ASSESSMENT OF RELATION BETWEEN LEGISLATIVE RISK AND EXPECTED PROFITABILITY OF A SUBSIDIZED PROJECT

[a]SIMONA HAŠKOVÁ, [b]PAVEL ROUSEK, [c]JAKUB HORÁK

Institute of Technology and Business, School of Expertness and Valuation, Okružní 517/10, 37001 České Budějovice, Czech Republic
email: [a]haskova@mail.vstecb.cz, [b]rousek@mail.vstecb.cz, [c]horak@mail.vstecb.cz

Abstract: The paper analyses relationship between the risk of a legislative change and expected profitability of subsidized projects. Introduction in risks is given in terms of their internal and external origin with focus on legislative risk within projects subsidized from public resources. This risk is covered by some specialized ratings. The aim is to measure the legislative risk of subsidized projects. To do it, we lean on data of the rating agency Euromoney Country Risk for the selected EU countries. The input ratings are processed to capture certainty degree of legislation stability. The certainty degree induces the possible threat of subsidy cuts of the purchase price for subsidized production here expressed as indicator of market risk. Based on this, we build and apply a statistical model for estimating expected profitability of an average subsidized project of a biofuel plant measured by E[NPV]. The E[NPV] results reflect differences depending on the certainty degree according to the country the subsidized production is realized. Possible reasons for neglecting legislative risk within cash flow budgeting and profitability calculation in subsidized projects is discussed. Here performed approach to express and incorporate legislative stability by means of certainty degree and market risk is an original contribution of the paper.

Keywords: legislative risk, expected profitability, biofuel plant, financial management, project management

1 Introduction

Risks associated with business projects are generally structured in terms of their internal and external origin. The basic division of internal and external risks and their analysis is expanded by several authors into more detailed categories (see e.g., Kaplan and Mikes, 2012, pp. 2-5): „Category I: Preventable risks. These are internal risks, arising from within the organization that are controllable and ought to be eliminated or avoided; Category II: Strategy risks. A company voluntarily accepts some risk in order to generate superior returns from its strategy, which could companies further redistribute (Klieštik et al., 2020); Category III: External risks. Some risks arise from events outside the company and are beyond its influence or control.“

The distribution allows us to perceive internal risks arising within a company or a project as a more easily influenced by the enterprise. Acceptance of financial indicators is a partial help to eliminate risk (Klieštik et al., 2020; Machová and Horák, 2019). The general concept and tools of the control of internal risks for different options of risk existence enable the company to optimize risks in the case of distribution control of scarce resources (Vasilkov and Gushina, 2015). External risks are of course broader and can be broken down into the risks of the microenvironment (e.g., supplier, customer, and competitor risk) and macro-environment (e.g., legislative, tax, and economic risk). It is the competitive market environment and the environment of more concentrated markets that influence the perception of market risk (Dvorský et al., 2020). The predictive potential of bankruptcy models can be used to determine the risks arising from the companies micro and macro environment (Klieštik et al., 2018). Special attention will be further paid to the legislative risk in connection with projects subsidized from public resources.

We consider the legislative risk as the possibility of a significant change in legislation. Such a change may subsequently adversely affect investments and their returns. The unforeseen change in legislation may cause attenuation of the subsidy supply e.g., to renewable energy projects by means of economic barriers such as subsidy cuts for renewable energy, the introduction of additional tax, etc. (Pimonenko et al., 2020). The literature works with the theoretical concept of legislative risk, including its assessment and evaluation. Some authors examine the qualitative and quantitative risk assessment methodologies (Di Nicola and McCallister, 2006). General risk management guidelines can be applied to quantify legislative risk (Jeynes, 2012).

On the practical level, the legislative risk is included in subject rating (Vinš and Liška, 2005), which is widely utilized despite legitimate criticisms, which makes it an imperfect valuation tool (Hill, 2002). In accordance with (Oetzel et al., 2001) the risk associated with the possible undesirable changes affecting the projects´ profitability can be estimated from the ratings of the services to which belong the Bank of America World Information Services, Euromoney, Standard and Poor's Rating Group, Moody's Investor Services, Transparency International and others.

It is considered that investing financial resources in the subsidized projects involves risks that may prove to be greater or at least more complex than generally considered within the capital budgeting (Busse and Hefeker, 2007). The threat of any undesirable legislative change could substantially alter the prospects of the project's cash flow prognoses thus affecting the economic results of the company (De Haan and Siermann, 1996). Political and economic risks influencing subsidy policy may arise in many forms such as: a new president or prime minister coming to power, a change in the country's ruling party, the power of lobbyists, high budget deficit, corruption, etc. (Wallace and Latcheva, 2006).

