Analysis of the Iberian electricity forward market hedging efficiency

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Abstract: An assessment of the hedging performance in the Iberian forward electricity market is performed. Aggregated data from the Portuguese and Spanish clearing houses for energy derivatives are considered. The hedging performance is measured through a net position ratio obtained from the final open interest of a month derivatives contract divided by its accumulated cleared volume. The base load futures in the Iberian energy derivatives exchange show the lowest ratios due to good liquidity. The peak futures show bigger ratios as their reduced liquidity is produced by auctions fixed by Portuguese regulation. The base load swaps settled in the clearing house located in Spain show initially large values due to low registered volumes, as this clearing house is mainly used for short maturity (daily and weekly swaps). This ratio can be a powerful oversight tool for energy regulators when accessing to all the derivatives transactions as envisaged by European regulation.

Keywords: energy regulation; power futures; regulated auctions; over-the-counter; market supervision.

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1 Introduction

The Iberian Electricity Market (MIBEL) is composed of the Spanish and Portuguese price areas. Capitán Herráiz and Rodríguez Monroy (2009) describe the evolution of the Iberian power futures market managed by OMIP, located in Lisbon (Portugal), during its first two years of existence. OMIP stands for Iberian Market Operator, Portuguese Pool. That research focuses on the assessment of the ex-post forward risk premia (i.e. the difference between the future prices and the underlying average spot prices for the corresponding delivery period). OMIP forward risk premia are remarkable, especially at the beginning of this market, limiting its price efficiency. The current research describes the evolution of the Iberian power futures market but focusing on another key efficiency parameter: the open interest. It comprises the first five and a half years of this power futures market (i.e. the dataset spans from the start of that market on 3 July 2006, until 31 January 2011). It aims to identify hedging patterns of the month contracts cleared and settled in OMIP clearing house (OMIClear) to shed light on how market participants manage their price risk and provide recommendations to the authorities in charge of the MIBEL supervision. Data cleared and settled in the energy derivatives clearing house located in Madrid, MEFF Power, operating since March 21, 2011 are also considered. MEFF stands for Spanish Financial Futures Market.

The Iberian electricity forward market is mainly composed of the power futures market, the auctions for catering the last resort supplies (CESUR auctions) and the dominant Over-the-Counter (OTC) market. CESUR stands for Electricity Contracts for the Last Resort Supply. The OTC trading corresponds to out-of-exchange trading, in which two market participants negotiate bilaterally or through a broker. The OTC trading in Spain is related to financial products, i.e. subject to cash settlement (not bound to physical delivery of the forward traded electricity) (Martín Martínez, 2008).

The Iberian Electricity forward market is one of the most dynamic European energy markets, according to its growing traded volume rates. Due to its recent nature (the OTC market started in 1999 and the futures market in 2006) not much literature has been published analysing the evolution of the Iberian forward prices, the traded volumes and the open interest. This article provides a first approach to the relation between the cleared volumes in the existing clearing houses and their open interest. One important feature of this market is its financial nature (in the rest of Europe the forward trading is essentially physical, with the exception of the Nordic countries). Therefore research about measurement of hedging and speculation trends in this emerging market is of paramount interest.

The hedging performance is tracked through the evolution of the net position ratio composed of the final open interest of each month contract divided by the accumulated cleared volumes in the clearing house. Month contracts are considered as their trading activity is good. The final open interest corresponds to the open positions at the end of the trading period of the contract. The accumulated cleared volume reflects the whole recorded volumes of the month contract (and the corresponding part of the quarter and year contracts containing that month) for clearing and settlement in the clearing house. The market participants can close positions during the trading period to limit their risk exposure or just for obtaining trading gains (i.e. arbitrage due to purchases at a lower price and sales at a higher price). The open positions will determine a hedge (i.e. a fixed price for the delivered energy) if the market participant performs the same operation in the spot market. The open position is cash-settled during the settlement period against the evolution of the daily spot price. This exposes the market participant to potential losses or gains in case he did not perform a similar operation in the spot market.

This analysis serves to identify how the Iberian electricity forward market is performing according to its original role as key hedging vehicle. Additionally, this research suggests further improvements to the design and application of this kind of ratios as a powerful market monitoring tool helping the supervisory agencies to detect and analyse suspicious trading behaviour bound to market abuse practices.

