# The competitive effect of EU transparency reforms: Evidence from Nord Pool

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# Information flows in the electricity market

maintenance

load

actual generation

required balancing

weather

futures prices

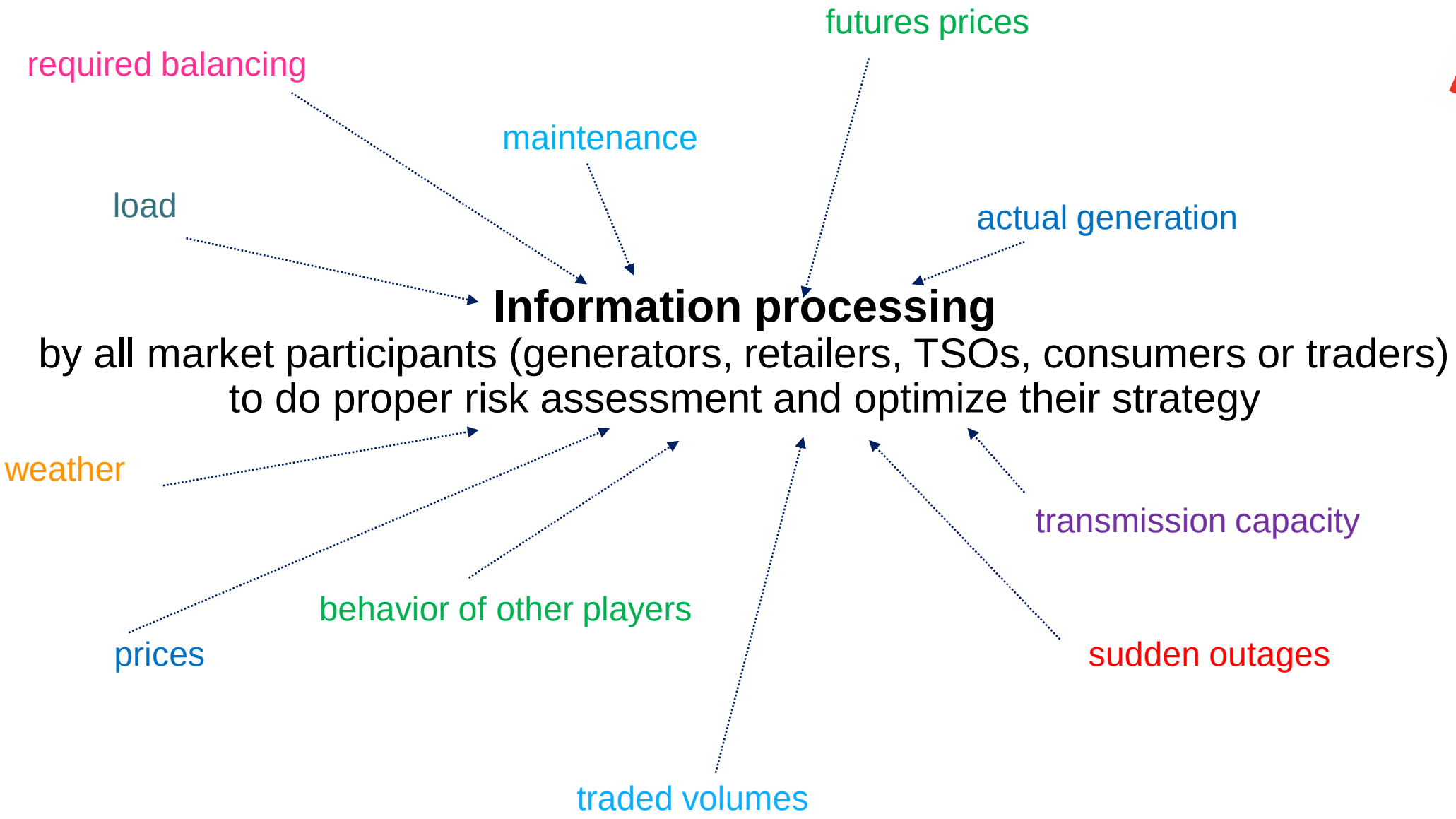
transmission capacity

behavior of other players

prices

sudden outages

traded volumes


futures prices
required balancing
maintenance
load
actual generation
Information processing
by all market participants (generators, retailers, TSOs, consumers or traders)
to do proper risk assessment and optimize their strategy
weather
transmission capacity
behavior of other players
prices
sudden outages
traded volumes

# Research question

**Is more information always better?**

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**Is more information always better?** YES!