The aim of the paper is to assess the risk of legislative change on the profitability of a subsidized project of renewable energy. We particularly take into account the threat of the subsidy cuts of the purchase price (feed-in tariff) for the energy produced. To measure it we derive from the data of the rating agency Euromoney Country Risk for the selected EU countries promoting production of subsidized renewable energy and therefore acting in the line with commitments of the Kyoto Protocol, which aims to combat global warming (Kyoto protocol, 1997). Based on this, we build a statistical model for estimating the expected profitability of the subsidized average project measured by E[NPV] for the given group of selected countries. In this context, the theoretical approach will be justified in the methodology and applied in the case of the project of a biofuel energy plant evaluation under consideration of legislative risk. The conclusive part summarizes procedures and states the original findings.

2 Materials and methods

The stochastic uncertainty of the business environment affects the reliability of the outcomes of managerial calculations with the subsidized projects being no exception.

The methodological approach to the profitability assessment of subsidized projects leans to the value concept (Froot and Stein, 1998) that takes into account explicit and implicit payments so that the result is a complete objective part of the economic assessment. The key decision-making criterion is presented by net present value (NPV) of the cash flow generated by the project during its life expectancy *n* (see e.g., Sayadi et al., 2014):

$$\mathrm{NPV} = \sum_{t=0}^{n} \frac{\mathrm{R}_t - \mathrm{C}_t}{(1+i)^t} \tag{1}$$

In relation (1), the variables R_t and C_t represent the revenues and costs at time *t*. In the case of a subsidized project, the discount rate *i* stands for the internal yield on investment – IRR (Horowitz, 1996). Investors, who use public sources to implement their projects, calculate with this annual yield; its size depends on the type of grant, subsidy and incentive policy. Ideally, it is equal to the alternative costs of the capital (Wiesemann et al., 2010). In the field of renewable energy projects, its size depends on adopted obligations of individual states, the condition of the government budget, intensity of lobby groups' activity and the voters' response to the rising market prices resulting from subsidies. The issue of the internal yield is therefore more or less a question of political decisions.

In terms of subsidised renewable energy projects, the unforeseen legislation changes may result in a reduction of subsidy of the purchase price of electricity produced (feed-in tariff – FIT). Under a FIT, the renewable electricity producers are paid a cost-based purchase price for the renewable electricity they supply to the grid, the access of which is guaranteed by long-term contracts (Klein et al., 2008). These purchase prices are one of the building blocks for cash flow calculations within budgeting and as such create the core of the NPV.

Risk modelling for subsidised production presents complexity due to the strong interaction between the trading of the products, the supply and demand imbalances and state of the economy and political stability. In this paper, we contemplate the market risk of subsidized energy production using a variable indicator σ expressing a ratio of the realized (actual) purchase price (P) for energy produced and the budgeted price given by the FIT (P_E).

The value of this ratio is a direct consequence of investor confidence in the stability of the legislative framework, the grade of which is measured by diverse rating agencies. To capture the risk of a legislative change, we utilize the Euromoney Country Risk rating. It includes the investment risk of a country, risk of losing direct investment and risk to global business relations; factors that are covered in ranking countries by risk are political risk, economic performance/projections, structural assessment, debt indicators, credit ratings, access to bank finance, access to capital markets, etc. (Euromoney, 2018).

2.1 Approach to the external risk measurement of subsidized projects

Let us consider the risk of legislative change of selected EU countries according to data released by the rating agency Euromoney Country Risk summarized in Tab. 1 (the original data were divided by a hundred and converted into opposite numbers in order to express the country non-risk perception – further on marked as Euromoney Index). All the selected countries in Tab. 1 are the EU members that have committed to fulfill the EU agreement set of the Kyoto protocol.

Let us denote ρ as a parameter of certainty degree represented by the value of Euromoney Index, where ρ ∈ ⟨0,1⟩; the higher the parameter ρ the lower the risk of undesirable changes relating to the legislative change that could threaten the performance of subsidized projects. The Index value ρ signals the level of confidence in the expected profitability in dependence of the country the projects are implemented.

