FORMATION OF OPTIMAL CAPITAL STRUCTURE IN PRIVATE – PUBLIC PARTNERSHIP

Linas Jasiukevičius[1], Asta Vasiliauskaitė[2]

[1]Kaunas University of Technology, Lithuania, linas.jasiukevicius@gmail.com
[2]Kaunas University of Technology, Lithuania, asta.vasiliauskaite@ktu.lt

Abstract

This paper presents the main guidelines for the formation of optimal capital structure in a public-private partnership (P3). The relevance of guidelines determines the growing number of investment projects carried out by various public – private hybrids, which, due to unique conditions of every project, usually cope with such problems as the formation of optimal capital structure and sharing of risk between shareholders. Due to this reasons, the purpose of the paper is to form a procedural model enabling to optimize capital structure of P3. The research methodology is based on the review of scientific literature as well as, the analysis and synthesis of analyzed problems and possible solutions. The created model enables to evaluate the requirement for private sector's involvement in the delivery of public services, to select the rational basis of P3 and its form, to determine the optimal structure of public and private investment and by optimizing capital structure of private partner to evaluate financial viability of P3.

Keywords: Financing policy, Capital and ownership structure, Private-public partnership, Risk sharing.
JEL Classification: G32.

Introduction

Over the last two decades Public-Private Partnership (P3), pioneered by the United Kingdom with its Private Finance Initiative of the early 1990s, has widely developed. Many governments around the world have embraced P3 as a vehicle for the delivery of public infrastructure and services across a wide range of industries and sectors including transportation, water supply and disposal, telecommunications, oil and gas, mining, schools, hospitals, military training and other facilities. P3 is particularly frequently-used in the developed western countries.

There are various reasons why governments might undertake P3s, although, as quoted in the literature, the key justifications for pursuing P3 are the objective of achieving improved value for money or improved services for the same amount of money, as the public sector would spend to deliver a similar project (Grimsey and Lewis, 2005). This is achieved mainly due to lower costs in P3 than in sole private investments and higher quality than in the sole public provision of the public good. Lower costs of P3 result from lower cost of capital of the public partner. Meanwhile better quality is achieved due to the transfer of know-how from private partner to the public body (Moszoro, 2010). Therefore, effective cooperation of private and public sectors in the preparation of P3 projects, especially characterized as being large-scale and having long-term consequences, is very important.

However, to be attractive and viable, the shareholding structure of P3 should fulfil the interests of both the public and private partners. To secure the return on investments, the private partner seeks to ensure guarantees for expected income or compensation for the retreat from the partnership, while the government seeks to find a private partner that would be able to perform the project and allow it to participate in the project only the extent that would allow to manage risk effectively and save costs. In summary, every partner seeks maximizing its share of the benefits and minimizing the risk of performing. In such circumstances there is strong demand need for negotiations, in which each partner seeks maximizing its benefits. Therefore, the difficulties related to the development of methods, which would allow to evaluate benefits and risks of every partner participating in P3, also to determine the provisions which would help to find a agreement between different interests and maximize the value of the whole project, is the relevant problem.

The relevance of the problem demonstrates the gradually growing amount of literature in which the problems on the formation of optimal capital structure in P3's are analyzed (see eg. Lopez-Lambas and Monzon, 2010; Moszoro, 2010; Zhang, 2005a,b; Dewatripont and Legros, 2005; Reeves, 2005). However, most of this research can be characterized as analyzing this process only fragmentarily. Most of the research studies generally include only particular certain aspects on the formation of capital structure. The review of the literature on this topic led to conclusion that all research can be divided into two periods of time: first, until financial crisis (2009), in which considerable attention is paid to the experience of P3 implementation and identification of various risks, and the second, in which due to financial crisis, the focus is on how the

private sector could efficiently get involved in the delivery of public services and the development of appropriate models. However, qualitative researches, in which financial aspect of capital structure's formation is conveyed insufficiently, dominate. This demonstrates that although P3 is not a new phenomenon anymore, no conventional and universally accepted model that would enable to form optimal capital structure in P3 has been developed yet. This determines the problems of the efficient capital structure formation in P3. Therefore, the creation and development of appropriate models would enable solving of this problem. Also systemization of knowledge and the best practice on is very relevant.