1. Continuous information is required to ensure the proper functioning of the electricity market
   - electricity storage is currently limited, demand and supply have to match at all time, and up-to-date information about available capacities as well as forecasted and actual grid conditions are essential for all market participants.
2. Available information facilitates entry
3. More information about other participants may have a pro-competitive effect

# Research question

**Is more information always better?** NO!

1. More information facilitates insider trading or collusion
2. An efficiently functioning electricity market provides the relevant information through market price
3. Different market participants (buyers, sellers, system operators, traders) require different type of information

# Research question

**Is more information always better?**

⇒ Need to better understand link between information flows and market efficiency

⇒ Estimating empirically the effect of transparency on electricity market outcomes is required

Significant shocks in market transparency are rare and there is no clear measure of market transparency that could be used

# Information sharing effect on market outcomes in electricity markets

“A prerequisite for a market to function properly is to have all the relevant information available to all market participants, including potential and prospective market entrants […]. A lack of harmonization in both the type of information that is available and the format in which it is published can make it impossible for market participants to develop a coherent and accurate view of electricity market fundamentals.”

The European Commission (DG Energy)

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The European Commission (DG Energy)

- **Insufficient transparency** can have **negative effects** on market competition and price formation as not all market actors have access to the same information.
- The publication of fundamental data is "a first step and pre-condition to the creation of a competitive and efficient European electricity market" .

# EU Transparency Regulations

## REMIT
## (EU, 2011)

- A regulation on wholesale energy market integrity and transparency
- Collection of data for e.g. insider information

## SPDEM
## (EU, 2013)

- Regulation on submission and publication of data in electricity markets
- Regulating the technical information describing physical conditions on the grid
- Information about capacity produced, capacity available, intra-zonal flows etc
- Transparency Platform

# Transparency Platform

- Started on the 5th of January 2015
- Detailed information on load, generation, transmission and balancing - SPDEM
- Also about unavailability under each of these categories – REMIT
- 9000 registered users
- Developed, maintained and operated by ENTSO-E, the association of transmission system operators (TSOs). (Hirth, 2018)

# Market transparency (1)

## Theoretical framework

Increased electricity market **transparency might allow for more coordination** between generators  making (tacit) collusion easier to sustain

P.B.Overgaard and H.P. Mollgaard, “Information exchange, market transparency and dynamic oligopoly”, Centre for Industrial Economics Discussion Papers, 2005.

# Market transparency (2)

## Theoretical framework

In multi-unit auction market equilibria with asymmetric information about production costs **competitiveness of the market improves when the transparency in the market increases**, since producers' mark-ups decrease, as they receive more similar information

Holmberg, P. and F. Wolak, 2018, "Comparing auction designs where suppliers have uncertain costs and uncertain pivotal status", RAND Journal of Economics, 49 (4), pp. 995-1027.

# Market transparency (3)

## Empirical studies on electricity market

**How information sharing can facilitate market manipulation?**

- Producers in the southern Norway price zone utilize information on available transmission capacity to induce transmission congestion in their price zone to exercise market power (Mirza and Bergland, 2015)
- Release of news about sudden production failures is a result of economic incentives as well as of technical problems – Nord Pool. (Lazarczyk and Fogelberg, 2014)
- Producers using marginal technologies (hard coal and gas) use failures to increase prices – the German-Austrian market. (Bergler et al., 2017)

