Influence of government grants to the future based evaluation methods during economic crises

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The aim of this work is to find out the ways in which existing company evaluation methods are affected by state benefits and how they have to be adopted to represent the influences more appropriately. A more realistic and volatile valuation can improve financing conditions and therefore the development of renewable energy sources. Solar cell producer were chosen as representative companies as the technology is still in an early stage of development. Further they receive both, direct and indirect state benefits. Both have different impacts on valuation methods. Finally, adjustments of state benefits are explained to increase the quality and the amount of company values.

***Key words**: Valuation method, state benefit, solar panels, government grants, economic crisis*

Introduction

During recent years, many articles and books have been written about different kinds of valuation methods and their use in practice. These methods are influenced by different factors, one of these being government grants. A large variety of government grants exists to support renewable energy sources, especially solar energy. This industry is in a stage of fast growth but, without state benefits, not yet profitable.

In 2007, Q-cells, the market leader of this industry, accounted investment grants and subsidies from the EU and the Federal government of Saxony-Anhalt of EURO 51.9 million for capacity expansion. As well feed-in tariffs support the selling of solar cells. In the annual review, the company wrote: "In Germany, currently Q-Cells' major market, demand is driven to a great extent by the Renewable Energy Sources Act (EEG) firstly implemented on 1 January 2000. (w. E. 2007). This shows the dependence on government grants and therefore represents a risk factor for the company as the future development of these benefits is unsure. Conspicuously is therefore, what compared with the relying index, the TECDAX Performance Index®, high volatility of those shares especially during 2008. Possibly, changes of government grants are the reason therefore. The affect was so negative that the IPO of Schott Solar had to be cancelled.

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Accounting for government grants according to IAS 20 (Accounting for Government Grants and Disclosure of Government Assistance)

The international Financial Reporting Standards (IFRS) have become more and more important during recent years. Other local reporting standards are loosing importance. For companies listed at a German stock exchange, the use of these accounting principles is necessary. Therefore, the influence of government grants is analysed for annual reports using the IFRS.

The accounting of government grants is mainly regulated in IAS 20. IAS 20.3 divides grants into:

- grants related to assets,
- grants related to income,
- forgivable loans.

The standard uses a wide definition of government grants and defines the positions and grants that are not subject to IAS 20. Government assistance presents therefore all economic advantages a company gains from state or similar institutions.

Excluded are:

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(Recenzovaná a revidovaná verzia dodaná 13. 3. 2009)

- the effect of changing prices caused by government grants and their influence on the financial statement,
- assistance determining the taxable income or income tax liabilities such as investment tax credits, accelerated depreciation allowance, and reduced income tax rates or
- participation of a government in the ownership or investments in equity of a company.

Free consultancy for marketing, in economic or technical questions as well as guarantees, warranties and low interest or no interest bearing loans, cannot be reasonably valued and is therefore not included in IAS 20 (IAS 20.37 and IAS 39). The term "government" summarises national and international governments, governmental agencies, and all similar bodies. Government grants are accountable in the moment of reasonable assurance, when the company fulfils all conditions and when it is sure that the grants will be received. There is no importance whether the company receives cash, asset value or forgivable loans.

Government grants for investment properties valued in the fair-value model can reduce the initial value on the one hand, or are recognised as income in the same period as the relevant expense on the other (IAS 20.12; 20.17). In the second case, grants related to depreciable assets are recognised as income over the periods and in the same proportions in which depreciation is charged. This approach is underlined by IAS 16.28 which says that the carrying amount of an item or property, plant and equipment may be reduced by government grants in accordance with IAS 20.

The accounting of non-monetary grants is ruled in IAS 20.23. Two possibilities are given:

- accounting of the fair value,
- accounting of the nominal amount. (IAS 20.23)

The contra-entry is deferred income.

For certain intangible assets, IAS 38.33 gives examples that can be accounted by both possibilities. Emission rights should be passivated as long as the fair value is higher than the value paid for the right [7, 1].

For deferred taxes, IAS 12 differentiates the following cases:

Identical accounting in tax statement and IFRS:

- either gross information shown and passive special item or
- net and reduction of historical costs or manufacturing costs.