Considering the analyzed problem the goal of this paper is to create a model allowing to form the optimal structure of capital in P3 by integrating various aspects of capital formation. The research methodology is based on the review of scientific literature, the analysis and synthesis of various aspects of capital structure formation as well as modelling of various factors of capital structure optimization. Assuming that every partner in P3 can use the cheapest available financial resources, also that capital cost of public body, despite their source obligations or taxes, is the same in this paper is analyzed three problems: 1) optimal structure determination of public and private investments; 2) optimal structure determination of the ratio of equity and borrowed capital, and; 3) determination optimal concession fee. The solutions are made by assuming that the cost of equity capital and borrowed capital is the same despite their proportion in the capital of the private entity.

The paper is arranged as follows: theoretical aspects of capital structure formation of P3 are discussed first. Then, considering these aspects, the second part of the paper presents the created model, enabling to form the optimal capital structure in P3.

Theoretical aspects of capital structure formation in P3

Due to the complexity of P3 there is no it's unanimous definition. In a broad sense P3 is interpreted as the cooperation between public and private sectors by providing public services or implementing the projects of public infrastructure. However, more precise approach of this type of partnership varies in every country depending on the settled intercourse between public and private sectors in it and legislation determining the possible forms of cooperation, ranges of activities and other aspects of P3 implementation. These distinctions determine the existence of plenty P3 definitions. Various definitions are represented by Liu and Wilkinson (2011); Ke *et al*., (2011), (Viegas, 2010), Duda (2010), Viegas (2010) and Tang, Shen and Cheng (2010). Considering and summarizing various P3 aspects mentioned in the papers of these authors P3 may be extensively described as the long-term contract based and by project implemented public and private sectors' mutual trust intercourse by which the provision of public services and/or implementation of public infrastructure projects is temporarily transferred to the private partner in return of transferring know-how by forming optimal capital structure, rationally dividing the risks, benefits and responsibilities between both public and private partners, securing the public partner's desirable quality of public services and effectively using complementary capabilities of both partners. This definition discloses a broad context of P3 in which the formation of capital structure is made. Also it allows to imply the possible problems related with the role of each party and the apportionment of risks, liabilities and rewards between partners which may arise by forming the capital structure in P3. The formation of optimal capital structure plays rather important role in solving these problems rationally. However, very formation is just a part of a whole process. In order to form successfully performing P3 it is also necessary to accomplish the preparative actions. By systemizing various literature by Moszoro (2010), Fischer *et al.* (2010), Rajan *et al.* (2010), Chung *et al* (2010), Takashima *et al.* (2010), Carmona (2010), Hoppe and Schmitz (2010), Chen and Chiu (2010), Duda (2010), Rajan, Siddharth and Mukund (2010), Bittegnies and Ross (2009), Hall (2008), Allonso-Conde *et al*. (2007), Hemming (2006), Jefferies (2006), Dewatripont and Legros (2006), Zhang (a, b) (2005), Reeves (2005), Currie (2005) and Wibowo (2004) it can be stated that the successful formation of optimal capital structure in P3 includes the accomplishment of the followed five stages (as shown in Fig. 1).

The process of optimal capital structure's formation firstly starts from the assessment whether discussed to deliver services are socially sensitive and due to this reason it is important to secure the public interests by delivering them. In this case socially sensitive services are considered the services which are not enough profitable to deliver by the conditions of pure market or delivered by less level of quality, and thereof resultant sequences would determine the significant negative social consequences. This determines social service status of these services and the assurance of their provision becomes a function of public sector. Consequently, by considering the provision of appropriate services firstly it is necessary to evaluate whether the public sector has to involve in their provision for the satisfaction of public interest. The involvement allows to laying the foundations for the consideration of public and private sectors cooperation's questions.

