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IGU

Hub prices correlation in Europe

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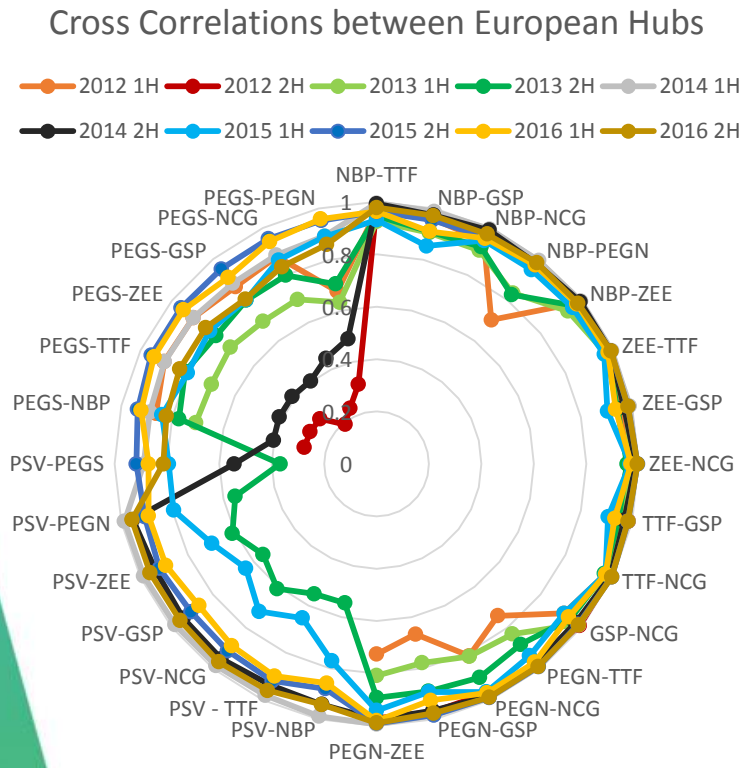
Purpose of the study

- Liberalization of gas markets in Europe, fostered by EU directives, led to the formation in the last twenty years of national or regional gas marketplaces, or “gas hubs”, physical or virtual, where gas-to-gas competition resulted in market prices theoretically independent of the traditional oil linkage
- Interconnection between hubs, if sufficient, should lead to high correlation between the hubs’ prices, with the differences between prices equal only to transportation costs
- Analysing the hub prices differentials in Europe was one of the issues selected by IGU’s Strategy Committee Pricing Group to address in the 2015-2018 triennium

Cross-correlation as a measure of hub linkage

- Cross-correlations between hub prices, using the Pearson Product Moment correlation coefficient applied to daily volume weighted average prices, were computed for several six-month periods from 2012 to 2016
- Data sources were found to be relevant specially for lower liquidity situations, but without changing qualitative conclusions
- Correlation analysis is a sound tool for the identification of the quality of markets hubs' integration, and a minimal value of 0.8 is needed for a reasonable correlation between hubs
- Other magnitudes, like the difference between price spreads and transport costs between the hubs, may give us additional insight in the degree of integration between two markets

Correlations between selected European hubs

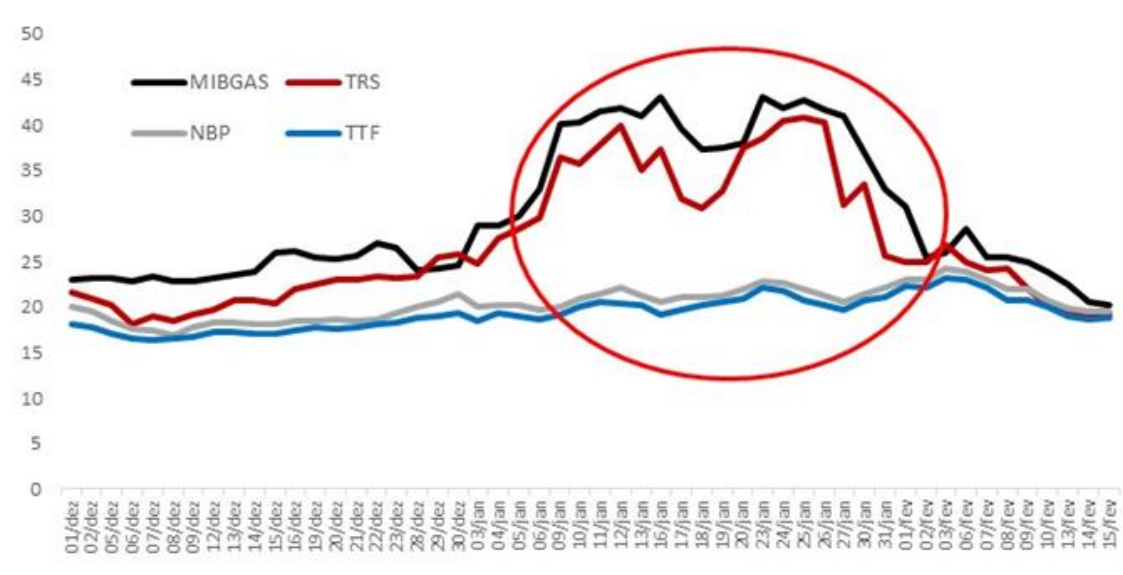


- A core group of North West Europe hubs (NBP, TTF, Zee, NCG, GSP, possibly PEGN as of today)presents very high correlation;
- This group is functioning as a single market and price signals are efficiently transmitted among them;
- De-linkage and barriers (possibly of diverse nature) to trade exist in other hubs, namely PSV, PEG Sud/TRS and now Mibgas

Causes for de-linkage

- Physical: limited interconnection, limited storage or regasification capacity, dualization of products (Pipe vs. LNG)
- Contractual: hoarding, destination clauses
- Regulatory: lack of UIOLI, conservative capacity definition in interconnection or storage, tariff pancaking, non-cost reflective tariffs or balancing penalties structures, asset usage barriers (fixed costs, guarantees), regulatory requirements that destroy the forward curve (EMIR, REMIT, MAD and so on)

De-linkage costs : an example



- Between the 19/12/2016 and the 30/01/2017 the spread between the TRS and the TTF reached values of almost 20 €/MWh
- This results in a transit extra-cost in the south-western markets, during this short period only, in the range of 20 to 80 M€, depending on the level of capacity considered and the ability of LNG deviations to smooth differentials
- The “cost” of this small crisis is of the order of magnitude of a 200 km high-pressure interconnection pipeline

Conclusions

- European gas hubs prices exhibit positive cross-correlations and a sub-set of these hubs located in NW Europe shows very strong correlation and thus a substantial integration of the respective regional market
- Another sub-set, peripheral to the previous, exhibits weaker correlations, permanently or occasionally
- Analysis of low correlation situations allows to identify different mechanisms causing hub pricing de-linkage, either physical (insufficient capacity) or contractual (hoarding) or regulatory
- Simple examples show that congestion costs arising from hub prices de-linkage can easily reach values equivalent to the investment costs of capacity reinforcement
- Recommendations can thus be made to authorities, regulators and TSOs for the improvement of integration of regional markets by eliminating such hub prices de-linkage causes; they include both measures to eliminate barriers and to foster liquidity