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Residual Value and its Importance in Concession Agreements for Infrastructure Problems

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Abstract:
Major and less important parameters affecting the efficiency of the Public Private Partnerships (PPPs) in Infrastructure development have been discussed and analyzed thoroughly in International research. Issues related to the Residual Value factor are under consideration recently, mainly from countries and organizations that have implemented PPPs years ago and now they have to manage risks associated with Residual Value. Efficiency in Residual Value is close related with the proper quality of the provided services by the infrastructure, ensures Value for Money and maximizes the returns on investment. The specific risk is more important to the concession projects where the infrastructure returns to the beneficial owner after the expiration of the contractual period. The paper examines the influence, importance and treatment of the Residual Value parameter in leasehold concession agreements, since this type of concessions have been analyzed less that the schemes related to Built Operate Transfer (BOT) contracts. Residual value risk and its management is an issue that should be taken into consideration from the tendering phase of the project during the optimal selection of the preferred bidder.

Key Words:
Residual Value, Public Private Partnerships, Leasehold Concession, Value for Money, Optimal Bidder

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1. Introduction

Residual Value constitutes an important parameter when assessing infrastructure projects viability during the investment analysis as well as during the Value for Money test for the public sector. In absolute terms Residual Value presents the remaining discounted value of the investment at the end of the period which can be considered as the liquidation value of the asset (European Commission, 2008).

Section 2 describes the essence of Residual Value in PPP projects general, since the life cycle of infrastructures usually exceed the horizon of PPP contracts. The importance of Residual Value regardless which calculation method is being applied and the necessity of including it into the Value for Money assessment is presented in section 3 of the paper.

Sections 4 and 5 focus on the specific PPP type, the leasehold concessions which are a significant tool for utilizing existing infrastructures of the state in cooperation with the private sector. Due to its importance, Residual Value is an important factor during the selection of the optimal bidder and its contribution to the final outcome and project's value should be included in the models which are used in order to assess the financial offers of the participants.

2. Residual Value in PPP Projects

Despite the fact that in some papers and research, the issues related to the Residual Value of the infrastructures in Public Private Partnerships seems to be a risk of low importance and influence[3], there is a special attention during the last years on the transfer of ownership of infrastructure from the private to the public sector after the expiration of the contractual period (Sadka, 2006; Iosa, 2008; Grout, 2005). This subject is under more detail consideration especially in countries that have implemented PPPs years ago and apparently they have experienced also the completion of the contracts and the transfer of the asset to the public sector. Governments and public sector authorities which have initiated the schemes of PPPs only few years ago they do not have dealt with the Residual Value issues since the number of the completed contracts is insignificant.

This problem will appear in a later stage. Most of the projects developed under various PPP schemes are infrastructures (stand alone projects or networks) and related facilities for the society (such as transportation, energy, water and waste treatment etc). The studies, engineering and life cycle exceed 50 years or even more.

[3] Xu (2010) presents that Residual Value risk in a number of PPP projects that he analyzes in China has less significance for the participants in the study, who are actually professionals involved direct or indirect with the specific projects.

The period of the agreement between the parties (public and private sector) in most of the cases does not exceed 35 or 40 years depending on the project, its nature and characteristics (Iosa, 2006). Therefore it is plausible that the issue related to the physical and operational condition at the termination of the contract, on which the infrastructure will be delivered / transferred back to its initial owner (i.e. public sector), should be under consideration (Sadka, 2006).

Residual value in absolute terms represents the value of the infrastructure at the project's lifetime span and it is calculated as the market value of the fixed asset as it was sold at the end of the specific period (horizon of the project) providing the equivalent liquidity.

3. The Importance of Residual Value Parameter

Residual Value at lower level compared with the one initially calculated can be considered as an indirect discount on projects' quality which leads to services of poor quality, lower demand and as a result revenues that diverge from the budget and the projections during the initial studies and business plans (NAO, 2004). This applies both during the operation of the project from the private partner as well as at the expiration of the contract agreement. Research has shown that projects under BOT schemes lower Residual Value is close related with shorter life cycle and less revenue stream.[4] More specifically during the expiration of the contractual period the asset has a remaining life cycle and the amount of the possible capital needed to be invested in order the infrastructure to be at the condition to provide services, is a critical factor affecting viability, regardless if the management will be undertaken by the private or the public sector.