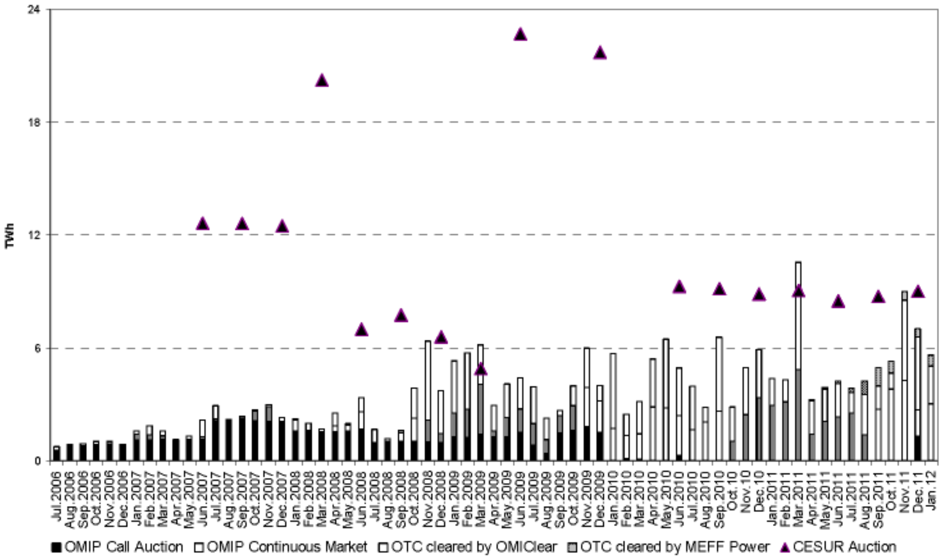
The paper is structured as follows: Section 2 describes the trading activity in the Iberian electricity forward market; Section 3 provides a concise literature review in stock and commodities markets, describing amongst other issues the traditional indicator in financial literature known as hedge ratio, and presents the analysis of the net position ratio for the Iberian electricity derivatives; Section 4 provides reflections about the usefulness of the net position ratio in the prudential oversight of the systemic risk; Section 5 summarises all the insights of the research, suggests further lines of research and concludes.

2 The trading development in the Iberian electricity forward market

The evolution of OMIP traded volumes has to be seen in conjunction with the non-organised OTC market and with the CESUR auctions. Only a portion of the OTC trades are centrally cleared. The equilibrium price of the CESUR auctions is one of the inputs in the price formula for the last resort rate (Alba Rios and Moreda Diaz, 2010; Villaplana and Cartea, 2012).

Figure 1 shows the evolution of the cleared and settled volumes (in TWh) in OMIClear and in MEFF Power through bars, and the matched volumes in CESUR auctions through triangles. There are two market modes in OMIP: the continuous market and auctions. Whereas the former is the main mode, the latter has performed a key role in the liquidity development, as the Spanish distribution companies and the Portuguese last resort supplier were obliged to purchase energy in such auctions until July 2009 and July 2010 respectively. Furthermore OMIClear permits the clearing and settlement of OTC volumes by OMIP trading members, either bilaterally or through one of the four registered brokers. In the period June 2007–January 2012, seventeen CESUR auctions have been celebrated where the Spanish distribution companies acquired the energy for their regulated supplies. Since the ninth auction, such a role was taken over by the last resort suppliers (CESUR, 2012; OMIP-OMIClear, 2012).

Figure 1 Evolution of traded and cleared volumes in OMIP-OMIClear, cleared volumes in MEFF Power, and matched volumes in CESUR auctions (TWh)



Source: OMIP-OMIClear (2012), CESUR (2012) and BME (2012) adapted by authors

OMIP traded volumes in the first two years were led by the compulsory auctions. Since that moment until the end of 2009 the continuous volumes reached a similar size to the auction ones. Afterwards, the continuous market volumes kept growing. During 2010, the scarce auction volumes were generated by compulsory auctions of peak futures for the Portuguese last resort supplier with underlying price the spot price of the Spanish zone. Since 1 July 2007, two MIBEL price areas coexist. They have the same price with lack of congestion but different price when congestion occurs in the interconnection between Spain and Portugal and the market splitting algorithm is applied (MIBEL Regulatory Council, 2009).

