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Pages 1-26

EU-ETS and Nordic Electricity: A CVAR Analysis

By Harrison Fell (Resources for the Future, 1616 P Street NW, Washington, DC 20036)

Abstract

A cointegrated vector autoregressive (CVAR) model is estimated to determine the dynamic relationship between Nordic wholesale electricity prices and EU emissions trading scheme (EU-ETS) CO₂ allowance prices. An impulse response analysis reveals that electricity prices have large short-term responses to CO₂ price shocks, but that this response dampens over time. Using hourly Nordic electricity spot market prices, I find that the value of short-term response of electricity prices to a shock in CO₂ prices in off-peak hours is consistent with expected values for near complete pass-through of CO₂ emission costs when coal-generated power is at the margin. Likewise, the estimates reveal that peak hour electricity price responses to CO₂ price shocks are as expected for a market that has near complete pass-through of CO₂ emission costs when natural gas-generated power is at the margin. These results further suggest the Nordic electricity market is pricing as a competitive market.

Pages 27-52

Resource Nationalism – Limits to Foreign Direct Investment

By Gavin L. Kretzschmar (PwC Chair of Accounting, KIMEP, University of Edinburgh, Edinburgh, UK), Axel Kirchner (Barrie & Hibbert Limited, Edinburgh, UK), Liliya Sharifzyanova (University of Edinburgh, Edinburgh, UK)

Abstract

Despite a global trend toward the privatization of state assets, host governments are consolidating ownership over strategically important domestic oil and gas resources, effectively limiting corporate foreign direct investment. These findings are supported by an analysis of global reserve acquisitions for the period 2000 – 2006, a period which saw listed national oil companies (NOCs) acquire over 82% of their reserves domestically, compared to only 25% for commercial operators.

We also perform a regression analysis and find that political risk and reserve size are

strongly related to state ownership retention, while the degree of state control is positively related to OPEC membership. Foreign direct investment is shown to be increasingly constrained to assets in low-risk developed countries or marginal oilfield assets.

Pages 53-86

Modeling Term Structure Dynamics in the Nordic Electricity Swap Market

By Dennis Frestad (University of Agder, Norway), Fred Espen Benth (Centre of Mathematics for Applications, Department of Mathematics, University of Oslo, Oslo, Norway), and Steen Koekebakker (University of Agder, Norway)

Abstract

We analyze the daily returns of Nordic electricity swaps and identify significant risk premia in the short end of the market. On average, long positions in this part of the swap market yield negative returns. The daily returns are distinctively non-normal in terms of tail-fatness, but we find little evidence of asymmetry. We investigate if the flexible four-parameter class of normal inverse Gaussian (NIG) distributions can capture the observed stylized facts and find that this class of distributions offers a remarkably improved fit relative to the normal distribution. We also compare the fit with that of the four-parameter class of stable distributions; the NIG law outperforms the stable law in the vast majority of cases. Thus, the NIG family of distributions, which allows for stochastic dynamics in terms of Lévy processes that are suitable for pricing derivatives and Value-at-Risk measurements, is a serious candidate for modeling term structure dynamics in the Nordic electricity market.

Pages 87-112

Explaining Fluctuations in Gasoline Prices: A Joint Model of the Global Crude Oil Market and the U.S. Retail Gasoline Market

By Lutz Kilian (Department of Economics, University of Michigan, Ann Arbor, MI, USA)

Abstract

The distinction between the price of gasoline in the U.S. and the price of crude oil in global markets is often ignored in discussions of the impact of higher energy prices. This article makes explicit the relationship between demand and supply shocks in these two markets. Building on a recently proposed structural VAR model of the global crude oil market, it explores the implications of a joint VAR model of the global market for crude oil and the U.S. market for motor gasoline. It is shown that it is

essential to understand the origins of a given gasoline price shock, when assessing the responses of the price of gasoline and of gasoline consumption, since each demand and supply shock is associated with responses of different magnitude, pattern and persistence. The article assesses the overall importance of these shocks in explaining the variation in U.S. gasoline prices and consumption growth, as well as their relative contribution to the evolution of U.S. gasoline prices since 2002.