In some cases in existing concession projects the contractual period T is not fixed from the outset but is subject to consideration and negotiation between the parties in order to meet specific criteria[5]. This includes that the NPV of the private sector to be higher that the invested capital I included its interest R ($I\,R \leq NPV_p$) and at the same time the NPV of the public sector for the post transfer period to be greater than zero ($NPV_g \geq 0$) (Shen, 2002). This implies that the residual value of the infrastructure is has significant importance for the government.

[4] Jang (2010) in his Phd Thesis refers to the direct correlation of the Residual Value, the life cycle of the project and the generated revenues from the operation. He uses the technique of loop diagrams to justify his opinion and findings.

[5] There is the opinion that the government benefits less or the private entity benefits too much from PPP contracts. Generally, a longer concession period is more beneficial to the private investor, and it may result in loss to the government. On the other hand, if the concession period is too short, the investor will either reject the contract offer or search for additional securities or sources that will provide the required level of profit.

In traditional cost – benefit analysis for the appraisal of medium and large scale infrastructure projects by the public sector the Residual Value might be overestimated, diminishing project's performance and returns (Florio, 2003). The applied methods for calculating the Residual Value do not estimate accurate the exit value of the infrastructure[6]. However in PPP projects and especially in concession and leasehold concession projects where the public sector has to assess and evaluate the offers / bids from the private enterprises the importance and the contribution of the Residual Value should be taken into consideration on the models (South Wales Government, 2007) and would lead to more complete contracts (Iosa, 2006).

EU guide for cost – benefit analysis proposes some alternatives for taking into consideration the residual value such as the standard accounting depreciation procedure (which is based on all fixed assets and liabilities) and the residual value deriving from the calculation of the NPV in the financial analysis of the cash flows for the remaining life span of the infrastructure (European Commission, 2008).

Especially in concession projects of utilizing existing infrastructure, where the private sector will commit capital investment to upgrade the facilities, proper consideration of Residual's Value contribution will increase concessions value. Moreover and regardless if the public sector is paying a price for the transfer of the asset to the government or not, after the expiration of the contractual period, it bears a part of the residual value risk of the asset and therefore this should be included in financial and accounting analysis (OECD, 2008).

4. The Case in Leasehold Concession Projects

The significance of Residual Value component as a risk in PPPs has leaded the relevant governmental authorities in many countries to propose various methods of calculation during the process of Value for Money testing[7]. According to these directions the Residual Value is either calculated separately and directly at the applied models or, based on its importance as a significant risk, it is taken into consideration (after the necessary modifications) in the discount factor as part of the systematic risk of the project (Public Private Partnerships, 2007).

Similar to the procedure of testing the Value for Money achievement in BOT projects, it is essential to consider the effect of the Residual Value in the case of leasehold concession projects and especially during the assessment of the financial offers submitted by the participants to the tender. Given the fact that leasehold

[6] Methods of calculating Residual Value at cost – benefit analysis approach are presented analytically by Jones (2014).

[7] Refer to South Wales Government (2007) and Public Private Partnerships (2007) for the cases of Australia and Ireland respectively.

concessions constitutes a tool which can be used to utilize not only existing operating infrastructure but also other not operational assets that require capital to be invested, the level of capital allocated by the private sector during the contract period should be a parameter of the evaluation[8]. The life cycle of the infrastructure is much higher than the length of the concession agreements period[9] and as a result after the expiration of the concession, the infrastructure and the project in general will continue to provide its services either under public or private operation and management (ACCA, 2004). In almost every technical project the life cycle exceeds 50 years while an average concession period is around 30 years. In practice concessions horizon is long since short term contracts might influence private party to under – invest in the infrastructure as the contract period is limited (Armstrong, 1994).

The main components of such analysis will be the net present value at termination year of the revenues, net of operating costs, that the project will be able to generate because of the residual exploitability of fixed assets whose economic life is not yet completely exhausted. This should be done in financial analysis at market prices, and in economic analysis at shadow prices (Florio, 2004).