The status of social services determines the requirement of appropriate size of budgetary appropriations for these services' provision. Therefore, in the second stage it is evaluated the financial possibilities of public body to implement the project i.e. whether it is able to impose solely budgetary sponsorship for the implementation of the project by which it would be delivered the public services. Due to this reason it has to be assessed the financial indicators such as net present value (NPV), self-financing ability (SFA) and other relevant indicators if the projects would be implemented by financial resources of solely public body. These indicators can be used not only in decisions for budgetary sponsorship to make but also as a benchmark known as public sector comparator (PSC) for evaluation of the efficiency of P3 as the means of public projects' implementation. Considering the possibilities of budget to finance the project P3 is further analyzed as sole or the one of alternatives (other alternative is traditional procurement). However, independently from the situation regarding public body which initiates P3 it will be relevant only if private sector's involvement will allow to decreasing the outlays of public body and the cost of the whole project.
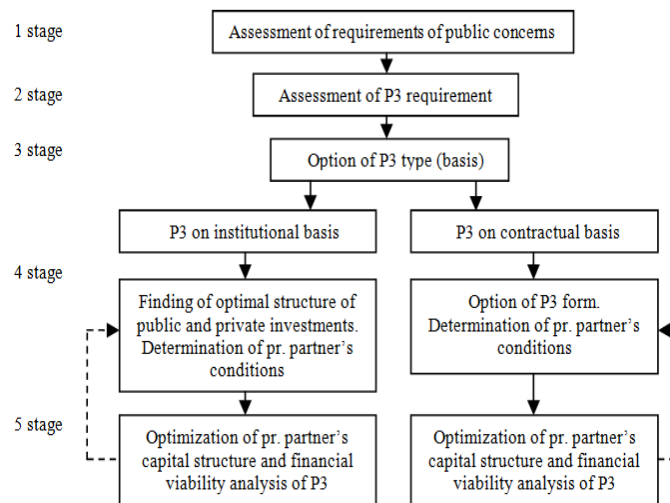

Figure 1. Methodology of optimal capital structure's formation

The third stage is characterized as in which it has to be chosen the basis of P3. If the project is such relevant for the implementation of public body's strategic purposes due to which it cannot be fully outsourced, and the particularity of the project is such that only the part of activities must be transferred to the private partner, P3 has to be implemented on institutional basis where capital is made from both private and public partners' investments, otherwise contractual basis where capital is made only from the investments of the private entity.

Depending on the selected basis of P3 it considers slightly different tasks in the fourth stage. In the case of institutional basis in regard of different costs of partners' capital and the saving of operating costs determined by more effective performance of private partner it is defined the optimal structure of private and public partners' investments. Then it is determined the conditions of private entity for the participation in P3 such as the conditions of transferring infrastructure and the amount of investments needed, the ways of getting the income and others. In the case of contractual basis firstly it is chosen the rational form of P3 and also as in the previous case it is determined the conditions of private entity participation.

Finally, despite the basis of P3 chosen in both ways it is optimized the structure of capital and analyzed the financial viability of P3 under the requirements of partners and financial institutions which provide loans for the implementation of the project. Due to the different risks of these stakeholders the requirements are accordingly different. Regarding the private partner P3 is attractive if it is satisfied its requirements of profitability and payback period of investments. For the public body P3 is useful only if it allows to decreasing the costs of project's implementation and outlays of the budget. The financial institutions provide the loans only if it is satisfied criterions of equity level and solvency such as debt service coverage ratio and loan life coverage. In summary P3 is financial viable only if it is satisfied all of these requirements named as the indicators of financial viability, otherwise it has to be changed the requirements or P3 is not unviable.

The consistent accomplishment of these stages allows to successfully choosing the rational form of P3 and forming its optimal structure of capital guaranteed win-win results for both public and private partners.

Model of capital structure optimization

Considering the previously presented methodology of optimal capital structure's formation the detailed solution algorithm of this process is provided as follows.

The algorithm starts with the determinations of services analyzed to provide (as shown in Fig. 2). It is described services and evaluated their social-sensibility regarding the fulfillment of public interest. Depends on sensibility of services their existence is consigned under market forces or they get "public services" status and the appropriate public body becomes responsible for the results of their provision. Then it is evaluated NPV, SFA and other financial indicators of the project by which it would be provided the public services if the project would be implemented solely by the public body. The projects planned to implement in P3 are usually characterized as lasting for many years. Therefore in order to achieve more accurate prognosticated results and decrease the risks of project's implementation it has to be used the simulation-based input data modeling. Data are discounted by social discount rate. Depends on the prognosticated indicators and the financial possibilities to implement the project by solely budget resources P3 is analyzed as only or the one of alternatives of project's implementation. Considering this circumstance it depends the decision for the project's and the way of its implementation. In any case it is useful to evaluate the possibilities of P3 for the benefits which the public body can expect to get due to the involvement of private sector to the project. Therefore depends on the earlier mentioned the particularity and strategic importance of the project further it has to be chosen the basis of P3 which would be the most rational for the implementation of project purposes. The accomplishment of all these operation enables to lay the foundation for further successful implementation of P3 and the formation of its optimal capital's structure.
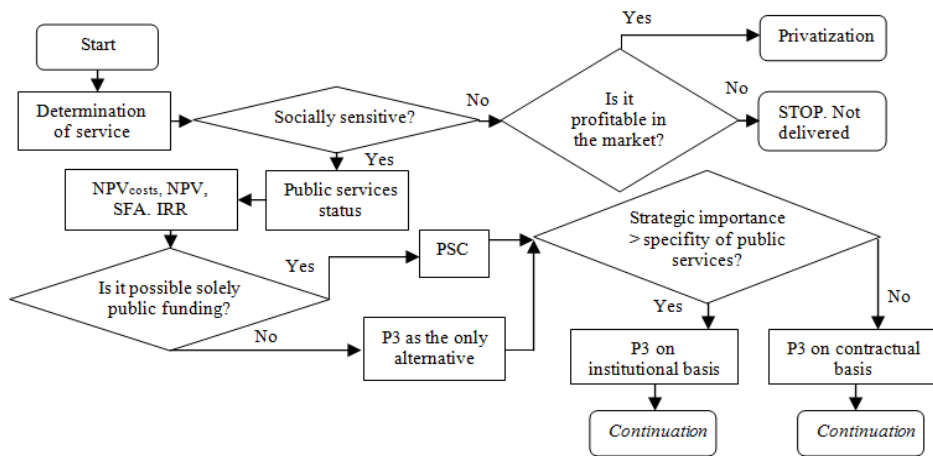

