> Jean-Pierre Ponssard, <i>Ecole Polytechnique & CNRS, France</i>
04:00pm – 04:20pm	External effects of shale gas hydrofracking: Risk and welfare considerations for water supply in Germany Sebastian Loucao, <i>Aachen University, Germany</i> Reinhard Madlener, <i>Aachen University, Germany</i>
03:00pm – 04:30pm	Session B3: Geopolitics of Energy Security II Room 2 Chair: Jean-François Carpentier , <i>University of Luxembourg, Luxembourg</i>
03:00pm – 03:30pm	Would climate policy improve the European energy security? Stéphanie Monjon , <i>University Paris Dauphine, France</i> Céline Guivarch, <i>University Paris Dauphine, France</i>
03:30pm – 04:00pm	Politics matters: Political events as catalysts for price formation under cap-and-trade Nicolas Koch , <i>Mercator Research Institute on Global Commons and Climate Change (MCC), Germany</i> Ottmar Edenhofer, <i>PIK & MCC & Technische Universität Berlin, Germany</i> Sabine Fuss, <i>MCC, Germany & ILASA, Austria</i> Godefroy Grosjean, <i>PIK, Germany & ILASA, Austria</i>
04:00pm – 04:30pm	Emergence of sovereign wealth funds Jean-François Carpentier , <i>University of Luxembourg, Luxembourg</i> Wessel Vermeulen, <i>Oxford University, UK</i>

04:30pm – 04:45pm Coffee Break

04:45pm – 06:15pm Session C1: Econometric Analysis of Energy Markets II Room 1

Chair: Aleksandar Zaklan, *DIW Berlin, Germany*

04:45pm – 05:15pm The long-run oil-natural gas price relationship and the shale gas revolution

Massimiliano Caporin, *University of Padua, Italy*

Fulvio Fontini, *University of Padua, Italy*

05:15pm – 05:45pm A structural and stochastic optimal model for the projection of LNG imports and exports in the Asia-Pacific region

Tom Kompas, *Australian National University, Australia*

Nhu Che, *Australian National University, Australia*

05:45pm – 06:15pm Stationarity changes in long-run energy commodity prices

Aleksandar Zaklan, *DIW Berlin, Germany*

Jan Abrell, *ETH Zurich, Switzerland*

Anne Neumann, *Universität Potsdam & DIW Berlin, Germany*

04:45pm – 06:15pm Session C2: Oil Markets Pricing Room 2

Chair: Deepa Datta, *Federal Reserve Board of Governors, Washington, USA*

04:45pm – 05:15pm On the efficiency of the CME-NYMEX oil option market: Evidence from a fractional cointegration analysis

Benoît Sévi, *University Grenoble Alpes - Grenoble II & IPAG Business School, France*

Gilles de Truchis, *GREQAM, France*

05:15pm – 05:45pm Institutions and natural resources effects in a multiple growth regime

Yacine Belarbi, *CREAD, Algeria*

05:45pm – 06:15pm Generating options-implied probability densities to understand oil market events

Deepa Datta, *Federal Reserve Board of Governors, Washington, USA*

Juan Londono, *Federal Reserve Board of Governors, Washington, USA*

Landon Ross, *Federal Reserve Board of Governors, Washington, USA*

06:15pm – 06:20pm Concluding Remarks (Amphitheatre)

Session A1

Fundamentals, derivatives market information and oil price volatility

Michel Robe, *American University, USA*

Jonathan Wallen, *American University, USA*

We investigate empirically what drives market expectations of crude oil price volatility. Between 2000 and 2014, we document a relationship between the term structure of option-implied volatilities (IVs) and global macroeconomic conditions, physical market fundamentals (OPEC surplus output capacity, oil storage) and economy-wide financial conditions (captured by the equity VIX). The VIX and the constraints affecting oil output or inventories have statistically and economically significant explanatory power for short-dated oil IVs and for the WTI IV term structure. Controlling for the VIX, macroeconomic variables and a measure of speculative activity based on public data are both insignificant. Our model outperforms an ARIMA model both in and out of sample. We discuss future work using proprietary data on individual trader positions.