The quality both of the infrastructure and the provided services is party depended on the level of the capital investment by the concessioner and constitutes significant parameter that defines the pricing policy towards the final user / payer of the services (Commission of the European Communities, 2007). Suppose that the private party (or Joint Venture) A is willing to undertake an investment through a concession agreement that has an high initial investment cost with high revenues and as a result can offer a specific fee to the owner (state) under the concession agreement. Alternatively the private party (or Joint Venture) B for the same project has a plan that requires lower investment while generating lower revenues and as a result the payment to the beneficiary is at the same levels similar with the one offered by party A[10]. Public sector's interest is to ensure that the selected offer for each project provides adequate quality of services and that this factor should be

[8] In international research there is a distinction between investments in existing infrastructures (Brown field investments) and investments in completely new projects from the beginning (green field investments) which bears more risks for the investors and lower returns. Refer to Bitsch (2010)

[9] Infrastructures' design and engineering generally exceed 50 years based at any time on the applicable national regulations and local and International technical provisions.

[10] The specific hypothetic scenario might be not fully clear and applied in the case of infrastructures related to railway networks or port projects, however is applicable to concessions related to marinas, hospitals, as well as to other assets owned by the public sector such as logistic parks, areas for integrated tourism developments etc, where the quality of services and its effect to the pricing policy is easily anticipated by the end user.

included in the analysis when assessing the financial offers submitted by the parties during the tender.

5. Including Residual Value in Leasehold Concessions Modeling

The Residual Value is affected and determined by a wide range of factors and parameters from the initial design and engineering to the construction and maintenance during the operation period. High specifications during the design and construction, implementation of high and new reliable technologies, innovation, adequate maintenance and investment for upgrading during the operation period improve project's Residual Value and as a result the asset value for the beneficial owner (public sector).

In the case of leasehold concession and for the purpose of selecting the preferred and higher bidder, the accurate calculation of the Residual Value should not be the major aim of the public sector's authorities. The participation of the Residual Value in the models should be at the sense of taking into consideration the added value that it provides to the submitted financial offers. Therefore simpler or more complex models, than those applied to the cost – benefit analysis, such as depreciation, perpetuity and component methods[11], can be partly and not fully applicable.

The Residual Value can be described by the following general formula:

$$\mathbf{R_{es} = f(w_u U + w_d D + w_i I_0 + w_j I_{j+} w_k M_k)}$$ [12]

Where:
Res: the Residual Value
w: represents the weighting factor of each parameter to the Residual Value.
$\mathbf{I_{0}}$" and $\mathbf{I_i}$ the initial investment and the various capital improvements during the concession period
U: the functional value of the asset at the time of its transfer to the public sector, which is related to the years of the concession.
D: the level of the design and engineering and the applied technologies
$\mathbf{M_{\kappa:}}$ the level and the quality of maintenance during the contractual period.

For committing to an infrastructure project under a concession contract the Residual Value at every time is given by:

$$\mathbf{Res = I_0\ e^{-d(T-t)}}$$ [13]

[11] For more details regarding the methods please refer to Jones (2014)
[12] Self process based on approach by Bitsch (2010), South Wales Government (2007) and Public Private Partnerships (2007).

Where:
T: the concession period
d: the depreciation rate until the end of the concession.

Since t < T if the private parties decide to invest at the beginning of the contractual period the Residual Value depends on the depreciation d, while, if capital invested at the end of the period then the Residual Value equals the capital cost. Proper maintenance and regular capital improvements decreases the depreciation rate d resulting to a higher Residual Value for the infrastructure.

Generally in models assessing the financial offers of the participants during the tender procedure for leasehold concession projects, the contribution of the residual value to the results and the selection of the preferred bidder is not taken into consideration. These models assess the direct financial benefits for the public sector such as lump sum fee, annual fixed remuneration and floating compensation as percentage of the revenues or EBIDTA of the SPV. In some projects where there is managerial flexibility to perform the investment, tender and contractual documents set specific requirements for the concessionaire to fulfill quality and quantity obligations related to the asset and / or provided services. This applies for all participants. The degree of the flexibility that the manager of the concessioner has to decide when and how much will invest is an important parameter. In specific type of projects such as water supply the regulator may set specific parameters and obligations for the private party to full fill service obligations rather than specific investment plan (D' Alpaos (2006). On the other hand the constant improvement of the technology throughout the contractual period might lead into cases where qualitative obligations cannot be applicable within a concession contract document.

An objective solution to ensure that the Residual Value is taken into consideration, and especially the added value that is being provided by a specific offer compared to another, is to include the proposed investment by each participant to the calculation of the public sectors benefit in its undepreciated form. This is a feasible technique, measurable according to the above analysis which is being applied in the BOT projects during the process of achieving value for money[14] but not to leasehold concession so far.