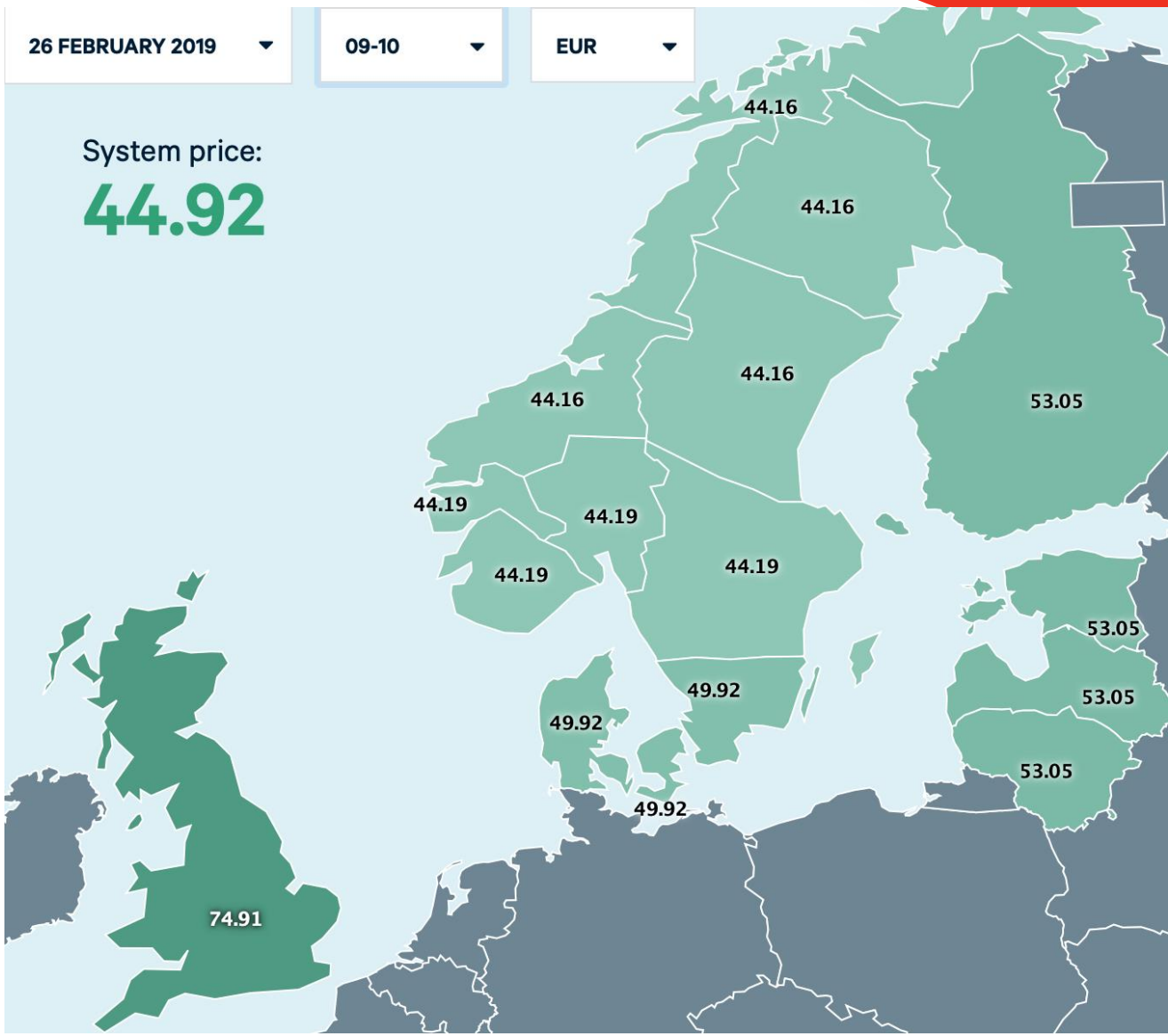
# Research question

**Study the effect of two major EU regulations** that have increased the amount of data available on the European Electricity system