Non- identical accounting:

- Reduction of historical costs or production costs
- Accounting as tax-neutral income:
- In each period analogous to the periods and in the same proportions in which depreciation is charged, but no deferred taxes

High cash movements as a result of government grants should be pointed out in a single position according to IAS 20.28. The investment itself should therefore be divided into investment and government grants.

The problem of consistent accounting in the cash flow statements can be solved by:

- Accounting operative cash inflow in the moment the grants are paid and operating dissolution of the special items
- Reduction of purchase/production costs by grants resulting in lower depreciation
- Pointing out of the grant in the cash flow from finance activities.

If the company has to invest to receive government grants, they cannot be valued before the company has fulfilled its obligation [6].

Today, loans with reduced interest payments do not have to be valued specifically belonging to IAS 20.37 in accordance with IAS 39 Financial Instruments: Recognition and Measurement; loans with reduced interest payments are treated like every other loan under IAS 39. This means, accounting of an initially recognised financial liability with the fair value. If measurement at fair value through profit and loss is not possible, transaction costs that are directly attributable to the issue of the financial liability have to be added. (IAS 39.43) Forgivable loans will no longer be stated as debt if it is more probable that they have to be repaid [7]. If it is planned in the future that these loans have to accounted by the fair value, the difference has to be passivated as a special item [3].

As shown, all valuation methods are influenced by government grants. Therefore it was necessary to adjust the given methods. The benefits lead to a faster move in the company lifecycle to high growth, while without these the company would be in an early stage of development. The characteristics of this stage are reflected by the high volatility of the stock prices which is mainly driven by the additional risk factor “changes in government grants”, while the government grants themselves are not a risk factor. Risk increases the variance resulting in a higher discount rate for expected future cash flows and a reduction in the value

of ptions “in the money”. The company value calculated by the discounted cash flow method and by the real option approach declines. The results of relative valuation perform differently. The point in time defines the value. When stable or increasing government grants are expected and the market is optimistic, the company value can be much higher than at another point in time when market expectations change to negative. This problem stopped the IPO of Schott Solar GmbH [11] but not the influence of valuation methods.

From the real option approach, it was possible to derive the influence of different kinds of government grants on the value of a company.

- Direct benefits reduce the expenditure for the initial investment,
- Indirect benefits increase the value of the future cash flows.

The premise that each production line and investment must be evaluated is additionally necessary to avoid the problem of negative free cash flows with the positive effect that influences on real options and discounted cash flows of a company can be regarded combined. Then the direct state benefits, except R & D support, reduce only the initial investment, and the decrease of interest payments can be neglected due to their marginal amount.

As shown, R & D support reduces the costs, therefore improving the result for the year and the operating cash flow. This characteristic is more typical for indirect state benefits. But due to the project orientated character and coming back to the real option approach, the main reason of R & D expenditures, gaining competitive advantage, means it should be deemed to be direct benefits for an investment. This is underlined by the approach of adding these expenses to the free cash flow or by capitalising them. Therefore the influence is similar to other direct state benefits.

The influence of all indirect state benefits as far as their impacts can be valued either that they increase turnover or reduce costs. Both factors improve the operating cash flow.

Aims of state benefits are the support of growth. Two factors are important: on the one hand profitability of investments or expectation of profitability, and on the other hand provision of financial resources to finance turnover growth. Therefore indirect state benefits to improve profitability and direct state benefits to finance the aspired growth are both necessary as long as an industry is not profitable, especially in times when liquidity is rare and financing conditions worsen.

Direct state benefits and exercise price

The aim of direct state benefits is to increase the probability that an investment will be made. Some investments would be made without those grants anyway, but regarding an increasing number of investments, the amount of positive decisions rises. As shown, the probability density of expected returns of an investment remains stable, but the exercise price is moved to the left. The surface area on the left of the exercise price declines, as well the probability of a non-investment.

An investment will be only made when increasing the expanded company value by additional positive net present values or strategic value. As state benefits increase the probability of investing, they improve the value of companies having access to government grants. Changing regulations or expectations about a revision of those grants cause uncertainty. The result of uncertainty can be presently observed on the financial markets worldwide. Factors lead to declining values that are based on doubt about state promises.

