

Analysing and forecasting zonal imbalance signs in the Italian electricity market

Francesco Lisi^{} and Enrico Edoli[†]*

Executive summary

Balancing and ancillary services markets are part of any electricity market, and the Italian market is no exception.

Balancing refers to the situation after markets have closed in which a transmission system operator (TSO) acts to ensure that demand is equal to supply, in and near real time.

In this context, the Italian market is divided in (macro-)zones. The zonal imbalance is the algebraic sum of the energy bought and sold by the Italian TSO, inside each zone, for balancing purposes. The sign of the zonal imbalance is important due to its economic consequences. Indeed, usually, for some consumption/production units the price at which they buy/sell energy in the ancillary services market differs from that settled on the day-ahead market, and the opportunity to make a profit depends only on the zonal unbalancing sign.

This point is of great interest for market operators and great concern for the Italian energy authority. Ideally, indeed, the zonal imbalance sign (ZIS) should not be predictable and producers should not imbalance voluntarily. However, to the best of our knowledge, there are no studies on this issue.

The aim of this paper is to fill this gap by looking at the dynamics of the historical time series of the imbalance signs and by analysing and modeling possible dependence structures. First, an analysis of the statistical and dynamical features of ZISs is provided. Then, several models for binary data are identified, estimated and compared in-sample. As these models provide the probability of a positive (negative) ZIS, different rules to translate the probability in a prediction of the sign, are discussed. Later, the models' out-of-sample predictive performance is considered and some strategies to exploit the predicted probability are also proposed. Finally, a simulation study is conducted to evaluate the economic benefits of using of the proposed model and strategy.

The analyses provide evidence that the ZIS is 'predictable', in the sense that it depends on past information and that the level of predictive accuracy depends on the load periods, as well as on past history and on the rule translating the probability of a positive imbalance sign into a sign prediction. Finally, it is shown that the information produced by a suitable model, together with a proper strategy, leads to a significant economic return.

The outcomes allow a more in-depth knowledge of an important, and not enough studied, topic. In addition, analyses and results are useful for market operators and for the Italian energy authority to prevent possible abuses.

Keywords: Balancing and ancillary services markets, IPEX market, Zonal imbalance sign, Binary data models, Forecasting..

^{*} Corresponding author: Department of Statistical Sciences, University of Padua, Italy. E-mail: francesco.lisi@unipd.it

[†] Phinergy Srls, Padua, Italy