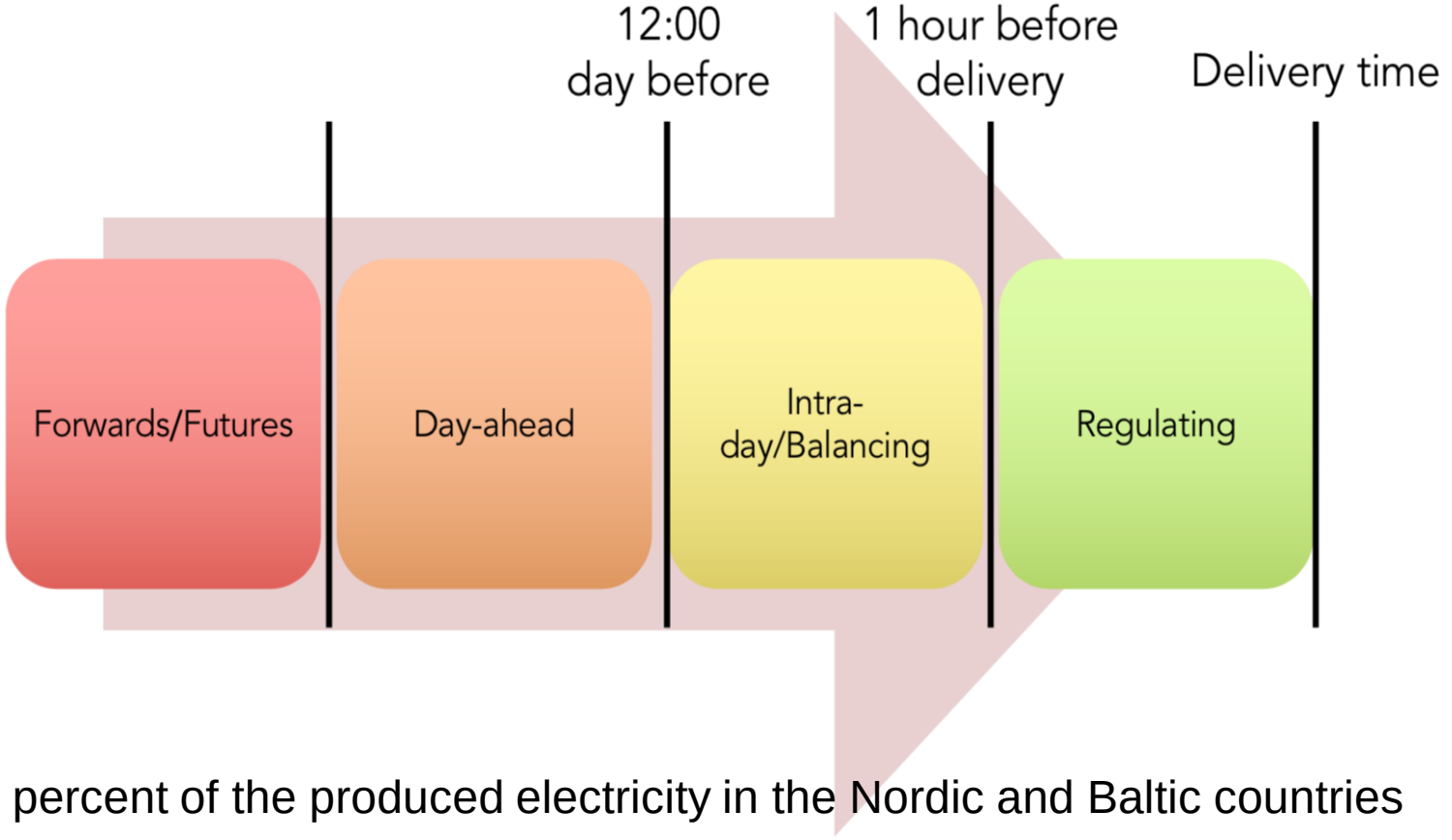
**Implementation of REMIT and SPDEM**

# Nord Pool

- Energy mix: large shares of hydropower and nuclear
- Increasing but relative small share of RES (25% in 2045)
- A well-developed liquid market, with a limited geographical scope, in case of congestion splits into regions which are under the same regulatory regime