Information flows across the futures term structure: Evidence from crude oil prices

Delphine Lautier, *University Paris Dauphine, France*

Franck Raynaud, *Ecole Polytechnique Federale de Lausanne, Switzerland*

Michel Robe, *American University, USA*

We apply the concepts of conditional entropy, information transfers and directed graphs to investigate empirically the propagation of price fluctuations across a futures term structure. We focus on price relationships for North American crude oil futures because this key market experienced several structural shocks between 2000 and 2014: financialization (starting in 2003), infrastructure limitations (in 2008-2011) and regulatory changes (in 2012-2014). We find large variations over time in the amount of information shared by contracts with different maturities. Although on average short-dated contracts (up to 6 months) emit more information than backdated ones, a dynamic analysis reveals that, after 2012, similar amounts of information flow backward as flow forward along the futures maturity curve. The mutual information share increased substantially starting in 2004 but fell back sharply in 2012-2014. In the crude oil space, our findings point to a possible re-segmentation of the futures market by maturity in 2012-2014. More broadly, they have implications for the Samuelson effect and raise questions about the causes of market segmentation.

Do hedgers speculate? Evidence from energy futures markets using mixed-frequency data

Yannick Le Pen, *University Paris Dauphine, France*

Benoît Sévi, *University Grenoble Alpes - Grenoble II, France*

Marie Bessec, *University Paris Dauphine, France*

In financial markets, it is common to distinguish between hedgers, who take positions in futures contracts to reduce their risk, and speculators, who engage in futures markets to benefit from a risk premium. The most standard view (Hull, 2015) commonly assumes that hedgers do not speculate, i.e. their positions are not influenced by market prices. The recent paper by Cheng and Xiong (2014) provides strong empirical evidence that hedgers indeed speculate in agricultural futures markets. Using CFTC data on positions by categories of traders, the authors show that 'non-commercial' traders (hedgers) indeed respond to price changes. Hedgers short more futures contracts in response to price increases and reduce their short position as the future price falls.

In this paper, we make use of mixed-data sampling (MIDAS) as developed in Ghysels et al. (2006, 2007) to use higher frequency variables (prices) as explanatory variables for lower frequency variables (positions of traders). Our empirical analysis investigate the response of 'commercial' and 'non-commercial' categories of traders to changes in futures prices for a set of energy commodities quoted on the NYMEX-CME.

Session A2

Do sovereign wealth funds help oil-producing countries to smooth the pass through of oil shocks to their exchange rates?

Dramane Coulibaly, *University of Paris West, France*

Helene Raymond, *University of Paris West, France*

Luc-Désiré Omgba, *Université of Paris West, France*

Managing their natural riches is a daunting challenge for many resource-countries, especially for developing ones, who can be particularly vulnerable to the so-called natural resource curse. Establishing a SWF to invest abroad a part of the oil rents could help some oil exporting countries to disconnect their real exchange rate from oil price shocks and preclude that its appreciation leads to a Dutch disease. There is however a dearth of empirical evidence on the efficiency of SWFs in this regard. This paper aims at contributing to fill in this gap. Our results concern that establishing a SWF helps to reduce the pass-through of oil price shocks to the real exchange rate and may therefore help to prevent a Dutch disease.

Security of European gas supply: Disruption scenarios from main suppliers

Sergio Giaccaria, *Institute for Energy and Transport, The Netherlands*

Tilemahos Efthimiadis, *Institute for Energy and Transport, The Netherlands*

Teodora Diana Corsatea, *Institute for Energy and Transport, The Netherlands*

Ricardo Bolado-Lavin, *Institute for Energy and Transport, The Netherlands*

This paper examines how the energy systems of the European Union countries would adapt to a prolonged disruption of gas supply. In particular, using a multi-regional energy system model, three scenarios are calculated where in each it is assumed that there is a one-year cut of gas supply from one of the major extra-European natural gas importers: the Former Soviet Union countries (FSU), northern Africa and Norway. We describe the changes in allocation of different energy sources through the entire energy system under scenarios of disruption of the trade relationship between Europe and its main gas suppliers. The analysis shows that in the northern Africa and Norway scenarios, an allocation that satisfies the entire energy demand exists, albeit at a high cost. This is achieved through increased imports of Russian gas and LNG and by substituting some natural gas with alternative fuels. However, in the case of a one-year disruption of FSU natural gas, natural gas prices will significantly increase and natural gas consumption will decrease for many EU countries.

