Discounting and discount rate in public-private partnership projects

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1. FOREWORD

The first public-private partnership contracts in the Republic of Croatia were concluded in 2006 and 2007. They were models of public-private partnership contracts known as PFI\(^1\) projects which included construction and renovation of schools, sports halls and the coach station. There were 13 PPP project contracts concluded at that time. The next PPP project was launched in 2012 as a concession model for the construction and running of the new passenger terminal at Zagreb Airport. All the projects registered in the Register of PPP contracts\(^2\) were launched prior to the entry into force of the Public-Private Partnership Act, which preceded the new Public-Private Partnership Act (Official Gazette 78/12) which entered into force in July 2012.

One of the reasons for delays in the PPP project delivery by public entities was surely the complex procedure envisaged by the previous act, together with a lack of simple instructions which would make it easier for public entities, which, according to the act, could be the sole proponents of PPP projects, to prepare and implement PPP projects.

It was the latter that prompted the Agency for Public-Private Partnership and its partners to provide the entities in the PPP market in the Republic of Croatia with a series of manuals aimed at clarifying some procedures in the preparation of PPP projects, and to educate interested entities regarding the complex, yet very challenging and exciting topics related to the preparation of PPP projects and project financing.

The series of manuals is to be understood as material that can be continuously improved. It is for that reason that they are called versions. We believe that they will continue to improve with the development of a good practice in the public-private partnership in the Republic of Croatia.

Damir Juričić, PhD
Managing Director of the Public-Private Partnership Agency

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\(^1\) Eng. Private Finance Initiative, Cro. Privatna financijska inicijativa.
\(^2\) [http://www.ajpp.hr/naslovnica/registar/ispis-ugovora.aspx](http://www.ajpp.hr/naslovnica/registar/ispis-ugovora.aspx)
2. INTRODUCTION

Public-private partnership projects are long-term collaboration projects involving the public and private sectors, where the private sector takes on the risks of construction and financing, as well as maintenance or demand. The choice of the PPP model rather than the traditional (budgetary) model is based on the calculation of savings associated with the PPP model.

In the PPP model of delivery of public infrastructure, it is not only the construction costs that are taken into account, but also whole life cost that in addition to the construction costs also include costs of maintenance, replacement, financing and revenues from any business activities - third parties’ revenues.

The whole life costs are expressed in present values. The present value of both revenues and costs can only be expressed by applying the discount method. In practice it is often said that the whole life cost are expressed as the net present value, that is, the difference between the present value of cash inflows and the present value of cash outflows.

The aim of this manual is to provide an illustration of the discount method in order to render the process of preparation and implementation of PPP projects more effective and efficient.
3. PURPOSE OF THE MANUAL

The purpose of this manual is to provide the stakeholders in the preparation of public-private partnership projects with basic information, especially regarding the construction of the public sector costs comparator and its application to discounted cash flows in order to estimate the present value of the life-cycle costs of projects. The Public-Private Partnership Act defines in Article 3, Item 6, public sector costs comparator as difference between the present value of the whole life cost pursuant to the traditional (budgetary) funding model throughout the entire contractual period and the same value in case of realization of the project pursuant to the PPP model. The comparator includes the calculation of the compensation required for meeting the whole life costs and other project outflows, the allocation of risks between the parties to the contract and the quantification of the allocation of risks.

Thus, the public sector costs comparator needs to include:

- present value of the whole life cost and
- present value of compensation.

Furthermore, the Regulation on the implementation of public-private partnership projects defines in Article 2, Item 3 present value as the value of future cash flows evaluated on the discounting day by applying designated discount rate. Article 8, Item 5 defines the criteria for the selection of private partners, which include the present value of the whole life cost and compensation.

This manual explains the basic principles and methods in the estimate of the present values of the above mentioned criteria.
4. DISCOUNT METHOD

Discounting is a financial method that is the opposite of the interest rate method. The interest rate method is a process in which the value of the stock prices at the present moment is increased in order to estimate the future value of the stock prices. For example, if one invests today 100 units of money (present value) at the annual interest rate of 10%, after one year (future value) the value of the stock price will increase by 10 units of money. Therefore, the future value of the present value of 100 units of money is equal to 110 units of money.

As opposed to the interest rate method, discounting means determining the present value of a known future value. In the process of discounting there is also an interest rate applied, which in this case is called discount rate. To take the opposite example, if we apply the annual discount rate of 10% to the present value of the future value of 110 units of money, the former will be 100 units of money.

When applying the interest rate method, the present value of the stock price (100 units of money) is multiplied by the so-called interest factor equal to $(1+k^\prime)$, where $k^\prime$ denotes interest rate. When applying the discount method, the future value (110 units of money) is multiplied by the so-called discount factor equal to $1/(1+d^\prime)$, where $d^\prime$ denotes discount rate.
The following is an example of a discounting process:

a) Suppositions:
- all the values are constant prices;
- the annual discount rate is 7%;
- the value of the capital costs is 1.000.000 kn;
- the total life cycle of the project is 8 years, and the construction shall take 1 year;

b) Cash flow forecast

<table>
<thead>
<tr>
<th>Description</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</thead>
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<td></td>
</tr>
<tr>
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<td>400.000</td>
<td>450.000</td>
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<tr>
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<td>-300.000</td>
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<tr>
<td>Difference</td>
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<td>100.000</td>
<td>150.000</td>
<td>150.000</td>
<td>150.000</td>
<td>200.000</td>
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b) Cash flow forecast

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<th>0,62275</th>
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<td>Discount factors</td>
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</tbody>
</table>
d) Calculation of the present values

Discount factors are calculated as follows: $1/(1+0.07)^n$, where $n$ denotes the year to which the value refers. The present value of a financial value is calculated as the multiplication of that financial value (benefit, cost, difference) and the discount factor for the same financial year.

