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Evaluating the power investment options with uncertainty in climate policy

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Abstract

This paper uses a real options approach (ROA) for analysing the effects of government climate policy uncertainty on private investors' decision-making in the power sector. It presents an analysis undertaken by the International Energy Agency (IEA) that implements ROA within a dynamic programming approach for technology investment choice. Case studies for gas, coal and nuclear power investment are undertaken with the model. Illustrative results from the model indicate four broad conclusions: i) climate change policy risks can become large if there is only a short time between a future climate policy event such as post-2012 and the time when the investment decision is being made; ii) the way in which CO₂ and fuel price variations feed through to electricity price variations is an important determinant of the overall investment risk that companies will face; iii) investment risks vary according to the technology being considered, with nuclear power appearing to be particularly exposed to fuel and CO₂ price

risks under various assumptions; and iv) the government will be able to reduce investors' risks by implementing long-term (say 10 years) rather than short-term (say 5 years) climate change policy frameworks. Contributions of this study include: (1) having created a step function with stochastic volume of jump at a particular time to simulate carbon price shock under a particular climate policy event; (2) quantifying the implicit risk premium of carbon price uncertainty to investors in new capacity; (3) evaluating carbon price risk alongside energy price risk in investment decision-making; and (4) demonstrating ROA to be a useful tool to quantify the impacts of climate change policy uncertainty on power investment.



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JEL classification

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Keywords

Real options; Investment; Uncertainty; Carbon shock; Climate policy

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