Figure 2. Framework for assessment of requirement of P3and choice of P3 basis

In case of the institutional basis P3 the process of capital structure optimization has to be continued by evaluating the possible savings of operating costs $J(q)$ of the whole project due to the partcipation of the private entity and its transffred know-how (as shown in Fig. 3). Savings enable the further analysis of P3 implementation, otherwise P3 is not rational in regard to the public body. In case of savings it is determined the optimal share of private investments Θ which is asstimated depending on the previously mentioned savings of operation costs and the ratio between capital costs of public and private partners (r_{pu} and r_{pr}) by minimizing total capital costs of operating costs $F(q,\Theta)$ (see eg. Moszoro, 2010). The larger the difference between the interest rates for the private partners and the smaller the savings resulting from private sector participation, the smaller share of private partner's investments is efficient in regard to the public entity.

By determining the optimal share of private partner's investments further by consistently changing the structure of the private entity in regard of equity E and borrowed capital D it is evaluated whether the P3 is financial viable under all requirements of partners and the borrower which are determinated by minimum values of appropraite indicators such as E_{min}, $IRRE_{min}$, $DSCR_{min}$ and others (see eg. Zhang, 2005a). It is selected iterations where it is satisfied all these requirements. The share of equity R in the private partner's capital is optimized under proportion where NPV of equity (NPV_p) ≥ 0, SFA ≥ 1, the savings of project implementation costs in comparison with the case if it would be solely implemented by the public partner ≥ 0 and the maximum IRR of equity ($IRRE$) can be achieved. The case of no iterations means that due to unsuffient profitability the private partner cannot regain its all investmensts (SFA < 1). Therefore by making