Energy security in the BRICS economies from 1990 to 2010: A quantitative assessment of trends and recommendations

Benjamin Sovacool, *Aarhus University, Denmark*

Jingzheng Ren, *University of Southern Denmark*

The BRICS countries (Brazil, Russia, India, China, and South Africa) represent major emerging economies that are coming to play a more prominent role in global affairs and economic development. Given that energy use is often seen as facilitating their development, the concept of energy security has attracted substantial attention from the stakeholders of these countries. This study aims at analyzing the energy security trends of the BRICS countries from 1990 to 2010. In doing so, the article will describe the status of energy security in each state, identify their respective performance on key energy security indicators over a 20 year period, and propose some strategic measures for improvement. The study will split the period from 1990 to 2010 into four five-year sub-periods, and the trends of energy security will be determined by analyzing energy security in 1990, 1995, 2000, 2005, and 2010, respectively. The study will evaluate multiple metrics spread across four dimensions of energy security. These include *availability and security of supply* (Energy Import Dependence: Net imports/TPES), *affordability and distribution* (electrification rates; access to non-solid fuel), *energy and economic efficiency* (Energy per GDP: TPES/GDP; Energy per capita: TPES/population; Electricity consumption per capita), and *environmental stewardship* (CO₂/TPES; CO₂/capita; CO₂/GDP). Principal Component Analysis (PCA) will be employed to prioritize the energy security of each country in these five year periods. An entropy method with objective weighting will avoid subjective influential factors, determine the relative importance of these metrics on energy security, and identify the most critical factors. Then, the study will employ Interpretative Structuring Modeling (ISM) to help stakeholders enhance energy security by evaluating a series of strategic measures.

Session A3

Revisiting current accounts and oil price fluctuations nexus: application for Canada

Blaise Gnimassoun, *University of Paris West, France*

Marc Joëts, *IPAG Business School & University of Paris West, France*

Tovonony Razafindrabe, *University of Paris West, France*

This study revisits the important link between oil prices and current account for oil exporting countries by paying a particular attention to the time-varying nature of this link. To this end, we rely on an innovative methodology which is the time-varying parameter vector autoregressive (Tvp-VAR) model with sign restriction. We find that while an oil supply shock has a non-significant impact on the current account, an oil demand shock has a positive and significant impact which tends to increase over time. In addition, by studying the economic factors underlying the growing evolution of this relationship, we find that, although the propensity to import of oil revenues has a significant negative influence on the pass-through of oil demand shocks on the current account, deepening of the domestic financial market and accumulation of foreign exchange reserve have a significant positive effect.

The seven sisters versus OPEC: The mystery of the petroleum market structure

Jose Noguera, *University of Santiago de Chile, Chile*

This paper provides an explanation of the changing behavior of the crude oil market and tests it using U.S. data from January 1913 to September 2014. We claim that the crude oil market has experienced two important structural breaks in its industrial organization. The first occurred when Venezuela and the Arab crude oil exporting countries forced the so-called *Seven Sisters* to sign the fifty-fifty profit-sharing agreements. The second occurred after OPEC succeeded in cracking the secrets of the international crude oil marketing and in undertaking the wave of nationalizations of the 1970s.

Analysis of the volatility's transmission on the oil markets

Frédéric Lantz, *IFP-School, France*

Jereon Rombouts, *ESSEC Business School, France*

Jean-Pierre Indjehagopian, *ESSEC Business School, France*

This study examines the dynamic relationship between spot and futures prices in the crude oil markets (West Texas Intermediate), diesel oil and gasoline in the USA over the last decade with weekly figures. The objective is to analyze the equilibrium and the short-term dynamics between these prices to highlight the main drivers of the oil market. For this purpose, we use an econometric approach to estimate the long-term equilibriums and the error correction models. A GARCH model is estimated to analyze the changes of volatility. Finally, we test the causality between spot and future prices of crude oil and final product prices.