[13] D' Alpaos (2006) uses the Residual Value in order to calculate the concession length by applying a simplified model of Brownian process by Mc Donald (1986)
[14] This is being proposed in Ireland BOT guide and constitutes non cash flow adjustments. Refer to Public Private Partnerships (2007)

6. Conclusion

The Residual Value component in the leasehold concession contracts constitutes a risk factor that should be taken into consideration even at the early stage of projects design and in any case at the preferred bidder selection stage. Although the investment flexibility of the concessionaire should not be affected, the diversification of each financial offer and its contribution to the overall project's value and to the benefits for the public sector should be taken into consideration and assessed accordingly.

Project will be able to generate further income by providing services as the economic life is not yet completely exhausted at the concession completion.The techniques related to the depreciated investment at the end of the contractual period together with any interim investment plan adapted to the characteristics of the project can be applied, similar to the BOT projects when undertaking the value for money achievement process or the financial procedures during the cost benefit analysis process.

References

Armstrong, M., Cowan, S. and Vickers, J. (1994), *Regulatory reform*, MIT Press, Cambridge, Mass.

Bitsch, F., Buchner A. and Kaserer, C. (2010) "Risk, return and cash flow characteristics of infrastructure fund investments" *European Investment Bank Papers,* Vol. 15 No1.

Commission of the European Communities (2007), *Green paper on sea ports and maritime infrastructure*, Brussels 2007.

D' Alpaos, C., Dosi, C. and Moretto, M. (2006), "Concession length and investment timing flexibility" *Water Resources Research, Vol. 42.*

European Commission (2008), *Guide to cost – benefit analysis of investment projects; Structural funds, cohesion fund and investment for pre – accession*, Directorate General Regional Police, July.

Florio, M. and Vignetti, S. (2003), *Cost benefit analysis of infrastructure projects in an enlarged European Union: An incentive – oriented approach*, Fifth European Conference on Evaluation of the Structural Funds, Budapest.

Flyvbjerg, B., Holm, MS and Buhl, S. (2002), "Understanding cost in public work projects: error or lie?" *J Am Plan Associat 2002; 68(3), pp. 279 – 95.*

Flyvbjerg, B., Bruzelius, N. and Rothengatter, W. (2003), *Megaprojects and risk,* Cambridge University Press.

Grout, P. (2005), "Value for money measurement in public private partnerships", *EIB Papers* Vol. 10 No 2.

Iosa, E. and Martimort, D. (2008), "The simple micro – economics of Public Private Partnerships" *Economics and Finance Working Paper Series,* Working Paper No 09–03.

Jang, G. (2010), *The bids evaluation decision model development and application for PPP transport projects; a project risks modeling framework*, PhD Thesis, Colorado State University, Fort Collins, Colorado.

Jones, H., Domingos, T., Moura, F. and Sussman, J. (2014), "Transport infrastructure evaluation using cost – benefit analysis: Improvements to valuing the assets through residual value – a case study", *Social and Behavioral Sciences 111 (2014), pp. 400 – 409.*

Mc Donald, R. and Siegel, D. (1986) "The value of waiting to invest" *Q. J. Econ.,* pp. 101, 707 – 728.

National Audit Office (2004), "London Underground: Are the Public Private Partnerships work successfully?" *(Rep. No. HC 644, Session 2003-04). London: National Audit Office.*

New South Wales (2007), "Government technical paper: Determination of appropriate discount rates for the evaluation of private financing proposals" February.

OECD (2008), "Public Private Partnerships In pursuit of risk sharing and value for money", available at: *www.oecd.org/publishing/corrigenda.*

Public Private Partnership (2007), *Value for Money and the Public Private Partnership procurement process*, Ireland, October.

Sadka ,E. (2006), "Public Private Partnerships: A public economic perspective", *International Monetary Fund Working Paper, WP/06/77.*

Shen, L., Li and H., Li Q. (2002), "Alternative Concession Model for Build Operate Transfer Contract Projects", *Journal of Construction Engineering and Management,* July/August, pp 326 – 330.

Xu, Y., Yeung, J., Chan, A., Chan, D., Wang, S. and Ke, Y. (2010), "Developing a risk assessment model for PPP projects in China — A fuzzy synthetic evaluation approach" *Automation in Construction 19 (2010),* pp. 929–943.