Energy Economics 36 (2013) 454–463

Contents lists available at SciVerse ScienceDirect

Energy Economics

journal homepage: www.elsevier.com/locate/eneco

Analyzing the impact of futures trading on spot price volatility: Evidence from the spot electricity market in France and Germany

Fotis G. Kalantzis, Nikolaos T. Milonas *

Department of Economics, National and Kapodestrian University of Athens, Greece

ARTICLE INFO

Article history:
Received 10 June 2011
Received in revised form 27 September 2012
Accepted 29 September 2012
Available online 16 October 2012

JEL classification:
G13
G14
G15

Keywords:
Electricity futures market
Volatility clustering
Electricity spot markets
Spot market volatility
VECM-GARCH

ABSTRACT

This paper examines the impact of the introduction of electricity futures on the spot-price volatility of the French (Powernext) and German (EEX) electricity markets, as well as the degree of their price correlation over the period 2002–2011. Our working hypotheses were tested based on a bivariate VECM-GARCH model. The results indicate that the introduction of futures contracts in the French electricity market, as well as the launch of the joint futures market in these countries in 2009, has decreased spot price volatility. However, this effect was not as explicit for the German market, due to data specificities. Other interesting results are: the German market dominates and leads the long run price relationship; the impact of cooling needs on demand is greater than the impact of heating needs; there is a substantial systematic pattern of electricity prices and their respective volatilities during weekdays and holidays. Overall, results are supportive of policy making at the European Commission regarding electricity market integration.

© 2012 Elsevier B.V. All rights reserved.

1. Introduction

The impact of futures trading introduction on the volatility of the underlying market was first noticed when the Chicago onion futures market collapsed in the summer of 1958. The manipulation of onion spot prices following the introduction of futures trading led to unacceptably low prices and eventually to the market collapse. One major reason for this market failure was the non-storability of onions from one crop period to another that did not enable the hedging mechanism to operate. In this paper we examine the electricity, a similarly non-storable commodity, and the impact of the introduction of electricity futures on the volatility of its spot market.

Previous studies on this issue led to conflicting results. Extensive research has studied spot volatility changes upon futures introduction on stock indexes, bonds, exchange rates and different commodities, but none on the electricity markets. This paper examines, among other things, the impact of the introduction of electricity futures on the volatility of electricity spot prices with the primary focus on the particular structure and characteristics of electricity markets.

Our research is based on the spot markets for electricity in the EU, and in particular, on those of France (Powernext) and Germany (European Energy Exchange—EEX) which stand out for their maturity, their geographical position, the size of their overall consumption and production, as well as the high degree of their price correlation. These markets were chosen for two further reasons: first, they started operating almost simultaneously and second, since the beginning of 2009, the level of their collaboration has been significantly enhanced as a result of their joint venture both on EPEX spot market and EEX Power Derivatives GmbH.

The electricity markets sprang globally over the last decade, as a result of the evolving energy market liberalization and the privatization of state-owned enterprises. As a result, the study of all issues relating to the electricity futures markets attracted great research interest. One important reason for this interest is that the electricity markets differ from the traditional money and capital markets in many ways (Pilipovic, 1998). In particular, significant differences are observed in relation to maturity, trading volumes, concentration level, the complexity of the derivatives contracts available therein and, not least, the non-storability nature of the electricity. The non-storability makes the electricity market extremely sensitive to exogenous factors such as, the seasonality of demand, the regulatory uncertainty, the investment, maintenance and operation costs of the production units and the frequent supply-demand imbalances, which lead to price spikes.

The impact of the futures market on the volatility of the electricity spot market is critically important to the participants, with respect to both risk management and to spot market transactions. It is indeed crucial, not only to the producers, the consumers and the suppliers, but also to the regulators to comprehend the extent to which the

* Corresponding author. Tel.: +30 2103689442; fax: +30 2103225542.
E-mail address: nmilonas@econ.uoa.gr (N.T. Milonas).

0140-9883/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.eneco.2012.09.017

financial instruments available to the markets allow them to deal with the various risks, hedge against price uncertainty, choose the optimal management of the operational costs and, effectively, enhance the operation of organized competitive electricity markets.

The organization of this paper is as follows: Section 2 provides an overview of the most important literature examining the impact of futures trading on the spot price volatility; Section 3 provides information on the institutional and market setting in the French and German electricity markets along with information on trading volumes and interconnection capacities; Section 4 describes and analyzes the data; Section 5, presents some theoretical considerations and the description of the model; Section 6, discusses the results of the empirical analysis and Section 7 provides a summary and concluding remarks.

2. Literature review

In this section we discuss the evidence on spot price volatility due to the introduction of futures contracts in financial and commodity markets. The rationale behind this literature review perspective is to gain insights for our analysis, since no evidence exists on electricity markets.

2.1. Three possible effects on spot price volatility

The main reason for the decrease in the spot price volatility following the introduction of futures trading is the increase in liquidity. Futures markets enhance the level of available information as a larger number of participants is attracted with a lower cost of transactions relative to the spot markets. The increased information improves market efficiency leading to fair price determination, thus lowering price volatility. In addition, with the existence of a futures market, the speculative activity migrates from the spot to the futures market, in effect reducing spot price volatility.