Session B1

Static mitigation of volumetric risk

Rachid Id Brik, *ESSEC Business School, France*

Andrea Roncoroni, *ESSEC Business School, France*

We consider the problem of designing a financial instrument aimed at mitigating the joint exposure to random price and volume delivery fluctuations of energy-linked commitments. We formulate a functional optimization problem over a set of regular pay-off functions: one is written on energy price, while the other is issued over any index exhibiting statistical correlation to volumetric load. On a theoretical ground, we derive closed-form expressions for both pay-off structures under suitable conditions about the statistical properties of the underlying variables; we pursue analytical computations in the context of a lognormal market model, and deliver explicit formulae for the optimal derivative instruments. On a practical ground, we first develop a comparative analysis of model output through simulation experiments; next, we perform an empirical study based on data quoted on EPEX SPOT power market. Our results suggest that combined price-volume hedging performance improves along with an increase of the correlation between load and index values. This outcome paves the way to a new class of effective strategies for managing volumetric risk upon extreme temperature waves.

Analyzing and forecasting the unbalancing sign in the Italian electricity market

Francesco Lisi, *University of Padova, Italy*

Enrico Edoli, *Phinergy Srls, Padova, Italy*

In this paper we analyze, for the Italian electricity market, the features and the dynamics of the unbalancing sign, defined as the sign of the algebraic sum of energy sold and bought by the national Transport and System Operator during the real time balancing of the electric network. The analyses give evidence that the probability to have a positive or negative signs depends on several factors and that there exist a serially dependence structure. We use this evidences to build models for the zonal sign dynamics and we use them for an out-of-sample forecasting exercise concerning the probability of positive unbalancing sign, π_t . The results show that the unbalancing sign is “predictable”, in the sense that it is different from a toss of coin, and that the level of accuracy depends on the load periods as well as on the rule that translates the π_t prediction into the sign prediction. Also, suitable models improve the prediction accuracy with respect to a naïf model that replicates the sign of “yesterday”.

The dynamics of risk premiums in Australian electricity futures markets

Stefan Trueck, *Macquarie University, Australia*

Rangga Handika, *Universitas Indonesia, Indonesia*

We investigate the dynamics of futures risk premiums in four regional Australian electricity markets (NSW, QLD, SA and VIC). We analyse realized risk premiums for quarterly futures contracts for different time intervals during the twelve months prior to the beginning of the delivery period of the contracts. Using data from 2005 to 2012, we find that futures premiums exhibit dynamics through time and tend to become more statistically significant as the contracts get closer to the beginning of the delivery period. The magnitude and significance of the premiums, however, vary across different regions, and also depend significantly on the contract quarter, i.e. whether the contract refers to the first, second, third or fourth quarter of the year. In a second step, we investigate the determinants of realized futures premiums and propose a model to effectively capture the dynamics of the premiums. We argue that time-to-delivery of contracts, spot price levels, volatility and variance of daily spot prices as well as the recent number of price spikes in the market are determinants for the dynamics of the observed premiums. For several of the markets and quarters, our model provides a reasonably high explanatory power. Overall, we find that futures premiums tend to be higher when contracts approach the beginning of the delivery period. Premiums also have a tendency to increase with spot price levels and with the frequency of price spikes observed in the spot market. Overall, our results illustrate the risk aversion of market participants and help to better understand the hedging behaviour and dynamics of risk premiums in Australian electricity markets.

Volatility in electricity derivative markets: the Samuelson hypothesis revisited

Delphine Lautier, *University Paris Dauphine, France*

Edouard Jaeck, *University Paris Dauphine, France*

It is common to assert, in the literature on commodity derivative markets, that the behavior of futures prices is characterized by the “Samuelson Hypothesis” (Samuelson (1965)), i.e. by the presence of a decreasing pattern of volatilities along the prices curve. Despite some debates about statistical measurements, this hypothesis has found a large empirical support. Yet, to the best of our knowledge, one of its empirical implications has never been proposed nor tested: if Samuelson is right, then prices shocks emerging in the physical market should propagate in the direction of the paper market. The first contribution of this paper is to fill this gap. Second contribution: up to now, the validation of the Samuelson hypothesis has never been considered in the case of electricity futures markets. Yet the non storability of this commodity raises interesting questions. Does this characteristic render electricity different from the other commodities, as far as the Samuelson hypothesis is concerned? More generally, what does this new commodity learn us about the role of inventories in the prices' volatilities? To answer these questions, we examine the prices behavior of the four most important electricity futures markets, worldwide, from 2008 to 2014: two European markets, the German one and the NordPool (the Nasdaq OMX commodities market, representative of Nordic countries), the Australian market and the PJM Western Hub in the USA. We use the American crude oil market as a benchmark for a storable commodity negotiated on a mature futures market. We find evidence of a maturity impact for all markets.