On 16 December 2011, the first auction for OMIP base load futures with underlying price the spot price of the Portuguese zone was celebrated. In this kind of auctions, the Portuguese last resort supplier (EDP Serviço Universal, S.A.) sells the Portuguese special regime production to the interested market participants. This type of auction facilitates the entry of new suppliers in the Portuguese market. The special regime corresponds to renewable generation and cogeneration (combined heat and power generation) (ERSE, 2011).

Both peak futures of the Spanish zone and base load futures of the Portuguese zone have still limited liquidity. The efficiency of the Iberian power futures market will increase once those derivatives reach the liquidity levels of the Spanish base load futures. The month with record of continuous volumes was March 2011 (4.86 TWh). The OTC cleared volumes also reached a record in that month (5.68 TWh) and maintain a growing trend, influenced by the OTC trading development (OMIP-OMIClear, 2012).

Since 21 March 2011, OTC power trades with Spanish underlying spot prices can also be cleared and settled by MEFF Power. Although its number of enrolled members and cleared volumes are growing fast (25 members at the end of January 2012, of which 13 are also active in OMIP, which has 38 members at that date) the accumulated registered volumes between March 2011 and January 2012 are still small (4.3 TWh) compared to the OTC registered volumes in OMIClear in that period (26.5 TWh) (BME, 2012; OMIP-OMIClear, 2012).

Whereas OMIClear is preferred by the market participants for the settlement of large maturities (month, quarter and year) futures contracts, MEFF power is preferred for short maturities (day and week) contracts (so far base load swaps of the Spanish zone). The different preferences by the market participants in terms of derivative type and maturity make that both clearing houses behave complementarily. For the sake of systemic risk mitigation, a larger portion of centrally cleared OTC trades is always welcome by the supervisory authorities (IOSCO, 2011). The goal may be better reached through dynamic competition regarding tariffs and services between the existing clearing houses as such a competition may attract more OTC volumes.

The first 17 CESUR auctions account for a traded volume of 191.3 TWh, 19% less than the accumulated volumes cleared by OMIClear in the period July 2006–January 2012 (CESUR, 2012). The OTC market has experienced a steady growing trend, summing up in that period approximately 888 TWh (Intermoney, 2012). Therefore the OTC volumes are 3.8 times bigger than the volumes cleared by OMIClear and 4.6 times bigger than the CESUR volumes. Only a minor part of the whole OTC volumes is cleared and settled by the existing clearing houses (10.3% by OMIClear and 0.5% by MEFF Power) (OMIP-OMIClear, 2012; BME, 2012).

3 Analysis of the net position ratio

3.1 The relationship between volume and open interest

Lucia and Pardo (2008) perform a research with stock data on the measurement of speculative and hedging activities in futures markets from volume and open interest data. They indicate that a necessary condition to be a hedger is to have a spot (or forward) commitment that involves a risk exposure. The speculators are outright position-takers, including the day traders, holding their positions for less than one trading day. The daily open interest determines the number of outstanding contracts at the end of a trading day (entered contracts but not yet liquidated). The open interest equals the number of outstanding long positions (or equivalently, short positions) at the end of the day. It increases whenever neither of the two traders involved in a contract trade is closing out a position and decreases when both parties are closing out a position. It remains the same when only one trader is closing out a position, being this trader replaced by another one. The daily trading volume reflects somehow movements in the speculative activity. The daily open interest captures hedging activities as it excludes all intraday positions taken by day traders, mainly inspired by speculative reasons. Hedgers tend to hold their futures market positions longer than speculators.

3.2 *Literature review on commodity derivatives and application to the Iberian energy derivatives market*

This section provides useful insights regarding commodity derivatives that can be useful for further research of the still developing Iberian power futures market. Firstly, a distinction between the net position ratio and the traditional hedge ratio employed in financial literature is provided.