It is therefore necessary to improve the predictability of government grants. This can be achieved by a guaranteed stable offer of programs. Individual decisions should be reduced to a minimum. To keep the programs stable and to force the companies to further improvements, the declining rate has to be linked to the best company of the industry. This creates a competitive situation like in most industries in a stage of maturity. The best production line earns the highest returns, the worst the lowest. New lines should only be supported with the amount necessary for a zero NPV for the most productive production line in the industry. Every profit has to be gained by improvements and cost reductions.

As shown in example 1, a lower strike price of a call option increases the probability that the option will be exercised at the maturity date, showing in a simple form that additional investments are supported. The probability distribution of a real option remains stable.

Example 1

The red curve on fig 1 represents the probable density of the standard deviation for the following parameters:

Volatility = 20 %

S = 12 mln

t = 2 years

K = 3 to 30 milions
r = 3 %
Exercise price 1 = 15 milions
Exercise price 2 = 10 milions

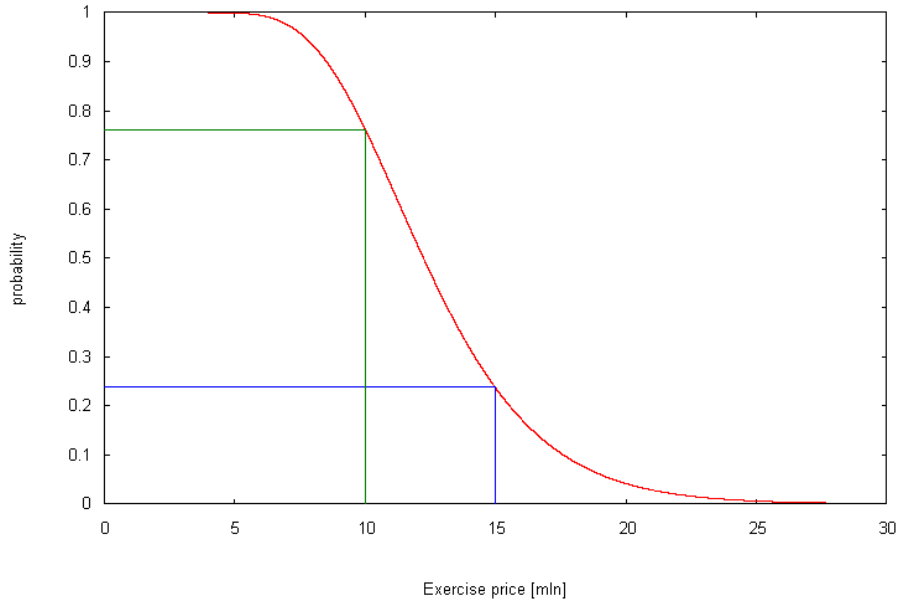

Fig. 1. The probability distribution of an investment.

In this example, 5mln investment grants increase the probability of an investment about 52 % from 24 % to 76 % at expiration date. Higher indirect state benefits would shift the curve to the right. Then, no or less state benefits are necessary for the same result.

Using the example 1, but now with different variances underlines that decreasing risk has positive influence on direct state benefits as shown in fig. 2.

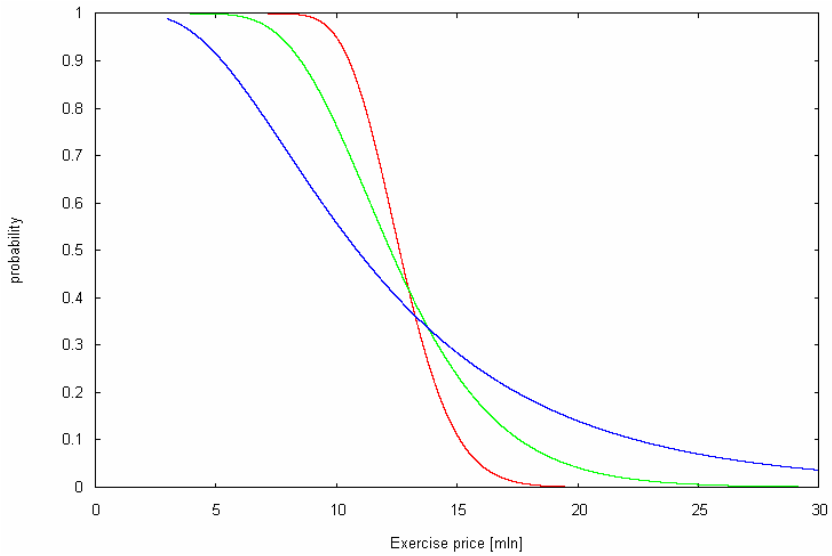

Fig. 2. Influence of volatileness to the investment grant, red line = volatility 10 %, green line = volatility 20 %, blue line = volatility 40 %.