The net present value (NPV) can be calculated in two ways:

- as the difference between the present value of benefits and costs or
- as the present value of the difference between benefits and costs.

<table>
<thead>
<tr>
<th>Description</th>
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</tr>
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<tbody>
<tr>
<td>Present value of benefits</td>
<td>2.180.589</td>
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<tr>
<td>Present value of costs</td>
<td>-2.332.690</td>
</tr>
<tr>
<td>Present value of the difference</td>
<td>-152.102</td>
</tr>
<tr>
<td>Difference of the present values</td>
<td>-152.102</td>
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</tbody>
</table>
5. PURPOSE AND OBJECTIVE OF DISCOUNTED CASH FLOWS IN PPP PROJECTS

Effective management of public revenues and expenditures, and in particular of public buildings with a long-term life cycle, whose construction and exploitation involve considerable costs over a long period of time, implies taking account of the time preference of money, that is the time value of money. The time preference of money is the value of money over a given amount of time. Hence it is said that the same quantity of money has a higher value today than in the future. The difference in value compared to the relevant time is directly connected with the discount rate.

Considering what has been said above, in order to even up the value in money of future inflows and outflows, it is necessary to discount them to the present value.

There is yet another very important impact of discounting which is related to a different statement of revenues and expenditures at the time of their occurrence. Namely, the same non-discounted values of the whole life cost will have different present values if the individual values of revenues and expenditure are calculated at different times. Therefore, one important conclusion that can be drawn is that the financial values calculated in earlier periods of time have a higher present value. Consequently, the public benefit is higher when the revenues are calculated in the near future, and expenditures in the distant future.
6. CHOICE OF DISCOUNT RATE

In the economic and financial practice discount rates are most often differentiated according to the object of discount (financial and social discount rate) and the way of expressing the price (nominal and real discount rate).

a) Financial discount rate

The financial discount rate represents the opportunity cost of capital (Brealey, Myers, 1996; Brigham, 1995). The opportunity cost of capital is the cost of investing in one project rather than in another – alternative – one. The loss incurred from opting for the first project and not the second – alternative – one is the opportunity cost. And vice versa, making gains in the second project and not in the first one represents the capital gain opportunity. Therefore, the financial discount rate is used in the process of evaluation of the performance of an investment option. That is the reason why it is important which financial discount rate will be used when judging the acceptability of investment opportunities. It is possible to opt for:

- weighted average cost of capital, that is weighted average cost of all sources of finance of a project. The choice of this discount rate implies the preference to derive the expected rates of return from third party (loan, bonds) or own (capital) sources of finance taking into account the relative weight of each source of finance;
- minimum marginal rate of return on investment that needs to be earned on an investment option.
b) Social discount rate

In the last fifty-odd years there have been controversies and differences in opinion in economic theory and practice over the development of a method of calculation of the social discount rate. On the other hand, it is completely logical that a discount rate should be applied in the assessment of public investment alternatives in order for the public management to make the optimum decision on public investment based on an analysis of gains and losses.

Public investments have an impact on the gross social product, and the value of the social discount rate draws attention to the necessary (or planned) difference between future inflows and outflows that need to be achieved through exploitation of public investments. Thus a higher social discount rate requires a larger difference between public inflows and outflows in order to justify public investments, whereas a lower social discount rate requires a smaller difference between public inflows and outflows.

Different countries apply different social discount rate, but the majority agree that developed countries need to apply a lower rate, whereas in developing countries a higher discount rate is required.

The European Union is applying a method based on the long-term economic growth rate and in its calculation the following parameters are used:

- rate of growth of public expenditures (g);
- elasticity of demand (n);
- rate of time preference of money (p);

based on which the social discount rate (SDR) is calculated as: \( SDR = ng + p \).
c) Discount rate for PPP projects in the Republic of Croatia

Having the status of observer since December 2011 and as a member state of the European Union as of 2013, the Republic of Croatia follows the recommendation of the European Commission (EC, DG Regio, 2006, EU, DG Regio, 2008) also on the implementation of the process of cash flow discounting as part of the formulation of a project proposal, that is public cost comparator, as defined in Art. 9, paragraph 3, Item 1 of the Public-Private Partnership Act (Official Gazette 78/12), and the obligation to publish the discount rate which public bodies are required to apply pursuant to Article 9 of the Regulation on the implementation of public-private partnership projects. The Agency for Public-Private Partnership publishes the discount rate on its website.
Priručnik 1

Diskontiranje i diskontna stopa kod projekata javno-privatnog partnerstva

7. BIBLIOGRAPHY

8. Kula, E.: Social discount rate in cost-benefit analysis - the British experience and lessons to be learned, University of Ulster, Jordanstown, Belfast and Centre for financial and management studies, University of London.