Table 1: The assessment of the selected EU countries in terms of the quality of legislative environment measured by Euromoney Index ρ ∈ ⟨0,1⟩

Country	Euromoney Index, ρ ∈ ⟨0,1⟩
Croatia	0.517
Czech Republic	0.577
Estonia	0.7
Hungary	0.587
Latvia	0.6
Lithuania	0.61
Poland	0.64
Slovak Republic	0.598
Slovenia	0.65

Note: 0 stands for the worst assessment, 1 is the best assessment.
Source: Euromoney (2018) input data adjusted.

The legislative changes can, for instance, negatively influence the situation in the renewable energy market, as I. they contribute to uncertainty regarding the future development of profits from the renewable energy projects and II. subsidy recipients (especially in agriculture) become fully dependent on the government support, the cut of which would result in putting the project out of business in many cases (Maroušek, 2013).

In the next, we focus on the point I. within the evaluation of a subsidized bioenergy project based on the net present value (NPV). Within the calculation, we distinguish the level of risk of a legislative change described as certainty degree ρ and with it connected the market risk σ expressed by the ratio of actual purchase price of energy produced and the expected (budgeted) price.

3 Results – case study: the biofuel plant project (BSP) cash flow budgeting reflecting the market risk

To analyze the impact of a legislative change to the profitability of BSP we draw from the data of Tab. 2, in which the symbols a, b, c, d represent the values of budgeted revenues. Symbol σ is the variable parameter expressing the market risk for which it applies $\sigma = P / P_E$, σ ∈ (0,1⟩; symbols P and P_E stand for the actual purchase price for the energy produced and the expected (budgeted) price, respectively. In the case of σ = 1, the project budgeted revenues are estimated as follows: a = 1800, b = 1900, c = 2500, d = 3800; all the values are stated in thousands of euros (further marked as kEUR).

Table 2: The average yearly cash flows (CF) generated by an average BSP reflecting the market risk σ in kEUR; σ ∈ (0,1⟩

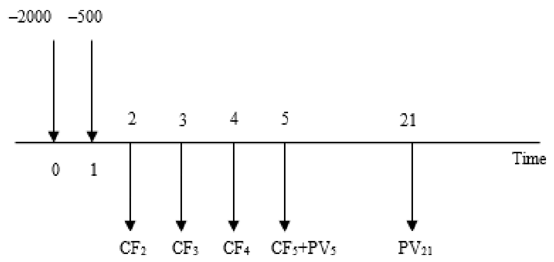
	Period (years)	0	1	2	3	4	5	6-21	22-31
	Year	2013	2014	2015	2016	2017	2018	2019-34	2035-44
1	Cap. subsidy	1000							
2	Cap. investment	3000	500						
3	Revenues			a· σ	b· σ	c· σ	d· σ	d· σ	d· σ
4	Operating costs			1400	1400	2000	2400	2400	2400
5	Depreciation in total			80	150	170	180	180	30
6	EBT (3–4–5)			a· σ −1480	b· σ −1550	c· σ −2170	d· σ −2580	d· σ −2580	d· σ −2430
7	Tax 24 % of EBT			0.24·a·σ −350	0.24·c·σ −370	0.24·c·σ −520	0.24·d·σ −620	0,24·d·σ −620	0,24·d·σ −580
8	EAT (6 – 7)			0.76·a·σ−1130	0.76·b·σ −1180	0.76·c·σ−1650	0.76·d·σ −1960	0,76·d·σ −1960	0,76·d·σ −1850
9	Operating CF (8+5)			0.76·a·σ−1050	0.76·b·σ −970	0.76·c·σ−1480	0,76·d·σ −1780	0,76·d·σ −1780	0,76·d·σ −1820
10	CF of cap. bud. (1-2+9)	−2000	−500	0.76·a·σ−1050	0.76·b·σ −970	0.76·c·σ−1480	0,76·d·σ −1780	0,76·d·σ −1780	0,76·d·σ −1820

Note: 0 stands for the worst result, 1 is the best result.
Source: Authors.

The data of Tab. 2 correspond to the CFs of an average biofuel plant built and put into operation in countries listed in Tab. 1 for the installed electrical power 1000 kW (Menind and Olt, 2009; Holm-Nielsen et al., 2009). The average BSP is financed from the firm resources and through government subsidy, here in the total amount of 1000 kEUR. The budgeted revenues and operating costs result from the expert assessment, which is based on similar projects with regard to the unique characteristics of the particular project. The purchase tariffs and operating costs are not adjusted to inflation. Therefore, Tab. 2 corresponds to the situation with zero inflation or both the cash revenues and operating costs change in exactly the same proportion as general price level.