3.2.1 The difference between the net position ratio and the hedge ratio

3.2.1.1 The fundamentals of the net position ratio methodology

The net position ratio employed in this article, being the first research performed for the Iberian power futures market based on this particular methodology, intends to measure the relation between the cleared volume and the open interest in that market. Therefore, it is built as the division of the open interest presented at the end of the last trading session of each month contract and the accumulated cleared volumes in the clearing house for that specific contract (and the corresponding part of the cleared volumes from quarter and year contracts containing that month) at that last trading session (i.e. when such a contract does no longer quote, as its trading period expires and its settlement period begins). This original ratio enlarges the variety of existing ratios based on open interest and traded volume data as reviewed by Lucia and Pardo (2008). Additionally, it provides a complementary alternative to the traditionally used hedge ratio, described below.

3.2.1.2 Literature review of the hedge ratio

The hedge ratio is the ratio of the position taken in the futures contracts that will exactly offset the size of the exposure in the spot market. Chen, Lee and Shrestha (2003) review the different theoretical approaches to deriving the optimal futures hedge ratio, based on minimum variance, mean-variance, maximised expected utility, mean extended-Gini coefficient, as well as semivariance. They discuss diverse methods of estimating the hedge ratio, ranging from ordinary least squares to heteroscedastic cointegration methods. Under martingale (i.e. the expected futures price change is zero) and joint-normality conditions for the futures and spot prices, different hedge ratios are the same as the minimum variance hedge ratio. Otherwise, there is no single optimal hedge ratio superior to the remaining ones. They indicate that the random coefficients model employed by Grammatikos and Saunders (1983) for currency futures can, in some cases, improve the effectiveness of hedging strategy, but that technique does not allow for the update of the hedge ratio over time.

Regarding oil futures, greater financialisation – i.e. the massive expansion of the financial layer of oil due to the explosion in the derivatives permitting speculation – raises the hedge ratio (Fattouh and Mahadeva, 2012a; 2012b).

Regarding electricity futures, Shawky, Marathe and Barret (2003) focus on the futures contracts traded on the New York Mercantile Exchange (NYMEX) for delivery at the California-Oregon Border (COB) hub for the period 1998–1999. Using a GARCH specification, they estimate a minimum variance hedge ratio. The mean hedge ratio (1.63) is bigger than for other commodities (e.g. Baillie and Myers (1991) using a similar GARCH model obtain an estimation of 0.07 for beef, 0.25 for coffee, 0.61 for corn, 0.38

for cotton, 0.50 for gold and 0.76 for soybeans). The reason behind the bigger electricity hedge ratios is the non-storable nature of electricity, the presence of a relatively few market players, and a bigger spot price volatility compared to the other commodities.

Further research is encouraged regarding the estimation of the optimal hedge ratio for the Iberian energy derivatives market, considering OMIP future prices and the underlying spot prices, to seize the magnitude of the resulting ratio compared to other commodities markets.

3.2.2 Literature review of energy markets about analysis of the open interest

Buchananan, Hodges and Theis (2001) provide a method of predicting direction of spot price movements in the natural gas market for the month succeeding from market participants' net positions in the New York Mercantile Exchange (NYMEX) futures market. The Commitment of Trade reports collected by the Commodity Futures Trading Commission (CFTC) act as a proxy for ex ante forecasts of futures price movements. These weekly reports contain the net long and short positions for each contract held by large hedgers, speculators and nonreporting or small traders. While the natural gas contract did not begin trading until the early 1990s, it has grown faster than most commodities. They find that the position of the larger speculator contains valuable information for predicting the direction and magnitude of subsequent price changes. Regarding the relation between MIBEL spot and futures prices, Ballester, Climent and Furió (2012), with data from year 2006 to year 2011, find causal relationships in the short term from futures prices to the geometric average of the forward curve (obtained with OTC data published by Reuters) as a proxy for spot prices, and empirical evidence of unidirectional Granger causality from one-month-ahead and one-quarter-ahead futures prices to spot prices.

