CONVERGENCE ACROSS EUROPEAN ELECTRICITY WHOLESALE SPOT MARKETS: STILL A WAY TO GO.

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Overview
The creation of a genuine pan-European electricity market has been a priority for policy makers since the end of the 1980’s. Over the past two decades, Member States of the European Union have radically reformed their electricity supply industries, dismantling vertically integrated state-owned supply companies and removing barriers to cross-border trade, which included the development of new interconnection capacity across Europe. Electricity markets integration has as its cornerstone the integration of national wholesale spot markets, as these markets establish prices that are passed on to final consumers. In theory, the Law of One Price implies that if wholesale electricity markets are perfectly integrated across Europe, electricity should be sold for a common price. In practice, interconnection congestion across European transmission networks is one factor which causes electricity price divergence between markets. Employing wholesale spot prices of Austria, Belgium, Czech Republic, France, Germany, Greece, Ireland, Italy, Poland, Portugal, Scandinavia, Spain, Switzerland, the Netherlands and the UK to January 2012, the convergence between these markets is identified. The results of this paper show that the European policy measures of the past two decades have not yet fully delivered their promises.

Methods
This paper evaluates convergence between 105 wholesale spot market pairs discriminating between achieved and on-going convergence. Pairwise fractional cointegration relations are estimated to check whether market integration has been achieved by January 2012, while time-varying pairwise relations are estimated to evaluate whether convergence is instead an on-going process.
In addition, estimations of multivariate GARCH models are carried out to provide an assessment of returns volatility transmission between markets belonging to common electricity regions, namely North-Western Europe, Central-Eastern Europe and Central-South Europe.

Results
The results of the fractional cointegration analysis highlight that all the 105 pairs of prices are fractionally cointegrated, though the majority of 99 market pairs (94% of pairs) do not display evidence of achieved convergence, i.e. perfect integration.
The results of the estimation of the time-varying models allow the classification of the 105 pairwise relations into four broad groups according to the degree of convergence displayed. These groups are markets that display clear evidence of on-going convergence; mixed evidence of convergence; seasonal convergence and no convergence. Market pairs displaying a clear evidence of on-going convergence all belong to the areas of Central-Western and Central-Eastern Europe; 20 pairs (or approximately 19% of pairs) are included in this group. Among them, are the market pairs of Netherlands-Germany, Germany-Czech Republic, and Spain-Portugal, for which convergence can be attributed to the increase in cross-border trade that has occurred over the past ten years. On-going convergence is present between markets that do not share a common geographical border, but in the majority of cases, share at least one border with Germany.
Market pairs that show mixed evidence of convergence include both markets that are directly interconnected, e.g. France-Switzerland, and markets that are geographically distant, e.g. Belgium-Austria. In total 17 market pairs (or 16% of market pairs) exhibit mixed convergence. A number of market pairs, including Austria-Switzerland, Germany-Switzerland, Netherlands-Switzerland and Czech Republic-Switzerland, display mixed evidence of convergence with a seasonal pattern that features convergence during the spring and summer periods and divergence during the periods of autumn and winter. This is not surprising, as traditionally it is during cold seasons that interconnector congestion is more likely allowing the local suppliers to exert market power and in so doing to increase the national wholesale electricity prices. However, for the majority of market pairs, 64 in total (or 61% of market pairs), no evidence of convergence is found. Of particular interest the Greek, the Italian and the Irish markets do not converge to any other market in the sample and that the Nordic market converges only to the Czech market.
Another means of determining market integration is by analysing returns volatility transmission across markets via MGARCH models. The choice of modelling returns volatility rather than price volatility is made to avoid the issues associated with the non-stationarity feature of the price series. To check whether convergence is a regional phenomenon, the estimations of MGARCH models for volatility transmission are carried out for
markets belonging to the same geographical area. Therefore, the 15 markets are grouped into three broad areas: North-Western Europe, including Ireland, UK, Netherlands, Belgium, France, Germany and Scandinavia; Central-Southern Europe, including Germany, France, Spain, Portugal, Italy, Switzerland, Austria and Greece; Central-Eastern Europe, including Austria, Czech Republic, Germany and Poland. The estimations of dynamic conditional correlations (DCC) models indicate the presence of significant and positive volatility spillovers across each of the specified regions. The DCC statistics for the North-Western area indicates that all European continental markets exhibit strong returns volatility spillovers (with correlations on average larger than 0.8), while correlations between peripheral markets, such as the UK and the Irish markets, and all the other markets are rather weak. The Nordic market displays an intermediate level of correlation with other European continental markets (around 0.65).

In Central-Southern Europe the pairs of core European countries, including Germany-Switzerland, France-Germany, Austria-Germany and Germany-Switzerland, and the pair Spain-Portugal feature a very strong level of correlation (on average above 0.7). Volatility spillovers between separated markets, namely Greece, Spain and Portugal, and the rest of Central-Southern Europe, are less pronounced, since correlations are always below 0.4.

In Central-Eastern Europe, Austria-Germany and Austria-Czech Republic feature strong volatility spillovers (correlations are above 0.70), while Germany-Czech Republic, Germany-Poland and Poland-Czech Republic show an intermediate level of correlation (between 0.5 and 0.63).

Conclusions

This paper contributes to the existing literature on market integration in European electricity markets using a large dataset of spot prices that includes data of Austria, Belgium, Czech Republic, France, Germany, Greece, Ireland, Italy, Poland, Portugal, Scandinavia, Spain, Switzerland, the Netherlands and the UK, updated to January 2012. The fractional cointegration analysis that has been conducted to find evidence of full market integration across countries highlights that European markets have not yet achieved complete integration. These results confirm the findings of previous work, including that of Zachmann (2008) and Bosco et al. (2010). The analysis on on-going convergence indicates that 41 market pairs (or 39% of market pairs tested), all belonging to the core countries of Continental Europe, display evidence of convergence, either on-going or mixed. On the other hand, 64 pairs (61% of market pairs) do not show any sign of convergence. In particular, it emerges that peripheral electricity markets of Greece, Ireland and Scandinavia show little evidence of convergence to other markets. Moreover, the Italian market, though geographically near to the major continental markets, does not exhibit evidence of convergence to other markets. This is because the production mix of Italy is very unbalanced towards fossil fuels plants and natural gas plants turn out to be marginal much more than in other countries. The analysis of returns volatility spillovers confirms that the level of interconnectivity and geographical proximity play the most important roles in explaining volatility transmissions across markets and hence market integration across European countries. Significant and positive volatility spillovers across Europe are suggested by the positive and significant DCC estimates at the 1% level. Overall the findings of this analysis highlight that the policy measures undertaken in the past two decades have been only partially successful in delivering the internal electricity market. If, on the one hand, major markets of continental Europe have substantially converged over the last five years, on the other hand, some country-specific factors still predominate in determining prices for peripheral markets poorly interconnected with the core of Europe.

References