Annual cash flows generated by the project are recorded in the last row of Tab. 2. The CFs steady state is expected from the 5th year; between the years 6-31 the CF prognosis creates two time-shifted annuities: the first, the 16-year annuity, starts in the 6th period, the second, the 10-year annuity, starts in the 22nd period. This allows us to simplify the cash flow structure as indicated in Fig. 1.

Figure 1: The cash flow structure of an average BSP project in EUR



Source: Authors.

The initial cash flows involving 32 payments within the life expectancy of the project captured in Tab. 2 can be replaced by the equivalent flows with seven payments (see Fig. 1). The CF payments of the years 1-5 are the forecasted cash flows of the 10th row of Tab. 2. The present values PV_5 and PV_{21} are "shadow" payments, which are equivalent to the effect of annuities that replace them. In view of Tab. 2 and Fig. 1, the set of relations (2) applies-see Tab. 3:

Table 3: The set of relation (2) corresponding to the simplified CF structure of an average BSP project calculated in Tab. 2

CF_0	− 2000	(2)
CF_1	− 500	
CF_2	0.76 · a · σ − 1050 = 0.76 · 1800 · σ −1050 = 1360 · σ − 1050	
CF_3	0.76 · b · σ − 970 = 0.76 · 2100 · σ − 970 = 1600 · σ − 970	
CF_4	0.76 · c · σ − 1480 = 0.76 · 2500 · σ − 1480 = 1900 · σ − 1480	
CF_5	0,76 · d · σ −1780 = 0.76 · 3800 · σ −1780 = 2900· σ − 1780	
PV_5	For the annuity payments of the 16- year annuity it applies: 0.76 · d · σ −1780 = 0.76 · 3800 · σ − 1780 = 2900 · σ − 1780. Considering the internal yield of 7 % and the annuity factor of 9.447 it corresponds to the present value PV_5 (2900 · σ − 1780) · 9.4 = 27260 · σ − 16732	
PV_{21}	For the annuity payments of the 10-year annuity it applies: 0.76 · d · σ − 1820 = 0.76 · 3800 · σ − 1820 = 2900 · σ − 1820 Considering the internal yield of 7 % and the annuity factor of 7 it corresponds to the present value PV_{21} (2900 · σ − 1820) · 7 = 20300 · σ − 12700	

Note: in kEUR. The net internal yield of 7% is applicable in the Czech Republic for renewable energy projects

Source: Authors.

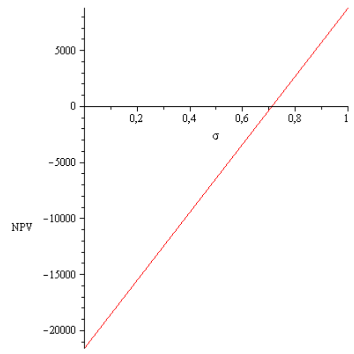
3.1 The course of NPV dependence on σ parameter

The above procedure to the project cash flow calculation is applicable for all possible depreciation schedules and compatible with the targeted derivation of NPV criterion.

Based on the set of relations (2) in Tab. 3 and relation (1), for the course of the budgeted NPV at the required internal yield of 7% depending on the σ parameter it applies:

$$\mathbf{NPV} = -2000 - 500 + (1360 \cdot \sigma - 1050) / 1.07 + (1600 \cdot \sigma - 970) / 1.07^2 + (1900 \cdot \sigma - 1480) / 1.07^3 + (2900 \cdot \sigma - 1780) / 1.07^4 + (27260 \cdot \sigma - 16732) / 1.07^5 + (20300 \cdot \sigma - 12700) / 1.07^{21} = -\mathbf{21571} + \mathbf{30350} \cdot \boldsymbol{\sigma}. \text{ For NPV} = 0 \text{ applies } \sigma = 0.71. \quad (3)$$

Figure 2: The course of NPV development depending on the market risk σ, where σ = P / PE, σ ∈ (0,1⟩



Source: Authors.

A drop in the purchase price P in the σ relation leads to a decrease in NPV (see Fig. 2); NPV ≤ 0 occurs at σ ≤ 0.71, see relation (3) and Fig. 2.

The course of NPV recorded in Fig. 2 and relation (3) is meaningful only in the case that the reduction of the purchase price P will not affect other renewable resource energy projects than the biofuel plant projects. Thus, the discount rate *i* remains stable reflecting the internal rate of return on investment. In situation of a proportional reduction of the purchase price P in comparison to the budgeted price P_E of all subsidized renewable energy projects, the discount rate *i* also decreases due to the lower internal yield on investment.

3.2 Expected net present value with regard to certainty degree

When estimating the project expected profitability, we take into account the degree of certainty ρ associated with a potential legislative change (see Tab. 1). Let ρ parameter be the weight in the formula for E[NPV] calculation. For the expected profitability of a subsidized project then applies:

$$E[NPV] = NPV_{\sigma=1} \cdot \rho + NPV_{\sigma<1} \cdot (1-\rho) \quad (4)$$

The first part of the sum in relation (4) stands for the optimistic scenario within which the legislation is not anticipated (ρ) resulting in σ = 1; the second part of the sum admits pessimistic scenario with the possibility of undesirable legislation change (1 – ρ) resulting in σ < 1. Thus, the ρ parameter directly influences the level of the change in purchase price (in the case of ρ, any undesirable change is not expected, thus σ = 1; analogically, the value 1 – ρ signals the risk of an undesirable change, thus σ < 1).

Let us assume that σ parameter does not drop under 0.71 within the pessimistic scenario (σ < 0.71 would imply a loss-making project). Then the average biofuel plant expected profitability E[NPV] is determined by the value of the weight ρ in relation (4), the result of which is shown in the last column of Tab. 4.

Table 4: The E[NPV] value in kEUR in dependence of the degree of certainty ρ given for selected countries with variable σ = 0.75 in pessimistic scenario

Country	ρ parameter	$NPV_{\sigma=1} \cdot \rho$	$NPV_{\sigma<1} \cdot (1-\rho)$	E[NPV]
Croatia	0.517	4538.7	575.5	5114.2
Czech Republic	0.577	5065.5	504.0	5569.5
Estonia	0.7	6145.3	357.5	6502.8
Hungary	0.587	5153.3	492.1	5645.4
Latvia	0.6	5267.4	476.6	5744.0
Lithuania	0.61	5355.2	464.7	5819.9
Poland	0.64	5618.6	428.9	6047.5
Slovak Republic	0.598	5249.8	479.0	5728.8
Slovenia	0.65	5706.4	417.0	6123.4

Source: Authors.

The results of expected profitability of subsidized biofuel plant revealed significant differences among the selected EU countries.

Despite the fact that the subsidy legislation is a topical issue in many countries, it is not often reflected in the cash flow budgeting of the subsidized projects and their expected profitability calculation. A possible reason is that the discount rate for unsupported projects captures an alternative yield that is influenced by the level of a project risk, both the internal and external. In subsidized renewable energy projects the internal yield is promised by the legislature in order to support the production of energy from renewable sources. As such, it has different qualities; significant risks within subsidized projects should be therefore incorporated additionally. One possible way how to achieve it is presented above.

4 Conclusions

The risk of legislative change concerning the subsidized projects can affect their expected profitability. In order to quantify this threat we lean to rating evaluation that includes various risks regarding possible subsidy legislative change. Despite the criticism of the rating predictive value, it is generally perceived as a good assessment tool.

We worked with Euromoney country rating data, which were transformed to express the certainty degree of stability in subsidy legislation for a group of EU countries. The value of certainty degree may e.g. involve risk of cuts in feed-in tariffs payed for energy produced by renewable resource plants. This induced threat was described as market risk and measured by means of a relation of the actual purchase price and budgeted price. The lower the certainty degree, the greater the level of market risk. The approach to expression and incorporation of certainty degree and from it derived market risk is the original contribution of this paper.

On the realization level the certainty degree performs weights in the formula for expected profitability calculation measured by E[NPV]. The aforementioned view of the components of risk of legislative change incorporated in the profitability measure was subjected to the methodology part in which the idea and essence is justified.

This approach was applied to assess the risk of a legislative change on the subsidized project profitability of an average biofuel plant. Within the profitability calculation the average yearly cash flows reflecting market risk were calculated. Based on this, the E[NPV] in dependence of certainty degree was expressed for the selected set of countries. Results revealed significant differences in expected profitability of renewable resource productions among the countries in a group. One of the reasons seem to be non-reflecting the legislative risk within the discount rate. The size of it is given by legislation to promote renewable energy production and as such has different qualities compared to unsubsidized projects. Significant risks of subsidized projects should therefore be taken into account in the calculations additionally, for example, as indicated in the article.

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