One more reason in support of the stabilization hypothesis is that with the introduction of any financial or commodity futures contract, markets will become more complete and the arbitrage process will begin to function. As arbitrageurs continuously examine the price relationship between spot and futures contracts, any observed departure from theoretical values will ignite arbitrage activity that will wipe out any price differential. These actions will reduce the large swings in futures and spot prices leading to smaller spot price variability.

The opposite argument of increased spot market volatility is based on the mere increase of the speculative activity in the futures markets. According to this argument, the small transactions costs in the futures markets attract speculators with low information level and cause price instability that is transmitted to the spot market resulting in increased volatility. More specifically, investors enter the futures market to hedge assumed positions in the spot market. Low information investors act opposite to high information investors sustaining an information asymmetry between demand and supply. The end result is the increased volatility of the underlying spot market.

As one may expect, a neutral effect in spot price volatility has also been detected by some researchers at the advent of futures introduction. The factors that lead to spot price volatility change may offset each other and no effect is detected. Perhaps some macroeconomic factors may be present that are not controlled effectively and confound the volatility effect, such as the state of the overall market (bullish or bearish), the budget and current account deficits and the currency evaluations/devaluations.

2.2. Spot price volatility effect in financials

There are numerous studies in financial markets examining the effect on spot price volatility caused by the introduction of futures trading. Figlewski (1981) studied the Government National Mortgage Association instrument using the standard deviation of returns as a volatility measure. He argued that speculators with inadequate information increase volatility through the incorrect signals produced from their transitions.

Harris (1989) studied the effect of S&P 500 index futures introduction on the volatility of spot S&P index and found that the S&P index volatility has increased after the introduction of futures trading on the index. Lee and Ohk (1992) studied the impact of index futures introduction on the volatility of underlying indexes in the case of Australia, Hong Kong, Japan, UK, and the US. Using the GARCH methodology, they found that the spot volatility has increased after the futures contracts introduction in all countries but Australia and Hong Kong. Following a similar methodology, Gulen and Mayhew (2000), in a study of stock index futures involving twenty five countries, found increased stock index spot volatility after futures trading only in the case of Japan and the US. In the remaining countries, there was either no effect or a volatility decreasing effect.

Edwards (1988) studied the introduction of stock index futures on the underlying spot market and argued that other macroeconomic factors may exist that affect the spot price volatility. In a study of financial futures on Treasury bill volatility, Simpson and Ireland (1985), found that, initially, futures trading led to a volatility decrease, but when futures volume increased, T-bill volatility also increased.

Besides the evidence on increased or unchanged spot price volatility caused by the introduction of futures trading, there is significant evidence on spot price volatility decreases. In a theoretical study, Grossman (1988) argues that in the presence of stock index futures with low transaction costs, participants trade in a regular manner reducing price volatility. In contrast, in the absence of futures markets, institutions face larger transactions costs when trading in the stock market directly. Grossman concludes that in order to reduce transaction costs, institutions will execute large trades less frequently leading to stock price volatility increases. A similar conclusion was reached by Grossman and Miller (1988) as well, and by Stoll and Whaley (1987) who, in a study of stock index futures, argued that the futures market improve the efficiency of the spot market.

2.3. Spot price volatility effect in commodities

The price stabilization mechanism exhibited by financial futures has been more strongly observed at the introduction of commodity futures. Sarris (1984) has provided a theoretical dynamic model to validate the argument of spot price variability decreases caused by the introduction of futures markets in the case of storable commodities. The novelty of his model is that it incorporated the interaction between hedgers and speculators whose storage decisions influence the distribution of spot prices in such a way that their variability decreases.

Netz (1995) advances on Sarris's idea, arguing that storage becomes more sensitive to fluctuations in the return to storage when futures markets are introduced. As a result, storage will absorb a greater amount of demand and supply imbalances than before the futures introduction thus making spot prices less volatile. Empirical tests using CBOT wheat futures confirm this theoretical finding.

Empirical support for decreased spot price volatility in commodities has been confirmed by several other authors as well. Powers (1970) found a reduction in the random component of time series cash prices of pork bellies and cattle after the introduction of their respective futures contracts. Taylor and Leuthold (1974) studied the cash price variability for cattle and found a reduction in monthly and weekly series after the futures market introduction.

Fleming (1999) examined the effect of introducing crude oil futures on the oil market volatility including other energy products. The results showed volatility increases for three weeks and even a year after the futures crude oil introduction. However, accounting for the US deregulation of the energy markets during the period of the study, Fleming's results are supportive of the hypothesis that

دریافت فوری ← متن کامل مقاله

ISIArticles
مرجع مقالات تخصصی ایران

✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
✓ امکان دانلود نسخه ترجمه شده مقالات
✓ پذیرش سفارش ترجمه تخصصی
✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
✓ دانلود فوری مقاله پس از پرداخت آنلاین
✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات