THE RELATIVE IMPORTANCE OF BEHAVIORAL FACTORS IN PHOTOVOLTAIC PROJECT FINANCING

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(1) Overview

Global investment in renewable energy has increased by 17 percent to around $257 billion in 2011 (FS-UNEP, 2012) – but nevertheless, this is only a fraction of what will be required for the transition to a worldwide sustainable energy system. Thus, substantial financial investment from both the public and private sectors are still needed over the next decades in order to achieve the goals set for renewable energy deployment and carbon emissions.

Solar photovoltaic (PV) is one of the most important renewable energy technologies with the highest share of newly installed power generation capacity in the European Union in 2012 (16 GW, i.e. 37% of total capacity, incl. non-renewables) (EWEA, 2013). Even though the costs of PV modules have sharply declined over the past years, changing policy frameworks and weakening policy support in different European countries put high pressure on PV project developers. Project developers more and more struggle to secure adequate funding for their projects as banks and equity investors only cherry-pick projects they deem to be of 'highest quality' according to their criteria and internal guidelines. The question in the market arises what 'high quality' actually means and how capital market actors trade off different financial and non-financial quality criteria.

We build on previous research in this area (Lüdeke-Freund & Loock, 2011; Hampl et al., 2011; Lüdeke-Freund et al., 2012) and conducted a ratings-based conjoint experiment comprising 691 hypothetical financing decisions made by 58 banks and equity investors (50% each) mainly from Europe. Our results strengthen the findings that non-financial factors, such as module brands, play a significant role in PV project finance (Lüdeke-Freund & Loock, 2011), whereas this 'brand effect' is much stronger pronounced among equity investors than among banks.

(2) Methods

This study followed a two-step methodological approach. In a first, qualitative step, 20 experts from the fields of PV project development, financing, services and components manufacturing in Germany and China where interviewed between September 2010 and January 2011. These in-depth interviews resulted in about 30 hours of recorded material that was transcribed, screened and partly coded to identify the most relevant project characteristics from lenders', equity investors', and project developers' perspectives (Hampl et al., 2011; Lüdeke-Freund et al., 2012). The initial set of attributes and levels that was used in a preliminary study (Lüdeke-Freund & Loock, 2011) could be refined and refocused for the purposes of the study at hand.

This final list of attributes and levels (cf. Figure 1) was pretested with industry representatives and in a second step a ratings-based conjoint experiment was designed. Conjoint analysis uses an indirect questioning method by applying a 'decompositional' approach to study decision-making processes (Green & Srinivasan, 1990). The preferences, i.e. average part worths and relative importance weights of each of the attributes and attribute levels are derived from the decisions made in the choice or rating/ranking tasks (Green & Srinivasan, 1990). Conjoint analysis has successfully been applied in studying renewable energy project financing and policy preferences in the past (e.g. Lüdeke-Freund & Loock, 2011; Lüthi & Wüstenhagen, 2012).

Two separate questionnaires were used, which were fully identical except for the financial attribute included in the conjoint design, where we included the internal rate of return (IRR) in the survey for equity investors and the debt service cover ratio (DSCR) in the bank survey. We calculated the part-worth utilities by applying a hierarchical Bayes model using Sawtooth Software (Sawtooth Software, 2002). Besides the conjoint experiment we also gathered demographic characteristics, information about the company the respondents work for and image ratings for the module brands included in the conjoint design.

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(3) Results

58 banks and equity investors (50% each) mainly from Europe took part in the conjoint experiment and conducted 691 hypothetical financing decisions in total, i.e. about 12 decisions per respondent. Our results show that the relative importance of the attributes included in the conjoint experiment differs between banks and equity investors in various aspects. Banks rate project location as the most important financing criterion (30%) relative to the other factors included in the design (in descending order according to their relative importance): debt service cover ratio (DSCR) (24%), module brand (17%), equity ratio (16%), and track-record of the EPC contractor/project developer (13%). Equity investors primarily focus on the internal rate of return (IRR) as the most important investment criterion (30%), followed by the module brand (24%), project location (23%), track-record of the EPC contractor/project developer (12%) and equity ratio (11%). The findings reveal that equity investors actually pay higher attention to non-financial factors such as module brands in their investment decision than banks, whereas the German module manufacturer included in the design (SolarWorld) was perceived as most favorable compared to Chinese competitors. Another finding is that the track-record of the EPC/project developer has only a minor effect on the simulated investment and financing decisions. Personal experience with the EPC/project developer has no value added for the average respondent in our study.

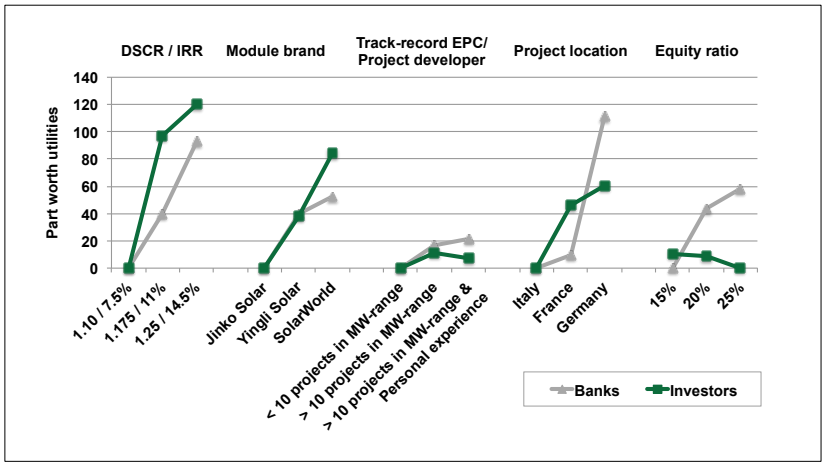

Figure 1: Part-worth utilities per attribute level based on hierarchical Bayes estimation

(4) Conclusions

In our study on PV project financing criteria and trade-offs we show that non-financial factors actually do play an important role in funding decisions by banks and equity investors. Specifically module brands seem to have high influence on investment decisions by equity investors, however IRR, as a financial performance figure, is seen as the most relevant attribute for the decision to engage in a specific PV project. The findings of our study are specifically relevant for project developers in order to better understand the funding processes and criteria of banks and equity investors. Through an optimization of their project designs project developers will be able to increase the probability of funding and can thus generate competitive advantage in the market for PV power production.

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