THE IMPACT OF MERCHANT RISK ON THE CAPITAL STRUCTURE OF OFFSHORE WIND FARMS

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Overview

Governments facilitate renewable energy investments through support schemes hedging the project's revenues against merchant risks - the risk of marketing variable renewable electricity at power market prices (Heiligtag et al., 2018). However, as an increasing number of offshore wind auctions result in zero bids (Bader et al., 2021; Danish Energy Agency, 2021), the role of governments in facilitating the energy transition is decreasing. Greater merchant risk exposure could alter the project's capital structure by reducing debt size and leading to higher capital costs, making the energy transition less cost-effective (Stukalkina and Donovan, 2018). This study tests the hypothesis that merchant risks lead to worse financing conditions by comparing the optimal capital structure of a hypothetical merchant offshore wind project to a project backed with a two-sided Contract for Difference (CfD).

Methods

We undertake the study within the framework of Trade-off theory suggesting that companies target a debt level that maximizes the benefits of leverage – the tax-deductibility of interest payments – up until potential financial distress costs of additional debt reduce the company value (Kraus and Litzenberger, 1973). Along those lines, our method consists of two segments. First, we use a stochastic revenue model to generate hourly revenue scenarios for the merchant and CfD-backed offshore wind project (Keles et al., 2013). We combine the model with long-term electricity price projections (Keles and Yilmaz, 2020; Umitcan et al., 2022) to derive revenue curves from 2020 to 2050. Second, we model financial distress costs as additional capital liquidity (Kitzing and Weber, 2015) required to avoid defaulting on project financing debt covenants. To find the optimal capital structure, we determine the debt level that maximizes shareholder value.

Results

Our findings confirm earlier studies that voice the need for revenue stabilization to ensure the bankability of offshore wind projects (Kitzing and Breitschopf, 2019; May et al., 2018; Neuhoff et al., 2018; Wind Europe, 2018). We find that a two-sided CfD increases debt size between 22 and 32% compared to a project with purely merchant revenues, as shown in Figures 1 a) and b). These results hold both in the case of a high and low price scenario where electricity prices peak in 2040 at 91 EUR/MWh and 61 61 EUR/MWh, respectively. To investigate the robustness of our results, we perform a sensitivity analysis on the project financing conditions and find significant potential for improving debt size for the merchant project. For instance, in the low price scenario, and under average financing conditions – including a 1.35 DSCR, an 18-year loan tenor, and interest rates of 2.95% - the merchant projects debt size would increase from 47% to 82%. Apart from the benefits of revenue stabilization via government-backed Power Purchase Agreements, these results highlight previous research findings on the importance of hedging against power price risks to increase debt size in the project financing of power plants (Guidera and Jamshidi, 2016).

Conclusions

We develop a novel method for quantifying the optimal debt size of an offshore wind farm by merging a stochastic revenue model with cash liquidity management for a project financed investment. We show that merchant risk decreases the optimal debt size for offshore wind projects, highlighting the need to stabilize revenues via measures like long-term Power Purchase Agreements. By quantifying the effect of merchant risk on the capital structure, we contribute to the ongoing policy debate on the future of support policies for renewables in Europe. To mobilize sufficient capital flows from low-risk commercial lenders and achieve European climate targets, EU governments should ensure measures to mitigate merchant risks.

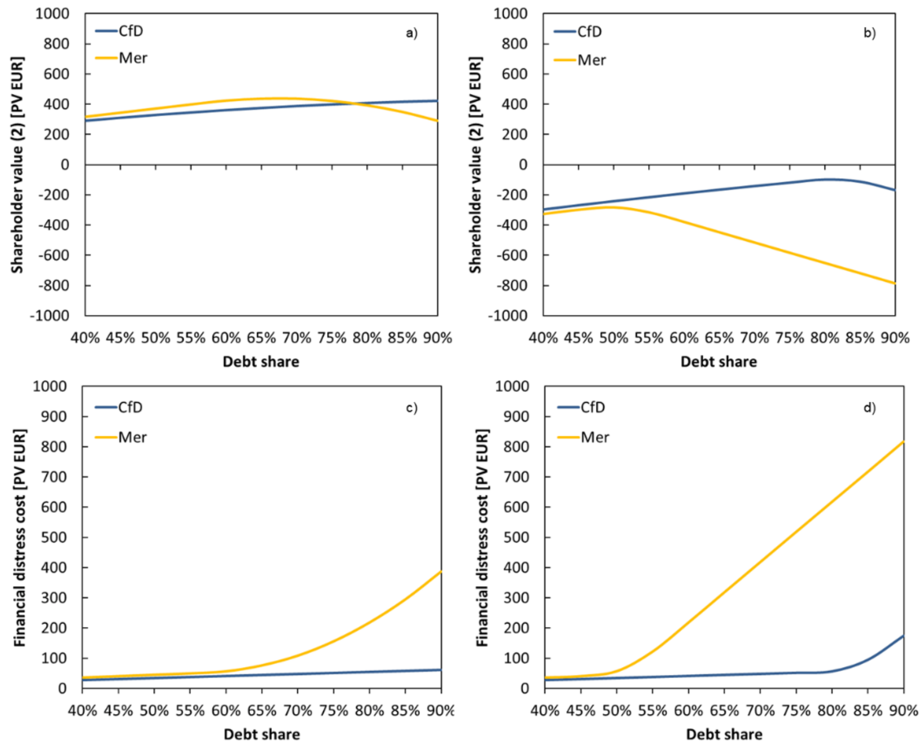

Figure 1: High and low price bases cases. Graphs a) and b) show the optimal debt shares for a high and low price scenario, respectively, while graphs c) and d) show the resulting financial distress costs. We conduct the analysis for debt size between 40% and 90%, assuming project financing

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