# Sequence of markets

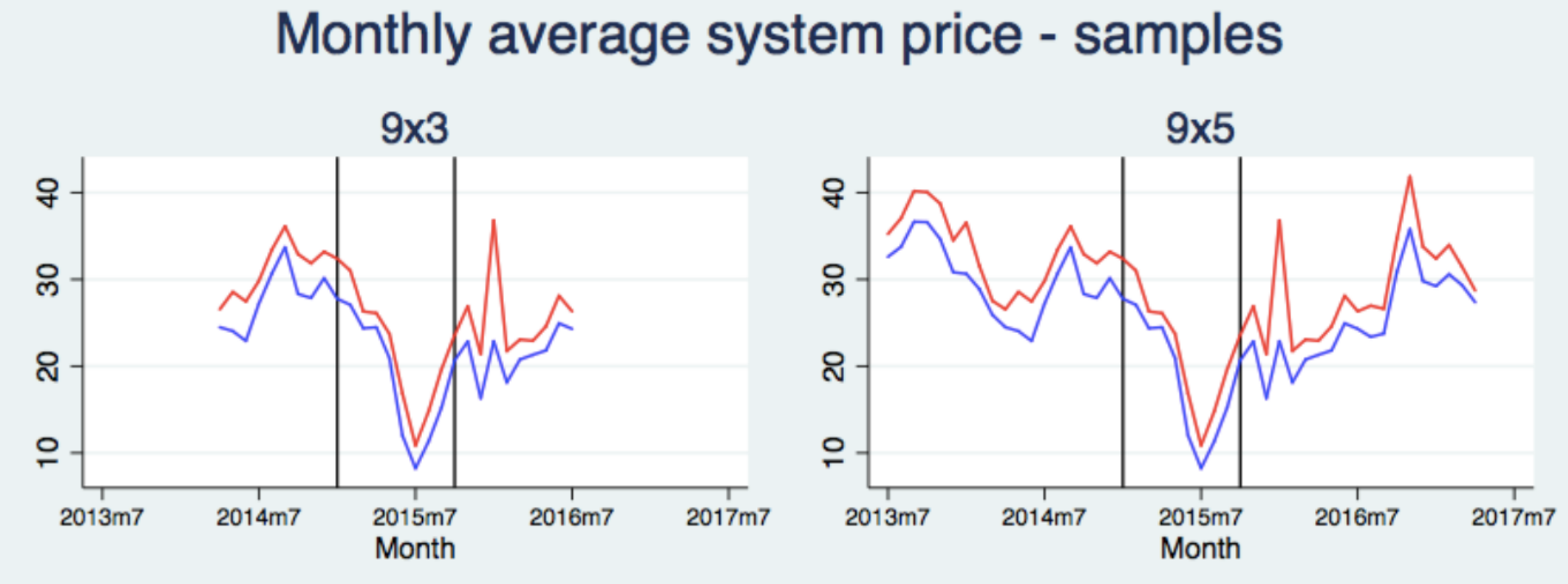



- More than 95 percent of the produced electricity in the Nordic and Baltic countries is traded at the day-ahead market Elspot
- Elspot in 2017 was 394 TWh the corresponding figure for Elbas was only 5.5 TWh.

