Risk and Return under Renewable Support mechanisms – towards a coherent framework

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Overview

We analyze how risk exposure from different support mechanisms, such as feed-in tariffs and premiums, can influence the investment incentives for private investors. The analysis is based on a net cash flow approach that takes systematic and unsystematic risks into account. Furthermore the different decision layers are distinguished, including regulatory settings, financing and investment decisions and operations. Risk affects the decision making through cost of capital in line with the Capital Asset Pricing Model as well as through active liquidity management. The model is applied to a specific case, a German offshore wind park. The support levels required to give adequate investment incentives are found to be significantly lower for a feed-in tariff than for a feed-in premium scheme.

Methods

This paper contributes to the debate about adequate support mechanisms by exploring risk implications of policy instruments. Thereby the impacts of policy choices on incentives for private investors are investigated in a multi-level decision model. Four levels of decision making are distinguished: 1) the choice of support mechanism and support levels by policy makers 2) the investment decision of the investors, including both the yes-no-choice and the size and type of investment 3) the financing decisions of the debt (and equity) providers 4) the operation decisions including decisions on liquidity management.
For identifying optimal decisions under uncertainty, backward induction may be used. This is equivalent to stating that rational decision makers will anticipate the impact of their decisions on further decisions and identify optimal follow-up decisions.
The approach is developed for the case of project financing, since this concept is both frequently used in practice and allows a transparent modelling of risk elements. The model aims at a theoretically sound approach consistent with empirical observations. It draws therefore from different aspects of financial theory. Systematic risk is considered based on the CAPM approach (cf. e.g. Sharpe 1964). In addition to that, unsystematic risk is included as factor in investment decision making. We consider unsystematic risk, since in practice, investors are typically not perfectly diversified or are subject to regulatory constraints. We therefore investigate optimal capital structure following the models by Bradley et al. 1984 and Schaeffler 2013. Moreover, liquidity management is explicitly considered during the operation phase considering that management has incentives to avoid costs from financial distress (cf. Schober et al. 2014) – but this will also lower expected returns.

Results

The developed model is applied to a specific case, an exemplary offshore wind project in the German Baltic Sea. The assumptions taken for the cash flow analysis are chosen in line with actual projects. The price and quantity risk models are calibrated on historical data.
Preliminary results indicate that the support levels required to give adequate investment incentives are for a feed-in tariff scheme approximately 5-8% lower than for a feed-in premium scheme. The results are strongly dependent on the support level.

Conclusions

Differences in risk exposure from the support schemes are considerable and affect the required support levels. This cannot be neglected in policy making, both when choosing between support instruments and when determining adequate support levels.