EVALUATING INVESTMENTS IN RENEWABLE ENERGY UNDER POLICY RISKS
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Purpose of your paper: The considerable amount of required infrastructure and renewable energy investments expected in the forthcoming years also implies an increasingly relevant contribution of private and institutional investors such as insurers. In this context, especially regulatory and policy risks have been shown to play a major role for investors when evaluating investments in renewable energy and should thus also be taken into account in risk assessment and when deriving risk-return profiles. In this paper, we provide a stochastic model framework in order to quantify policy risks associated with renewable energy investments (e.g. a retroactive reduction of a feed-in tariff), thereby also taking into account energy price risk, resource risk, and inflation risk. The model is illustrated by means of scenario analyses and applied to identify potential country diversification effects within a portfolio of renewable energy investments, which is also of high relevance for the new European risk-based insurance regulatory framework Solvency II.

Synopsis: The increasing expansion of renewable energy to reduce greenhouse gas emissions is one main goal of the Europe growth strategy 2020. To provide incentives for private and institutional investors to invest in renewable energy such as wind parks, the governments typically grant subsidy payments during the life span of the investment projects (e.g. feed-in tariff (FIT)) (Turner et al. (2013, p. 6)). In this context, policy risks have been identified as one of the most prominent risks as the uncertain future of the policy support schemes for investments in renewable energy projects implies a high degree of uncertainty regarding future cash flows (Micale et al. (2013), Jin et al. (2014), Gatzert and Kosub (2014)). In Spain, Bulgaria, Greece, and the Czech Republic, for instance, the guaranteed feed-in tariffs have recently been reduced retroactively for solar parks, thus implying a considerable reduction of investors’ returns.

Hence, policy (or political) risks play a major role for investors when evaluating investments in renewable energy projects and should be taken into account when establishing risk models and when deriving risk-return profiles. In this context, especially country diversification effects may help to reduce regulatory and policy risks associated with renewable energy investments in different countries for diversified portfolios. The aim of this paper is to develop a model to quantify policy risks based on a qualitative risk assessment by experts using fuzzy numbers, which will be applied to identify potential country diversification effects that may reduce the overall risk of a portfolio of renewable energy investments. We thereby also take into account energy price risk, resource risk, and inflation risk.

Overall, while previous literature has emphasized that policy (political) and regulatory risks are among the most relevant risks for investments in renewable energy projects, risk mitigation and transfer is highly challenging (see Gatzert and Kosub (2014)). Sachs, Tiong and Wagner (2008) include regulatory risks into their political risk analysis and use a method based on fuzzy numbers to quantify regulatory risks based on qualitative information acquired from experts. Reuter et al. (2012) also study...
the probability of feed-in tariff reductions as one application of their renewable energy investment approach, but without modeling the underlying risk factors and with focus on investment incentives instead of a risk assessment of existing projects in the operating phase. In general, policy risk can be expected to further increase in the future as pointed out by Turner et al. (2013, p. 7), who see a trend towards combining regulatory certainty with market-based components, as states change their support schemes to achieve cost reduction and a fairer distribution of risks.

The quantification of policy risks is challenging, and relying on expert estimations will typically be necessary as the number of comparable events, which can be used to quantify policy or political risk and to calibrate the model, is typically not sufficiently large. This is also stated by Brink (2004), for instance, who points out that the measurement and observation of political risk to a great extent depends on subjective human judgment. Therefore, if objective probabilities for policy risk factors cannot be obtained, one needs to revert to experts (see also Sadeghi, Fayek and Pedrycz (2010)). In this paper, we will make use of fuzzy set theory, which provides a methodology for 1) handling subjective and linguistically expressed variables and 2) for representing uncertainty in the absence of complete and precise data (see Sadeghi, Fayek and Pedrycz (2010)). Regarding the cash flow model, we extend the approach in Campoccia et al. (2009) and follow Monjas-Barroso and Balibrea-Iniesta (2013) to model energy prices at the exchange using a mean-reverting process, which can also be extended. Inflation risk is modeled using the Vasicek (1977) model. The developed model will be exemplarily applied to the evaluation of onshore wind parks including a risk of a retroactive reduction of a feed-in tariff, but it can also be applied to other renewable energy investments such as solar parks, for instance, and also take.

Establishing an adequate risk model and conducting risk assessment is of particular relevance for institutional investors such as insurers in order to derive risk capital requirements imposed by regulatory authorities and to ensure a certain safety level. The quality of such risk models will thus have a major impact on the attractiveness of investments in renewable energy due to high costs of capital arising from solvency capital requirements when using the standard model, where an internal model may lead to lower capital requirements (depending on the specific investment). As the previous literature has emphasized that policy risks play an important role, investors such as insurance companies should thus closely monitor and assess these risks. We provide a model framework for quantifying policy risks using fuzzy set theory, which also takes into account energy price risk, inflation risk and resource risk. While the quantification of policy risks comes with challenges, our approach provides first relevant insight for investors into main drivers and diversification benefits associated with policy risks.

Our results emphasize that policy risk can have a major impact on an investor’s risk-return profile. Policy risk is thereby driven by several risk factors and politics should be careful with actions which can worsen one or more of these risk factors. Even a political discussion, e.g., the discussion about a minor retroactive reduction in Germany (“EEG-Soli”), without an actual impact can lead to increasing values of some risk factors (e.g., political instability). This could either decrease the investments in renewable energy and could cause the failing of renewable energy aims, or increase costs as investors generally require a premium for taking the additional risk. Furthermore, politics should behave consistently even in areas not directly link to renewable energy in order to not
Contribute to an increasing policy risk. Inconsistent behavior towards investors in different areas (e.g., public-private partnerships in the case of infrastructure projects) may cause risk factors to increase. We further show that diversification has a crucial impact on risk-return profiles of investors when dealing with policy risk. Countries with low policy risk may potentially use this fact to decrease subsidy payments granted to the operators of wind farms, as investments in these countries will nevertheless be taken into account in order to reduce the overall risk through diversification.

References


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