Given the same investment grants, with a volatility of 10 %, the effect is much higher than with a volatility of 40 %.

The financial crises presented a new problem – liquidity – not only for the solar cell producer or customer but for the whole supply chain. Supporting only one part of the chain results in delivery bottlenecks: the full production capacity cannot be used, and the expected returns shrink.

If the state is expected to finance all suppliers and customers, many new problems arise. Which shall be supported, in which way, with what kind of support? Many questions, uncertainties and necessary regulations would lead to market imperfections, misallocations, and a huge administrative effort.

One solution is partially already given by state supported export finance. Adjustments must be made as the liquidity has to be supplied by the state if the financial institutions are unable or unwilling to supply.

Assuming that the silicon supplier of Q-Cells is unable to raise the necessary funds to finance the expansion with a state guarantee and a participation of 5 %, the supplier can be financed by the bank of Q-Cells as long as it fulfils the necessary creditworthiness. If the 5 % risk is taken by the bank or Q-Cells is not relevant but they should not be taken by the state. This increases the interest in selecting and analysing the trading partners accurately. The same procedure is possible for the customers.

The risk factors influence the value of the underlying asset. This can be simply demonstrated when the value of the underlying asset is calculated by the net present value. The risk factors influence the risk-adjusted discount rate. Fluctuating values are the result of changing risk factors. Stable state benefits have no influence on the variance of an underlying asset but changes or expected changes affect risk factors, and therefore the variance of the underlying asset [2]. The value of solar cell producer are mainly dependent on the profitability of its production lines. Therefore, the variance of the company is highly correlated with the variance of the expected profits of the new and existing production lines.

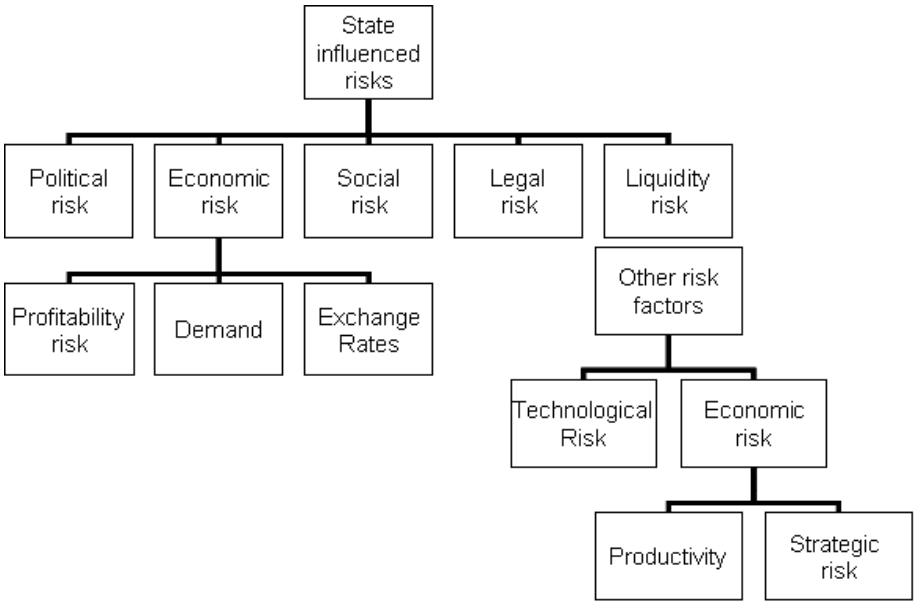

Fig. 3. Risk factors influenced by state benefits according [9, 4].