Bolinger, Wiser and Golove (2006) analyse the price dynamics of NYMEX US natural gas futures contracts. They indicate that the open interest serves as a liquidity proxy. Beyond the first 36 of the 72 gas futures contracts listed, the remaining futures are scarcely traded (their open interest drops to zero). Although the traded volume may be a better measure of liquidity, it is also more sensitive to the particular day chosen. A larger part of the open interest is due to commercial traders. In the US natural gas futures market, those hedgers account for 60%–75% of the open interest. In the case of the Iberian power futures market, the contracts with higher traded volumes (Spanish base load futures for the two prompt months and quarters and the prompt year) are as well the unique contracts with remarkable open interest values. Therefore, the liquidity in this emerging market is more concentrated than in more mature markets as NYMEX. Neither the Iberian power futures market operator and Portuguese clearing house (OMIP-OMIClear) nor the Spanish clearing house for energy derivatives (MEFF Power) do not publish statistics regarding long and short positions associated to commercial traders (i.e. energy companies) or to financial entities. The publication of such statistics via periodical market monitoring reports from each clearing house – or alternatively by the regulatory agencies having access to centrally cleared data – would provide more post-trade transparency, increasing the confidence in the market and thus its efficiency.

Sanders, Boris and Manfredo (2004) examine the CFTC's Commitments of Traders reports for crude oil, unleaded gasoline, heating oil and natural gas futures contracts. A positive correlation between returns and positions held by noncommercial traders (i.e. funds), and a negative correlation between commercial (i.e. hedgers) positions and market returns, are found. For both groups, returns lead positions. Commercials are net sellers the week following an increase in prices, and noncommercials are net buyers. The publication of long and short positions per agents' type for MIBEL derivatives data centrally cleared would serve to assess if their evolution is also driven by the evolution of returns based on available prices (e.g. OMIClear and MEFF Power publish their settlement prices daily). Any anomaly in the usual evolution of those relationships might warn the supervisory authorities for excessive speculation in the context of some special event, e.g. a new CESUR auction.

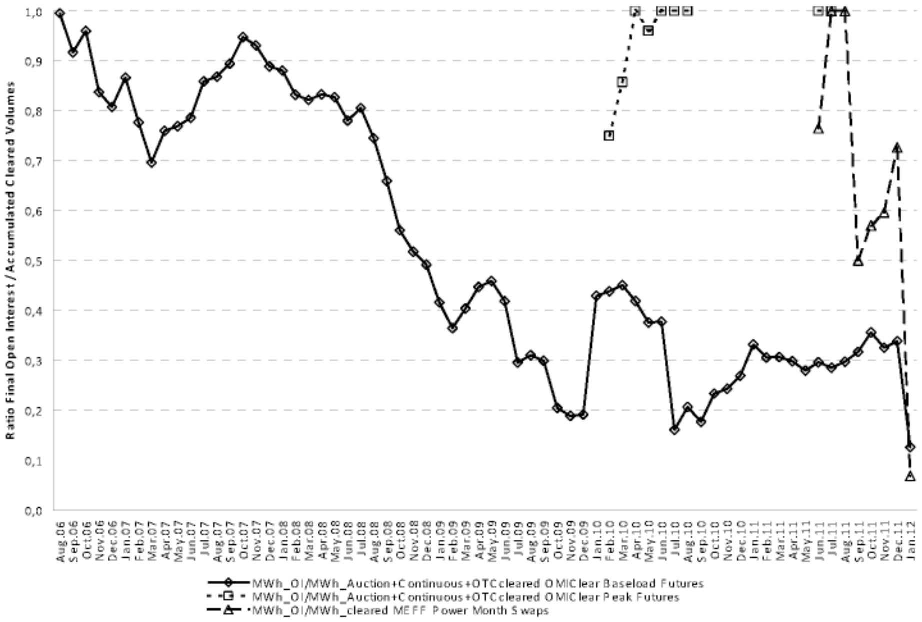
Regarding crude oil market, Fleming and Ostdiek (1999) detect a strong inverse relation between the open interest in crude oil futures and spot market volatility. When the open interest is greater, the volatility shock of the spot market associated with a given unexpected increase in futures trading is much smaller. Therefore the trading of futures contracts improves depth and liquidity in the underlying market. Further research is encouraged with MIBEL spot and futures data to assess the impact of the development of the open interest on the spot market volatility. However, the main factors affecting the volatility of the Iberian spot market are the abundant wind generation and the regulatorily fixed prices for the remuneration of coal power plants burning indigenous coal. This subsidised price is applied since February 2011 by the Spanish government for the sake of security of supply (BOE, 2011). Whereas the volatility is increased by the former due to the intermittent nature of wind generation, it is decreased by the latter as such fixed prices act as a price cap in the spot offers of thermal power plants, limiting as well the price fluctuations in the futures market.