Pages 113-144

Valuing Plug-In Hybrid Electric Vehicles' Battery Capacity Using a Real Options Framework

By Derek M. Lemoine (Energy and Resources Group, University of California, Berkeley, CA, USA)

Abstract

Plug-in hybrid electric vehicles (PHEVs) enable their drivers to choose whether to use electricity or gasoline, but this fuel flexibility benefit requires the purchase of additional battery capacity relative to most other vehicles. We value the fuel flexibility of PHEVs by representing the purchase of the battery as the purchase of a strip of call options on the price of transportation. We use a Kalman filter to obtain maximum likelihood estimates for three gasoline price models applied to a U.S. municipal market. We find that using a real options approach instead of a discounted cash flow analysis does not raise the retail price at which the battery pays for itself by more than \$50/kWh (or by more than 15%). A discounted cash flow approach often provides a good approximation for PHEV value in our application, but real options approaches to valuing PHEVs' battery capacity or role in climate policy may be crucial for other analyses.

Pages 145-172

Climate Policy and the Long-Term Evolution of the U.S. Buildings Sector

Page Kyle (Joint Global Change Research Institute, Pacific Northwest National Laboratory, College Park, MD, USA), Leon Clarke (Joint Global Change Research Institute, Pacific Northwest National Laboratory, College Park, MD, USA), Fang Rong (School of Public Policy and Management, Tsinghua University, Beijing, China.=), and Steven J. Smith (Joint Global Change Research Institute, Pacific Northwest National Laboratory, College Park, MD, USA)

Abstract

Buildings are the dominant driver of daily and seasonal electric load cycles, and account for 40 percent of U.S. final energy use. They account for roughly 10 percent of direct U.S. CO₂ emissions and roughly 40 percent once indirect emissions from electricity generation are included. This paper explores the possible evolution of this sector over the coming century, its potential role in climate action and response to climate policies, and the potential benefits of advances in building technologies for addressing climate change. The paper presents a set of scenarios based on a detailed, service-based model of the U.S. buildings sector that is embedded within a long-term, global, integrated assessment model, MiniCAM. Eight scenarios are created in total, combining two sets of assumptions regarding U.S. building service demand growth, two sets of assumptions regarding the improvements in building energy technologies, and two assumptions regarding long-term U.S. climate action – a no-climate-action assumption and an assumption of market-based policies to reduce U.S. CO₂ emissions consistent with a 450 ppmv global target. Through these eight scenarios, the paper comments on the implications of continued growth in building service demands, the ability of efficiency measures to reduce emissions, and the strong link between decarbonization of electricity generation and building sector emissions.

Pages 173-198

Welfare Impacts of Electricity Storage and the Implications of Ownership Structure

By Ramteen Sioshansi (Integrated Systems Engineering Department, The Ohio State University, Columbus, Ohio, USA)

Abstract

Increases in electricity price volatility have raised interest in electricity storage and its potential arbitrage value. Large utility-scale electricity storage can decrease the value of energy arbitrage by smoothing differences in prices on- and off-peak, however this price-smoothing effect can result in significant external welfare gains by reducing consumer energy costs and generator profits. As such, the incentives of merchant storage operators, consumers, and generators may not be properly aligned to ensure socially-optimal storage use. We examine storage use incentives for these different agent types and show that under most reasonable market structures a combination of merchant and consumer ownership of storage maximizes potential welfare gains from storage use.

BOOK REVIEWS

Pages 199-204

A Smart Energy Policy: An Economist's Rx for Balancing Cheap, Clean, and Secure Energy

By James M. Griffin

(New Haven: Yale University Press, 2009)

(Book Review by Maureen S. Crandall)

Pages 204-206

Analytical Methods for Energy Diversity and Security

Edited by Morgan Brazilian and Fabien Roques

(Amsterdam: Elsevier, 2008)

(Book Review by Julián Barquín Gil)