Indirect state benefits and volatility

Direct state benefits reduce the exercise price of the investment as shown. But increasing volatility as demonstrated by Steinbrenner [8] moves the peak of probability density, the most expected value of the underlying asset, to the left. The chance of higher profitability has to be compensated by the higher probability of lower or negative profitability. As the aim of state benefits is not to make people rich but to support renewable energy sources, the chance of higher profitability is less important than reaching profitability. Therefore the volatility has to be reduced.

A better planning reliability results in decreasing volatility as the number of available alternative paths of future developments decrease up to investments under certainty, when only one perfect path is left [9]. Thus, state benefits have to be adjusted to reduce volatility instead of increasing volatility as they are presently doing.

The most important state benefits for renewable energy sources in Germany are currently the feed-in tariffs. With validity date 1st January 2009 the feed-in tariffs will be reduced by 10 % in 2010 and 9 % in 2011. The digression will be reduced or increased by 1.0 % according to whether defined growth rates are reached or not. This is a first small step towards an expectable state reaction on economic trends [5].

From fix to flexible feed-in tariffs

Flexible feed-in tariffs firstly imply higher uncertainty than fixed feed-in tariffs. But associated with the right conditions, increasing volatility due to state benefits can be eliminated and compensated by general competitive risk. Assume that the feed-in tariffs will be fixed each year at a special date with the premise that the best competitors' solar cells should gain a return on investment at a defined place over a specified time of 0 %. 20 years can be used as the period since a performance guarantee for that period is often given for projects. Adjusting the benefits that the expected return tends to 0 implies that benefits can be achieved only by improvements and cost reductions. But more important is that in this point, direct state benefits are most effective as the gradient of the curve is the highest. Therefore, the state can select support location factors and create safe employment. Given a return on investment, this opportunity would be passed up.

Like direct state benefits, a market-orientated reward can be achieved which need not be adjusted each year. This factor can be assessed for different kinds of solar cells and installation techniques. The result is that there is no additional risk factor "changing state benefits". A reason reducing risk and uncertainty is that it is sure that a positive return can always be gained in the supported industry.

Another possibility would be that the state or a state-owned company buys solar cells for an amount of MWp specified in advance with conditions fixed in advance. The best supplier under these conditions will receive the orders and the state will sell the products. This approach increases competition, especially in cases of overcapacity, and can result in cut-throat competition but also forces the companies to make further improvements. Sales financing is not difficult for the manufacturers, as this is the task of the state. This approach offers the chance to compare expected capacity with purchase commitments.

Both approaches offer a chance to reduce the uncertainty about future developments by replacing the risk of changing state benefits by general market and technology risks. In other words, the non-diversifiable market risk "state benefits" was shifted to a firm-specific or in this case, investment specific risk which can be diversified. By diversification an investor can reduce the firm-specific risks of his portfolio when elimination is possible. These factors are recognised in the company valuation methods anyway.

Influence of volatility on direct and indirect state benefits - examples

Volatility has negative influence on both, direct and indirect state benefits. Possibilities to reduce volatility is, when government grants are flexible but the conditions are stable. In both cases, a return on investment of 0% for the best investment of the specified technology should be possible. Therefore, necessary direct state benefits depend on given indirect state benefits and necessary indirect state benefits depend on given direct state benefits. But how to adjust those benefits? Using the Black-Scholes model allows the following comparison of direct and indirect state benefits, like in the examples 2:

Example 2:

The red curve in graph represents the probable density of the standard deviation for S = 15 milions, the green curve for S = 12 milions with the following parameters:

