Electricity Market Integration, Decarbonisation and Security of Supply: Dynamic Volatility Connectedness in the Irish and Great Britain Markets

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This study investigates the volatility connectedness between the Irish and Great Britain electricity markets and how it is driven by changes in energy policy, institutional structures and political ideologies. We assess various aspects of volatility connectedness between 2009 and 2018. Among other implications, our results suggest that supporting renewable generation by setting an appropriate carbon price in interconnected wholesale electricity markets will improve market integration.

The integration of wholesale energy markets remains a prioritised policy instrument in delivering the three distinct but interrelated energy policy goals of affordability, security of supply and environmental sustainability. Especially through the pursue of the last policy goal, the volatility in the wholesale electricity market is expected to rise with growing shares of renewables with intermittent supply characteristics. Therefore, investigating the presence of asymmetric volatility connectedness in electricity markets is important in order to trace the source (institutional, policy-oriented or events driven) of connectedness. Further, examining the volatility connectedness of spill overs as well as its dynamics help to study information efficiency and additionally, contribute to under-standing the volatility transmission mechanism.

Static analysis: average unconditional connected-ness of volatilities over sample period.

Dynamic analysis: volatility connectedness at given day which is highly conditional on changes absorbed by market (events, policy reforms, market re-designs).

Figure 1: Definition of static and dynamic analysis [1,2]

We examine volatility connectedness in the interconnected wholesale electricity markets between Ireland *(all-island Single Electricity market)* and Great Britain *(wholesale electricity market)* from static vs dynamic and symmetric vs asymmetric angles (Figure 1 and Figure 2). Great Britain and Ireland were chosen due to the need of accommodation of energy and environmental policy changes in line with the European Commission Directives as well as broader institutional and political changes such as Brexit.

"Good" volatility / positive realized semi variances: variation caused by positive changes in electricity prices.

"Bad" volatility / negative realized semi variances: associated with uncertainty due to negative movements in prices.

Figure 2: Decomposition of volatilities

The difference between symmetric and asymmetric volatility connectedness is explained in Figure 3. In general, the average level of volatility in Ireland is greater than in the Great Britain market and for both markets, the data shows that the mean and the median of the logged volatilities are very close to each other indicating their near symmetric distributions.

Symmetric volatility connectedness cannot capture how physically interconnected markets are linked through the level of asymmetry of returns distribution.

Asymmetric volatility connectedness tends to be a source of contagion[2] but traces the source of connectedness.

Figure 3: Definition of symmetric and asymmetric volatility connectedness

The **static analysis of the volatility connectedness shows that the volatility connectedness is low and time varying.** This is explained by the inefficient flows across the two interconnectors between Britain and Ireland up until 1 October 2018 when market coupling took place[3]. However, important events, policy reforms or market re-designs could significantly boost the volatility connectedness more than double than its unconditional level when absorbed by the markets. The **asymmetric analysis** shows that the magnitude of good unconditional volatility dominated connectedness is marginally larger than that of the bad unconditional volatility connectedness over the period from 2010-2018. The growing similarity of the markets mostly in form of convergence in energy generation technologies can be the reason. Further, we observe frequent interchanges regarding the dominant role of good and bad volatility in driving the volatility connectedness, due to the changes in the leading role of each market in originating this interrelationship.

The **dynamic symmetric volatility connectedness between the two markets is time varying and the analysis shows that there are notable periods when the volatility connectedness between the two markets remains at a relatively high level. These shifts are conditional on significant policy changes and events, which may cause significant dynamics in Great Britain and/or Ireland**. The dynamic asymmetric analysis shows that in terms of magnitude, the dominance of good volatility connectedness is slightly larger than that of the bad volatility connectedness in general but ad interim, there is a higher frequency observable at which the volatility connectedness switches to the regime dominated by the bad volatility connectedness compared to the reserve direction.

The results suggest that good volatility levels would be even higher once the Irish market adopts the carbon price floor. Thus, **supporting renewable generation by setting an appropriate price of carbon in interconnected wholesale electricity markets will improve market integration**. These findings are not only relevant for the EU but for all institutions responsible for improving market integration.

References:

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