3.3 Analysis of the net position ratio of the Spanish electricity derivatives

OMIP-OMIClear and MEFF Power final open interest (i.e. the value published for the last session in which a given contract is quoted) are studied for each month contract. Only Spanish month contracts are considered: OMIP-OMIClear base load and peak futures and MEFF Power base load swaps. The division of the final open interest and the accumulated cleared volume is used as a net position ratio to measure the potential interest of the traders in these contracts for risk management (i.e. hedging by means of final open positions, in case they trade the same amount with the same nature afterwards in the spot market (e.g. spot purchases in case of long derivatives positions)).

Figure 2 shows the evolution of the final open interest for each month derivative divided by the total cleared volumes of such a derivative product (including the corresponding cleared volumes for that delivery month from the quarter and year products). The first month considered is August 2006, as OMIP started on 3 July 2006. Until July 2008, the net position ratio of the base load futures contracts fluctuates in a narrow spread (0.7–1.0) due to the fact that the final open interest is almost equal to the auction volumes and that both the continuous trading and the registration of OTC trades for central clearing and settlement were scarce. As practically all the auction volumes were due to compulsory purchases of the Spanish distribution companies and the Portuguese last resort supplier established by their respective national legislative pieces, no other hedges were established out of such compulsory trades. Afterwards, the volumes from compulsory auctions became smaller but the continuous volumes and the OTC registered volumes in OMIP-OMIClear grew, as shown in Figure 1. Due to that change in the nature of the trading activity, the net position ratio diminishes and oscillates since the beginning of year 2009 in a wider spread (0.1–0.5). The smallest ratio would indicate that the market participants tend to close positions for profit taking due to price fluctuations in the futures prices along the trading period of the contracts, minimising the portion of trades for hedging purposes.

Figure 2 Evolution of OMIP-OMIClear and MEFF Power net position ratio per delivery month



Source: OMIP-OMIClear (2012) and BME (2012) adapted by authors

In the case of OMIP peak futures, the series is composed of few values, as there are only cleared volumes for the months within the period February 2010–August 2010, and June 2011–July 2011. In the first period, the 97.6% of those volumes corresponded to auctions, 1.5% to continuous trading, and 0.8% to OTC registered volumes. The net position ratio of the peak futures fluctuated in a narrow spread (0.7–1.0) as almost all the transactions corresponded to hedges performed by the Portuguese last resort supplier in auctions for the purchase of regulatorily fixed amounts. The maximum ratios (1.0) in June 2011 and July 2011 correspond to single OTC registered transactions of those month contracts, due to the scarce liquidity of the peak contracts out of the compulsory auctions. An ampler dataset is required to detect if these contracts experience a liquidity growth tending tower smaller net position ratios, as the more developed base load futures have shown due to the agents' learning curve, which can trade more dynamically and maximise their portfolio returns.

Regarding the base load swaps cleared in MEFF Power, the ratio decreased sharply in January 2012 to 0.07 due to the fact that increasing volumes were registered, as shown in Figure 1. The series began in June 2011, as it was the first month swap with registered volumes. The months of July and August 2011 presented the maximum ratio (1.0) due to the minimal registration of contracts in the first months of the clearing house. There is only 1 transaction for the quarter swap with delivery period the third quarter of 2011, and 3 transactions for the month swap with delivery period August 2011. The accumulated volume for July-2011 only considers the corresponding volume of the quarter contract (Q3-11). The accumulated volume for August-2011 considers the volumes from the month contract and the fraction from the quarter contract (Q3-11). The accumulated cleared volumes coincide in both cases with the final open interest as no market participant closed some of these few open positions. Afterwards, the ratio presents a descending see-saw oscillation. A larger dataset is required to draw stronger conclusions about the registration activity in this relatively new clearing house as the trend for the base load month swaps has been erratic so far (the liquidity of that clearing house at its start have been more concentrated on short term swaps (daily and weekly)).