Session B2

Impacts of subsidized renewable electricity generation on spot market prices in Germany: Evidence from a GARCH model with panel data

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The growing intrusion of environmental-related policies in the electricity industry in Germany has induced a non-negligible cost. However, although it is very costly to develop renewable electricity production due to its unpredictability and intermittence, electricity generated from renewable reduces the price of electricity on the spot market, which is known as the "merit-order effect". It is crucial to determine the amplitude of this effect particularly in the context of increasing burden of renewable support policies borne by final consumers. This paper aims to quantify the price reduction effect created by wind and solar power generation on German electricity spot prices. Using hourly data for the period 2009-2012 in German electricity wholesale market for GARCH model under panel data framework, we find that wind/solar power generation injected into German electricity network during this period induces a decrease of electricity spot prices and a slight increase of their volatility. The model-based results suggest that the merit order effect created by renewable electricity ranges from 3.5 to 5 EUR /MWh which implies to the total annual volume of around 1.8 to 2.45 billion euros savings on the wholesale market.

Investment prospects of renewable and non-renewable power generation in China

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China is facing double pressure from security of sufficient energy supply and urgent mitigation of environmental damages resulted from its economic dependence on combustion of coal. This requires China, largely and timely, to develop renewable power generation and determine proper tariff policies. In this paper, we evaluate the effects of investment inducement on renewable and non-renewable technologies in China based on the current feed-in tariffs of wind and solar generation as well as the on-grid price of coal-fired generation. A NPV approach is applied to the investment evaluation of wind and solar power, whereas a real option analysis is explored to the project assessment of coal generation given the uncertainties on generation costs and expected revenues. As results, the conclusion on investment decisions on coal generation is ambiguous. The average needed number of full load hours to trigger investments on wind power is 1600 hours and the one of solar power is only 580 hours, which are largely below the actual loaded hours, meaning that the prevailing Chinese support policy for renewables is more than sufficient to encourage new investments on renewables. This conclusion is consistent with the observation of the Chinese renewable expansion.

Defining the abatement cost in presence of learning-by-doing: Application to the fuel cell electric vehicle

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The transition of a sector from a pollutant state to a clean one is studied. A green technology, subject to learning-by-doing, progressively replaces an old one. The notion of abatement cost in this dynamic context is studied. The theoretical (dynamic optimization) perspective is linked to a simpler practical one. The practical deployment perspective allows to study sub-optimal deployment trajectory, and the analyze of the launching date provide a definition of a dynamic abatement cost easy to use for evaluation of real-world policy options. The case of FCEV illustrates the merit of the toolkit.

External effects of shale gas hydrofracking: Risk and welfare considerations for water supply in Germany

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In this paper we investigate the externalities related to hydraulic fracturing ('fracking') in Germany, based on a detailed analysis of hydrofracking risks and potentials, and a stylized social welfare analysis related to adverse impacts of unconventional gas production on both surface- and groundwater resources and (drinking) water supply. Natural gas is extracted by a profit-maximizing monopolist. Society has to face several kinds of negative externalities, including additional water purification costs. The results of our sensitivity analysis show that the maximized welfare is in any case higher than the welfare resulting from the profit-maximizing quantities as it is predicted by our model. Also, the regulator always has to pay a subsidy to maximize welfare, which shows that the monopolist has an incentive to exercise his market power in order to keep the prices up for profit maximization. The monopolist's profits are always non-negative, whereas the welfare-maximizing quantities generally reduce his profits. As profits do not drop below zero, however, there is no need to employ a second-best approach. We conclude that increasing costs and/or an increasing price sensitivity lead to both reduced profits and reduced social welfare, while an increasing prohibitive price increases profits and social welfare.