Source: IAE 2016

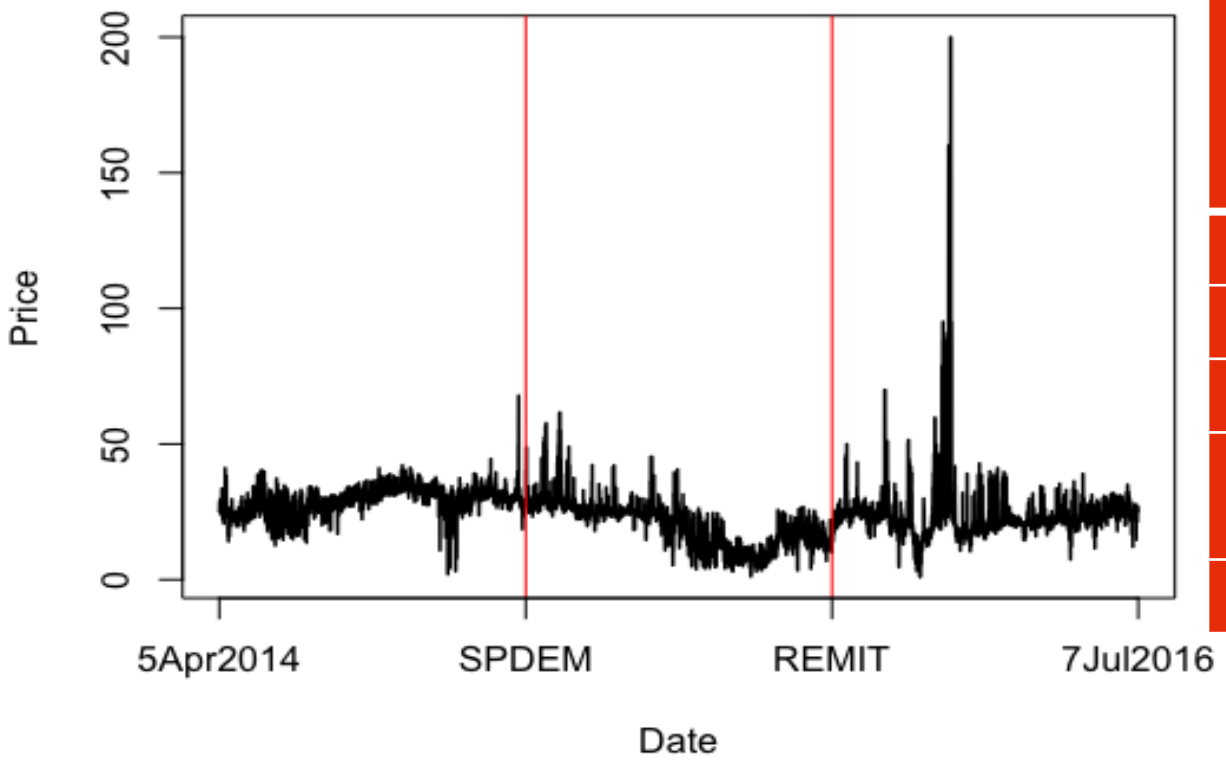
# Research question

1. Analyze the effect of transparency on the mean level of prices
2. Analyze the effect of transparency on the volatility of prices



# Data

- Nord Pool day-ahead hourly data for 2014 – 2016.




| System price | Before the 1st reform | In between the two reforms | After 2nd reform |
|---|---|---|---|
| Min | 2.00 | 1.15 | 1.14 |
| max | 67.83 | 61.63 | 199.97 |
| mean | 29.37 | 20.41 | 23.50 |
| sd | 5.301257 | 8.267101 | 8.934503 |
| obs | 6601 | 6599 | 6600 |

# Data

- Nord Pool day-ahead hourly data for 2014 – 2016.
- Implementation of SPDEM and REMIT reforms
  - First step: increase of public information
  - Second step: an increase of amount of information available to the regulator
- Data quality issues:

# Data

- Nord Pool day-ahead hourly data for 2014 – 2016.
- Implementation of SPDEM and REMIT reforms
- Data quality issues:

# Empirical strategy – Model A

$$System\ price_t = \alpha_0 + \alpha_1 PeakHours + \beta_1 Post\_reform_{it} + \beta_{2,i} PeakHours_t * Post\_reform_{it} + \alpha_2 wind_t + \alpha_4 Reservoirs_t + \alpha_5 Production_t + \alpha_6 ETS_t + \alpha_{10} Holidays + \alpha_{11} Weekday + \alpha_{12} Month + \alpha_{13} Year + \varepsilon$$

- System price – hourly data NordPool day-ahead price
- *Post_reform* - 7 Oct 2015