Volatility = 20%
t = 2 years
K = 3 to 30 milions
r = 3%

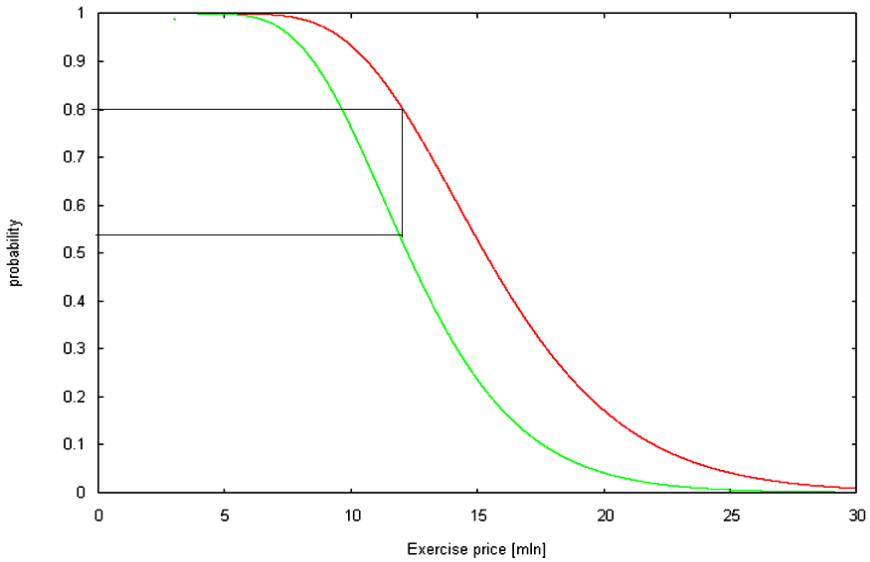

Fig. 4. The probable density of the standard deviation, red line - S = 15 milions, green line - S = 12 milions.

Example 3:
Assumption: S = K = 15milions where
S = current value of the underlying asset
K = exercise/strike price of the option

In this case, without state benefits, the exercise price of the investment would be the same than the value of the expected cash flows from the investment

Possibility one - direct state benefits
Direct state benefits of 3milions reduce K to 12 milions. Using the standard normal cumulative distribution formula

$$f(x) = \sum_{-\infty}^{x_n} \frac{1}{\sqrt{2\pi}} * e^{\frac{-x^2}{2}} dx \qquad (1)$$

where:

$$x = \frac{In\frac{S}{K} + r * t + \sigma^2 * \frac{t}{2}}{\sigma * \sqrt{t}} \qquad (2)$$

calculates for K = 12 milions probability of investment of 80.50 % and for K = 15 milions of 52.82 %. The investment or exercise price without state benefits K was 15milions. Due to state benefits, K was reduced to 12 milions. The result is that the probability of an investment was increased by 52.4 %.

Possibility two - indirect state benefits
Indirect state benefits increases S from 15milions to 18milionsn. S can be increased by higher free cash flows of the investment. To make both cases comparable, the indirect state benefits have to be increased by the risk free interest rate from the point, direct state benefits were paid out till the indirect benefits were received by the company. Regarding a time bar shows, direct benefits were paid for the initial investment while indirect benefits can be as well paid out later, improving the cash inflows from an investment. Therefore, accrued interests have to be added to the benefits. The free cash flows are then discounted with the same risk free interest rate as implied by the real option approach. As the amount is compounded and discounted with the same interest rate results, that S increases by 3milions.
Tax payments are not taken into account as for making both cases comparable, the benefits offered to the company have to be identical. Therefore it must be true that the state offers 3 milions benefits. If therefore company has to pay taxes, they have to be rewarded to the company that the state has paid in both cases 3milions to the company. 3 milion state benefits increase S from 15milions to 18 milions. Using the above mentioned formula calculates for K = 15milion, S = 15milion a probability of investment is 52.82 % and for K = 15molions, S = 18milions it is 76.28 %. The result is that the probability of an investment was increased by 44.41% and therefore smaller than in possibility one.

Example 4:
In this case, without state benefits, the expected cash flows from the investment are smaller than the initial investment. State benefits increase either the expected cash flows or reduce the initial investment, that

$$S = K.$$

Possibility one/direct state benefits:
Starting point is K = 15 milions; S = 12 milions, the probability in this point is 23.63 %.
State benefits of 3 milions reduce K to 12 milions, then: $S = K$ = 12 milions; the probability in this point is 52.82 %
The result is that the probability of an investment was increased by 123.53 %.

Possibility two/indirect state benefits:
Starting point is as well K = 15milions; S = 12 milions with a probability of 23.63 %.
S now increases due to 3 milions state benefits to 15 milions and K remains at 15 milions.
Then: $S = K$ = 15 milions; the probability in this point is 52.82 %
The result is that the probability of an investment was increased by 123.53 %.
In this example, the results of indirect and direct state benefits are identical.

Example 5:

The expected returns of the investment are in this example with and without state benefits smaller than the initial investment. Starting point is S = 15 milions, K = 19 milions.