Session B3

Would climate policy improve the European energy security?

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Energy security improvement is often presented as a co-benefit of climate policies. This paper evaluates this claim. It presents a methodology to investigate whether climate policy would improve energy security, while accounting for the difficulties entailed by the many-faceted nature of the concept and the large uncertainties on the determinants of future energy systems. A four-dimension analysis grid is used to capture the energy security concept, and a database of scenarios allows us to explore the uncertainty space. The results, focusing on Europe, reveal there is no unequivocal effect of climate policy on all the dimensions of energy security. Moreover, time matters: the effect of climate policy depends on the time horizon considered. Lastly, these results are robust to uncertainties on drivers of economic growth and the potentials and costs of end-uses technologies, but are sensitive to fossil fuels availability, low carbon technologies in the energy sector and improvements in energy efficiency.

Politics matters: Political events as catalysts for price formation under cap-and-trade

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This paper investigates how and to what extent allowance prices respond to regulatory news in the world's largest cap-and-trade system – the EU ETS. Capitalizing on an event study method that incorporates a highly flexible econometric technique, we isolate and quantify the news-implied price response to 28 hand-collected announcements about the time profile of EU ETS supply schedules that took place between 2008 and 2014. The induced price reaction gives an instantaneous feedback on how market participants view the evolution of cap stringency in the light of a particular policy announcement. Our findings suggest a high responsiveness of the cap-and-trade market to political events. We provide strong evidence that the backloading decision process caused substantial price declines. The event-induced negative drifts evolve gradually as market participant's faith in the political support for backloading is shaken in the light of severe decisional bottlenecks in the lengthy legislative process. In addition, we document positive price reactions to the announcement of the 2020 and 2030 policy packages, while news related to the 2050 roadmap either did not affect allowance prices or induced negative price drifts. These results point to an underappreciated feature of cap-and-trade programs: with temporarily non-binding periodic cap, market perceptions will dominate price formation. If a relaxation of cap schedules in the future is expected, the current allowance price drops significantly, irrespective of whether the contemplated change actually happens. In sharp contrast, with a tax instrument such an instantaneous price feedback from policy debates will not occur.

Emergence of sovereign wealth funds

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This paper tests the theoretical founded hypothesis that the surge of SWF establishments is determined by three main factors: 1) the existence of natural resources profits, 2) the government structure and 3) the ability to invest profitably in the domestic economy. We test this hypothesis on a sample of 21 SWFs that were all established in the period 1998- 2008 by comparing them to the countries that did not setup a fund in the same period. We find evidence for all three factors. The results suggest that SWFs tend to be established in countries that run an autocratic regime and has difficulties finding suitable opportunities for domestic investments. We do not find the net foreign asset position of a country to be similarly related to the explanatory variables, indicating that the establishment of a SWF is distinct from a national accounting result. Since our model, based largely on economic criteria, predicts well the establishment of SWF, concerns over their investment behaviour appear overblown.

Session C1

The long-run oil-natural gas price relationship and the shale gas revolution

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The gas extraction technological developments of the 2000s have allowed shale gas production, which in the US has become a significant part of the total gas production. Such a significant change might have affected the long-run relationship between oil and natural gas prices postulated by several authors. By using monthly data of oil and gas prices, as well as gas quantities from 1997 to 2013, we test for the presence of a long-run relationship, allowing also for possible breaks. We first show the stationarity of gas quantity data before the production of shale gas and the existence of a break in the trend (and in the intercept) on the integrated gas price time series, by the time shale gas enters the market. Then, applying a Vector Error Correction Model, we show that shale gas production has affected the relationship across variables. Gas quantities become relevant in the formation of gas prices after the beginning of shale gas production, while impact of oil prices on the gas ones doubles. However, on the basis of the available data, it is not unequivocally possible to assess whether or not a new long-run relationship between oil and gas has been established.