4 The net position ratio and the prudential oversight of the systemic risk

Current financial reforms in both the United States and the European Union – the regulatory developments derived from Dodd-Frank Act and the Regulation on European Market Infrastructures (EMIR) respectively – are considering the introduction of position limits in the commodities derivatives trading to counter disproportionate price movements or concentrations of speculative positions (U.S. Government, 2010; European Union, 2012). Such considerations stem from conclusions derived in the G-20 summit celebrated in Pittsburgh in September 2009, in order to prevent the systemic risk of the global financial market (European Commission, 2009 or IOSCO, 2011).

According to the current levels of trading volumes and prices in the Spanish OTC power market (CNE, 2011; 2012a), assuming a yearly traded volume of 300 TWh (300,000,000 MWh) at an average price of 50 €/MWh (i.e. the price level of the Spanish power futures market, very close to the price level of the spot market in the months with weakener renewable production and the price level of recognised prices for power plants burning indigenous coal), such a market would produce a turnover of 15 billion €. If the trading patterns observed in the clearing houses (i.e. net position ratios around 0.1 at the beginning of year 2012) were equally replicated in the dominant OTC market, only 1/10 of the turnover (1.5 billion €) would be exposed to the credit risk due to default of one counterpart (i.e. due to open positions assuming an OTC net position ratio built as the OTC open position divided by the total OTC traded volumes). Therefore, a steady low net position ratio in the OTC trading would mitigate the potential impact on the systemic risk. Were these figures right (so far only mere assumptions according to aggregated post-trade data published by the Spanish Energy Regulator (CNE) in its monthly supervision reports of the Spanish electricity forward market and annual reports to the European Commission), the market participants would not be taking exaggerated open positions. In that sense, the probability of the feared systemic risk would be somehow moderate, even without the implementation of position limits.

5 Conclusions

A novel approach to measure the hedging performance in the Iberian Forward Electricity Market is employed, rather than the traditional method of the hedge ratio widely used in financial markets. A net position ratio is estimated with aggregated data from the Portuguese and Spanish clearing houses (OMIClear and MEFF Power respectively) through a ratio obtained as the final open interest of a month derivatives contract divided by the accumulated cleared volume for that delivery month (i.e. the month contract and the corresponding part of the quarter and year contracts). The power futures base load contracts traded in the Iberian energy derivatives exchange show the lowest ratios due to their good liquidity. Since the beginning of year 2009, those ratios are less than 0.5 (around 0.1 at the beginning of year 2012), indicating that less than half of the cleared volumes can be used for hedging and the rest of cleared volumes correspond to positions being closed. The market participants closing such positions can benefit from price differences in the purchase and sale operations centrally cleared by OMIClear. They can also benefit through the portfolio trading based on the exploitation of the price differences (e.g. arbitrage) between the coexisting market mechanisms in the Iberian electricity forward market (namely, OMIP power futures market, CESUR auctions and OTC trading). The power futures peak contracts show bigger ratios as almost all the cleared amount correspond to hedges of the Portuguese last resort supplier in OMIP auctions in which this company has to purchase quantities regulatorily fixed. A larger data set is required to draw robust conclusions for the base load swaps registered in MEFF Power, as this clearing house started operations on 21 March 2011.

As the net position ratio for January 2012 is very low in both clearing houses (0.07 in MEFF Power and 0.13 in OMIClear), further research is suggested with a larger dataset along year 2012 to detect if lower values respond to a change in the trading behaviour. As the registration of short maturity contracts is becoming more frequent in both clearing houses – daily and weekly, and weekend in a less extent, further research is encouraged to analyse if the net position ratios of those contracts are bigger, responding to hedging needs of the market participants close to the delivery period, or smaller as they could be used to close positions from the month contracts, either to adjust their hedging needs according to physical delivery commitments or to exploit existing price differences between the different maturities (arbitrage gains).

The ratio employed in this research is actually a straightforward static indicator, as it is built on the final open interest. A more complex and powerful dynamic indicator would consider the evolution of the open interest for all the trading sessions, not the last one. That daily ratio would help to better understand the trading patterns.

Further research comparing the daily evolution of the net position ratio with the daily evolution of the hedge ratio would provide powerful insights to grasp the hedging trends in this emerging market. Both ratios are not directly interrelated as the former depends exclusively on futures data and the latter depends as well on spot data. However, assuming for both cases that derivatives cleared volumes and spot volumes remained constant, the evolution of both ratios were led by the development of the net position (i.e. the open interest).

