

Derisking Electricity Prices For Decarbonisation

A novel perspective on market incompleteness through irreversibility

Motivation

The lack of long-term electricity contracting has remained an unresolved issue in European markets, with growing implications for decarbonising industries.

We offer a new explanation for electricity market incompleteness by developing a bilateral contracting model between electricity producers and consumers, that incorporates risk aversion and investment irreversibility.

Research Questions



What underlying reasons can explain electricity market incompleteness?

• How can we support the

We then calibrate the model using the example of a Power Purchase Agreement between a decarbonising industrial firm and a low-carbon electricity producer. **European industry** in mitigating electricity price risks?

 Which factors drive willingness to engage in long-term electricity contracting?

Methodology

We consider **two agents** with **symetric profit functions**: An industrial firm looking to decarbonise, as well as a low-carbon energy producer. They are both exposed to electricity price risk.

They have the **option to chose** from three options: investing independently, investing with a PPA, or delaying the investment. The **value of the option** corresponds to the highest-valued choice among these alternatives.



We employ a risk measure that incorporates an **endogenous risk premium**, which adjusts expectancy to reflect the inherent risk associated with the project.

Based on these computations, we are able to determine **contracting zones** between electricity producers and consumers.



Key Results



The electricity market is incomplete because existing producers and consumers cannot fully hedge their risks. This leads to a volatile electricity market, which hinders investment.



Intuitively, signing PPAs between new producers and consumers could isolate them from market volatility and allow for optimal joint investment.

We show that this intuition does not hold with irreversible investments : **No PPA can be signed**, and new entrants cannot isolate from the

Considering Irreversibility (Real Options Valuation)

missing market failure.

We conclude that completing the market through dedicated policies will help **unlock deep decarbonisation investments** in the industrial sector.

References

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