A structural and stochastic optimal model for the projection of LNG imports and exports in the Asia-Pacific region

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The Asia-Pacific region is the biggest and fastest growing liquefied natural gas (LNG) market in the world. It differs considerably from other international gas markets in terms of supply, demand, pricing and contracting mechanisms. At present, the market is undergoing radical change, in particular, changes in the sources of supply and LNG contracts and pricing. Recent rapid growth in shale gas in North America and newly commencing LNG projects in Australia have fundamentally changed future LNG supply patterns. With this, the recent falling trend of LNG prices resulting from the oil price slump has impacted on LNG trade and raises significant challenges for existing price-contracting mechanisms and the economic feasibility of potential LNG projects. This paper develops an Asia-Pacific Gas Model (APGM), based on a structural, non-linear, stochastic and optimising framework, and thus provides a valuable tool for the projection of LNG trade in the Asia-Pacific region. The model projects that Asia-Pacific LNG imports are expected to increase from 197.7 million tons (Mt) in 2015 to 275.8 in 2020 and 362.2 Mt in 2030. Total LNG trade value is projected to increase from US\$95.4 billion in 2015 to US\$167.0 billion in 2020 and US\$254.0 billion in 2030. Future LNG trade expansion is largely driven by emerging and large importers (i.e., China and India), and serviced, most importantly, by new supplies from Australia and the USA. Model results indicate that new LNG supplies from Australia and the USA are projected to increase substantially, expanding their contribution to total Asia-Pacific LNG supply from 14 per cent, at present, to more than 50 per cent in 2019. The share of emerging LNG consumers in total LNG imports is projected to increase rapidly from 20 per cent, at present, to more than 50 per cent in 2030. The LNG import values for China and India alone will rise from US\$28.3 and US\$15.9 billion in 2020 to US\$66.5 and US\$44 billion in 2030.

Stationarity changes in long-run energy commodity prices

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This paper considers the question of whether changes in persistence have occurred during the long-run evolution of U.S. prices of the non-renewable energy resources crude oil, natural gas and bituminous coal. Allowing for structural breaks when testing for breaks in persistence, we disentangle the effect of a deterministic break from that of a stochastic break and advance the existing literature on persistence properties of non-renewable resource prices. The results demonstrate the importance of specifying a structural break when testing for breaks in persistence, whereas our findings are robust to the exact date of the structural break. Our analysis yields that coal and natural gas prices are trend stationary throughout their evolution, while oil prices exhibit a break in persistence during the 1970s. The

findings suggest that especially the coal market has remained fundamentals-driven, whereas for the oil market exogenous shocks have become dominant. Thus, our results are consequential for both theoretical and empirical work on energy commodity markets.

Session C2

On the efficiency of the CME-NYMEX oil option market: Evidence from a fractional cointegration analysis

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In efficient markets, the realized volatility of oil futures and the implied volatility of options markets should be linked in the long-term for a given underlying asset. We test this conjuncture for the first time in oil markets making use of most recent econometric techniques in the estimation of co-integrating relationships for fractional processes. The methodology allows for the estimation of long-run relationships between volatility processes that exhibit long memory. Our empirical results provide evidence of a long-run link between realized and implied volatility for the WTI crude oil quoted on the NYMEX-CME over the 2000-2012 period thereby supporting the efficiency hypothesis for this market.

Institutions and natural resources effects in a multiple growth regime

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The dependence to natural resource is currently the object of a wide debate in the analysis of economic growth in rentier states. In this work, we examine the interaction effect between oil resources dependence and the quality of institutions on economic growth by employing a panel threshold regression methodology. Our results show that the effect of oil resource dependence on economic growth becomes positive, as the quality of institutions improves. In other side, contrary to many precedent results in this area, an increase in oil dependence wipes out the positive effect of institutional quality on growth. Indeed, a positive variation of the institution quality doesn't necessary lead to a positive variation in economic growth.

Generating options-implied probability densities to understand oil market events

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We investigate the informational content of options-implied probability density functions (PDFs) for the future price of oil. Using a semiparametric variant of the methodology in Breeden and Litzenberger (1978), we investigate the fit and smoothness of distributions derived from alternative PDF estimation methods, and develop a set of robust summary statistics. Using PDFs estimated around episodes of high geopolitical tensions, oil supply disruptions, and macroeconomic data releases, we explore the extent to which oil price movements are expected or unexpected, and whether agents believe these movements to be persistent or temporary.

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