Although the global net position ratio shown in this research is a useful indicator of the trading development, it has some limitations. First, it only provides a partial snapshot of the trading, as the majority of the opaque OTC trading is still not centrally cleared and no aggregated data is published. Second, the hedge only exists if the agent finally performs the same operation in the spot market. Additionally, the net position ratio would be different per market participant type and the reasonable level of this indicator would only be useful per market participant type (not a global value as presented in this research). In the case of an energy company intending to hedge its generation or supply, the net position ratio would tend to present higher values. In the case of a financial entity without hedging goals and non-highly leveraged, its ratio would tend to present lower values (what minimises its credit default risk). In case the net position ratio of any participant grew substantially affecting the price volatility, the supervisory authorities could monitor if the integrity of the whole system is in danger and take appropriate enforcement measures.

A more sophisticated design of the net position ratio (i.e. with daily values, distinguishing per market participant type and permitting screening for one agent) and the hedge ratio are suggested to be employed by energy regulators devoting resources to market oversight of wholesale (spot and derivatives) energy markets and by the Agency for the Cooperation of Energy Regulators (ACER). These authorities, as well as other competent authorities – the national financial and competition authorities and the European Securities and Markets Authority (ESMA) – will have access to energy derivatives transaction details according to EU Regulation on Energy Market Integrity and Transparency (REMIT), in force since 28 December 2011 (European Union, 2011). The obligations for the market participants to submit their transaction records to ACER, that will grant data access to the energy regulators, will begin once the details of the transaction reporting are published in a European Commission Implementing Regulation. The use of daily net position and hedge ratios by the market monitoring authorities, filtered per market participant type (utility, financial entity, dominant operator, new entrant, etc.) could help to detect any suspicious behaviour regarding market abuse. Publication of aggregated statistics as those shown in CFTC Commitment of Traders' Reports would increase the ex-post trade transparency, enhancing the efficiency of the European wholesale energy markets.

The energy regulators can also access to OTC data by own initiative, if stated in their national law. For instance, the Spanish Energy Commission (CNE) has access to limited information over OTC power transactions, namely volumes and anonymous (i.e. with no disclosure of the counterparts) transaction prices, through the information voluntarily submitted by the main brokers CNE (2011). On 5 March 2011, the Law of Sustainable Economy was published in the Spanish Official Gazette (BOE). The fifth final disposition of this law modifies the Securities Market Law, enabling the information exchange between CNMV (the Spanish Financial Services Authority) – CNMV is the authority empowered to request OTC power data in the Spanish financial market – and rest of entities belonging to the MIBEL Regulatory Council. This Council is composed of CNE, CNMV, ERSE (Portuguese National Regulatory Authority) and CMVM (Portuguese Financial Services Authority). Their members have signed on 17 May 2011, a Multilateral Memorandum of Understanding (MoU) for the cooperation and efficient coordination in the MIBEL supervision, permitting their coordinated OTC supervision, facilitating the data collection. Additionally, CNE and CNMV have signed on 3 July 2012, a collaboration agreement in the framework of the supervision of energy forward markets, CESUR auctions and REMIT (CNE and CNMV, 2012).

As a result of the enhanced cooperation between CNE and CNMV, the former published a report related to the supervision of the trading in OMIP and OTC and its effect on the 15th and 16th CESUR auctions supervised by CNE (CNE, 2012b). The main conclusion of such a pioneering report within the REMIT framework is the absence of suspicions regarding market manipulation in the months around the CESUR auctions held in June and September 2011. Further reports analysing the forward price formation in the Spanish electricity – and even gas – auctions held in year 2012 would be very worthy supervisory works in the REMIT scope. The use of daily net position and hedge ratios per individual market participant would enrich substantially the analysis and insights of such reports and strengthen the daily market monitoring practices, helping to implement proper regulation in case market failures were detected.

Finally, a dynamic analysis of the net position and the hedging ratios could be used as well by policy makers to assess the convenience and estimate the proper magnitude of position limits. These limits are envisaged for the European and North American commodity derivatives markets, in order to avoid excessive speculation impacting on prices (Chilton, 2012).

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