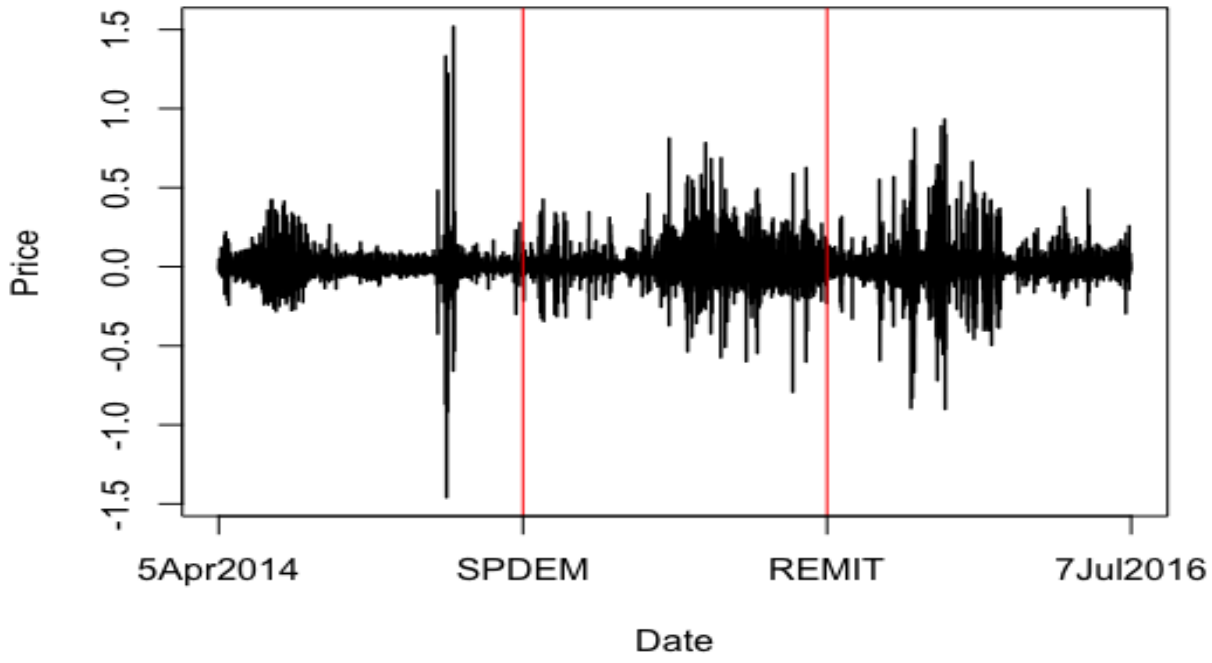
| | 9 months before and after | 18 months before and after |
|---|---|---|
| **Post-REMIT reform dummy** | -9.824*** | -10.20*** |
| **Peak hours** | 0.0490 | 0.0763 |
| **Peak x Post-REMIT reform dummy** | 0.320** | 0.167* |
| **Wind generation** | -0.000751*** | -0.000876*** |
| **Hydro reservoir** | -8.91e-05*** | -0.000278*** |
| **Production** | 0.000517*** | 0.000479*** |
| **EU ETS price** | 0.149 | 0.847*** |
| **Temperature** | -0.0246* | -0.143*** |

# Conclusions from Model A

- Mean prices have dropped by ~9 € after the implementation of both reforms
- This would indicate the procompetitive effect of both reforms
- Peak prices after reforms have increased as compared with off-peak prices

- **But what can we observe if we look at volatility of prices?**

# Data – Model B




$$R_t = \ln\left(\frac{price_t}{price_{t-1}}\right)$$

# Empirical setup – Model B

GARCH model with ARMA adjustment for autocorrelation and external regressors.

$$R_t = \mu + \gamma Wind_t + \varepsilon_t \qquad (1)$$

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 \qquad (2)$$

2 characteristics of electricity prices:

- Mean reversion
- Clustered volatility

# Results from Model B

| Coefficients | Before the 1st reform | | In between the two reforms | | After 2nd reform | |
|---|---|---|---|---|---|---|
| **Wind** | 0 *** | | 0 *** | | 0 *** | |
| | 0 | | 0 | | 0 | |
| **Omega** | 0.000004 | *** | 0.000284 | *** | 0.000199 | *** |
| | 0 | | 0.000021 | | 0.000015 | |
| **alpha** | **0.050000** | *** | **0.584106** | *** | **0.597597** | *** |
| | 0.001552 | | 0.022003 | | 0.018915 | |
| **beta** | **0.900000** | *** | **0.414893** | *** | **0.401402** | *** |
| | 0.001729 | | 0.017081 | | 0.018346 | |
| | | | | | | |

# Conclusions

- We observe a procompetitive effect on the mean level of prices after implementation of both reforms
- However price volatility has increased
  - Indicating that periods with extreme prices were more frequent
- More frequent price spikes might indicate market manipulation

# Conclusions

- Contribution to the policy debate on electricity market performance currently taking place in Europe and elsewhere.
- Electricity is a homogenous good but electricity markets around the world are heterogeneous by design.
- This variety of market rules may suggest that an optimal set of rules has not yet been identified.
- The literature about information disclosure on the performance of electricity market is scarce
- Countries who share electricity grids and hope for competitive prices, do not always have the same information disclosure rules
- This is especially important as EU countries are moving towards higher transparency and other countries follow in their step – for e.g. Turkey.

# Thank you!

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