Possibility one/direct state benefits:
Starting point is K = 19 milions; S = 15 milions, the probability in this point is 22.21 %.
State benefits of 3 milions reduce K to 16 milions; the probability in this point is 43.74 %.
The result is that the probability of an investment was increased by 96.94 %.

Possibility two/indirect state benefits:
Starting point is as well K = 19 milionsln; S = 15 milions with a probability of 22.21 %.
S_0 now increases due to 3 milions state benefits to 18 milions and K remains at 19 milions. The probability in this point is 45.21 %
The result is that the probability of an investment was increased by 103.56 %. In this example, the results of indirect state benefits are better than direct state benefits.

Reasons
Equalising both terms, one with direct state benefits, reducing the exercise price K:

$$K = K - \Delta K$$

and the other one with indirect state benefits, increasing the value of the expected cash flows:

$$=> S = S + \Delta S.$$

Then:

$$\sum_{-\infty}^{x_n} \frac{1}{\sqrt{2\pi}} * e^{\frac{-\left[\frac{In\frac{S+\Delta S}{K}+r*t+\sigma^2*\frac{t}{2}}{\sigma*\sqrt{t}}\right]^2}{2}} = \sum_{-\infty}^{x_n} \frac{1}{\sqrt{2\pi}} * e^{\frac{-\left[\frac{In\frac{S}{K-\Delta K}+r*t+\sigma^2*\frac{t}{2}}{\sigma*\sqrt{t}}\right]^2}{2}} \quad (3)$$

The only part of the formula that is affected by S and K is: $-\ln\frac{S+\Delta S}{K}$ and $-\ln\frac{S}{K-\Delta K}$ when all other factors remain stable. To compare both terms, $\Delta S = \Delta K$ when there are nominal identical state benefits in both cases.

Therefore the influence of state benefits is the same for both cases when:

$$-\ln\frac{S+\Delta S}{K} = -\ln\frac{S}{K-\Delta S} \quad (4)$$

$\Delta S_1 = 0$ => no state benefits are paid
$\Delta S_2 = (K\text{-}S)$ => $\Delta S + S = K$ => $K - \Delta S = S$

for ΔS_2 is true:

$$-\ln\frac{S+\Delta S}{K} = -\ln\frac{S}{K-\Delta S} = -\ln 1 \quad (5)$$

The influence of indirect state benefits is higher when:

$$-\ln\frac{S+\Delta S}{K} > -\ln\frac{S}{K-\Delta S} => \frac{S+\Delta S}{K} < \frac{S}{K-\Delta S} \quad (6)$$

This is true for all $S + \Delta S < K$.

Conclusion

In all cases, the exercise price including state benefits is higher than the expected returns of the investment, an amount of indirect state benefits increase the probability of an investment stronger than the same amount of direct state benefits.

Accordingly, in all cases, the exercise price including state benefits is lower than the expected returns of the investment, an amount of indirect state benefits increase the probability of an investment less than the same amount of direct state benefits.

Therefore for state benefits itresults, that indirect state benefits are preferable as long as the exercise price is higher than the value of the expected future cash flows from an investment. In the point S = K, both benefits have the same influence. When exercise price is lower than the value of the future cash flows of the investment, direct state benefits offer higher surplus for the same grant offered by the state.

To guarantee that an investment is made, direct state benefits have advantage since their probability density tends faster against 100% than that of indirect state benefits.

As shown, both kinds of benefits offer advantages. Under an economic point of view, the best allocation of state benefits is: indirect benefits as long as S < K till S = K and direct state benefits for S > K.

With the assumption that the return of the best investment shall be $\leq$ 0 %, it must be true that $S - K \leq 0$ and therefore $\frac{S}{K} \leq 1 \Rightarrow S \leq K$; for all $S \geq 0$

The result is that only indirect state benefits fulfil the given conditions.

In practice it is difficult to find out the right point until indirect state benefits are more effective and beside economic considerations, political interests have big influence over such decisions. The adjustment of direct state benefits is easier and location factors to attract companies can be improved. Indirect state benefits like feed-in tariffs run the risk of improving the market conditions for goods but without having influence on the fact where those products were manufactured. Therefore this is a discussion of international trade and protectionism.

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