the assumption due to the avail of all possibilities to decrease the costs of project's implementation it has to be increased income of private partner. This can be done by the adjusting the allowable maximum service price and/or concession fee payble by the public partner. If the adjusted price is reasonable regarding public interest and adjusted concession fee is bearable for the budget of public body the process of capital optimization comes back to the step of capital structure optimization and financial viability analysis, otherwise P3 is not implemented. The accomplishment of all these actions allows to forming optimal capital structure in institutional basis P3.
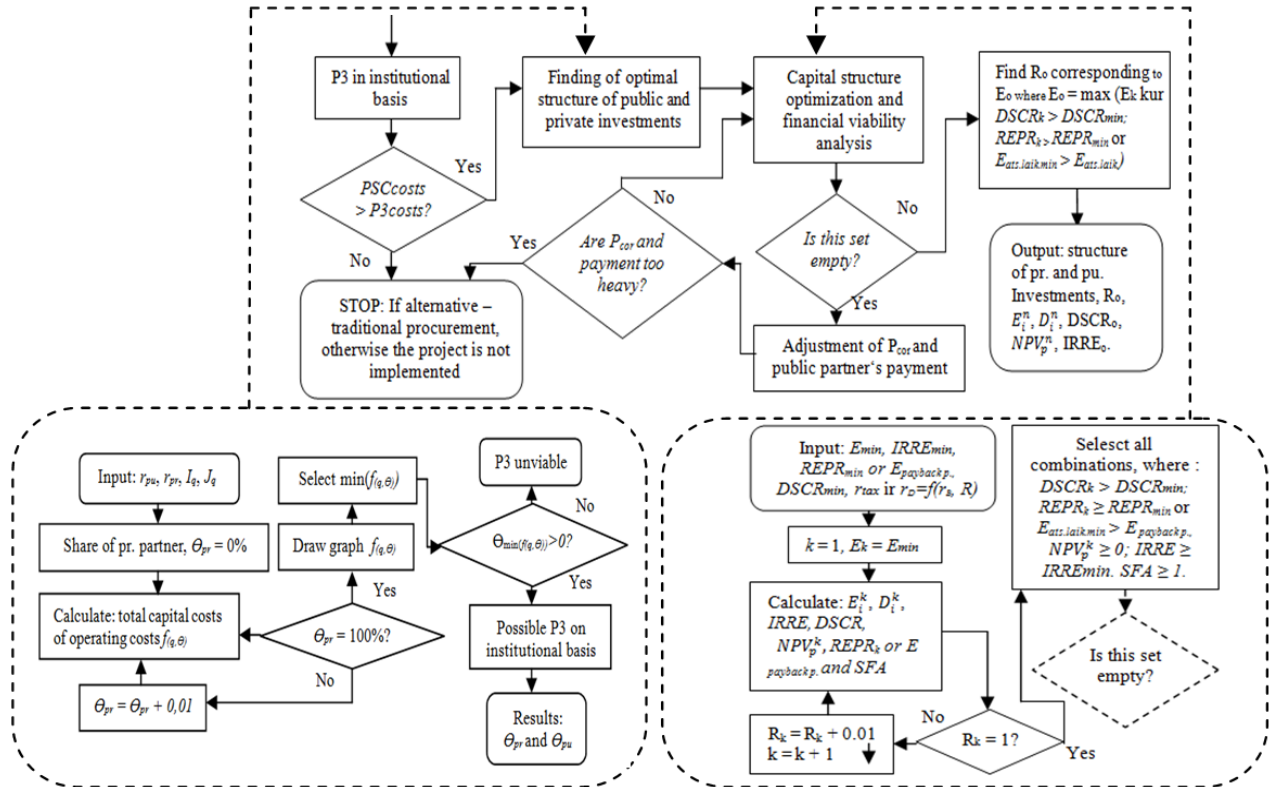

Figure 3. Framework for capital structure optimization and financial viability analysis of P3 on institutional basis (*designed in accordance with Moszoro (2010), Fischer et al (2010), Zhang (2005a,b)*)

In case of the contractual basis P3 the process of capital structure optimization has to be continued by defining the way of income to get for the private entity and the status of infrastructure transferred to him. Depends on these factors the process of optimization further resolves into three branches (as shown in Fig. 4). They have a lot of similarities regarding the process of capital structure optimization of the private partner and analysis of financial viability of P3 especially in cases where the trasnferred insfrastructure is not ready for exploitation. However, their leaving situations are different.

In case of possibility to get income only by the form of concession fee as it is defined in the form of Design-Built-Finance-Operate (DBFO) the capital structure of private partner is optimized by coherently changing the ratio between equity and borrowed capital as in the previous case of institutional basis P3. However, in this case of no iterations P3 can be financial viable only if it will be increased the concession fee, otherwise P3 is unviable. If due to budget constraint the increasement is financial unbearable the only way to make P3 financial viable is to allowing to getting income also from consumer fee. In this case the capital structure is optimized under the conditions as in the form of Built-Operate-Transfer (BOT) which distinguishes from the previous form by possibility to tax the final consumers. In case of no iterations here it is able to adjust the combination of the price of services and concession. The P3 is financial viable only if the adjustment is reasonable regarding public interest and it is satisfied all the previous mentioned requirements, otherwise P3 is financial unviable.

Diversly from the previous cases of contractual basis P3 it is trasferred the ready to use infrastructure in the last case. Under P3 forms of lease or rent the private entity pays a concession fee for the expoited infrastructure to the public partner. Despite these changes here it is also applied the same framework for the optimization of private partner's capital structure and financial viability analysis. However, in case of no

iterations instead of adjusting the concession fee or/and price the capital is optimized by providing or adjusting the subsidy to the private partner.

If adjusted subsidy is reasonable regarding the public interest and satisfies all the previous mentioned requirements P3 is financial viable. and regarding the ratio between equity and borrowed capital as in all P3 forms the structure is optimized in the point where IRRE is maximum.
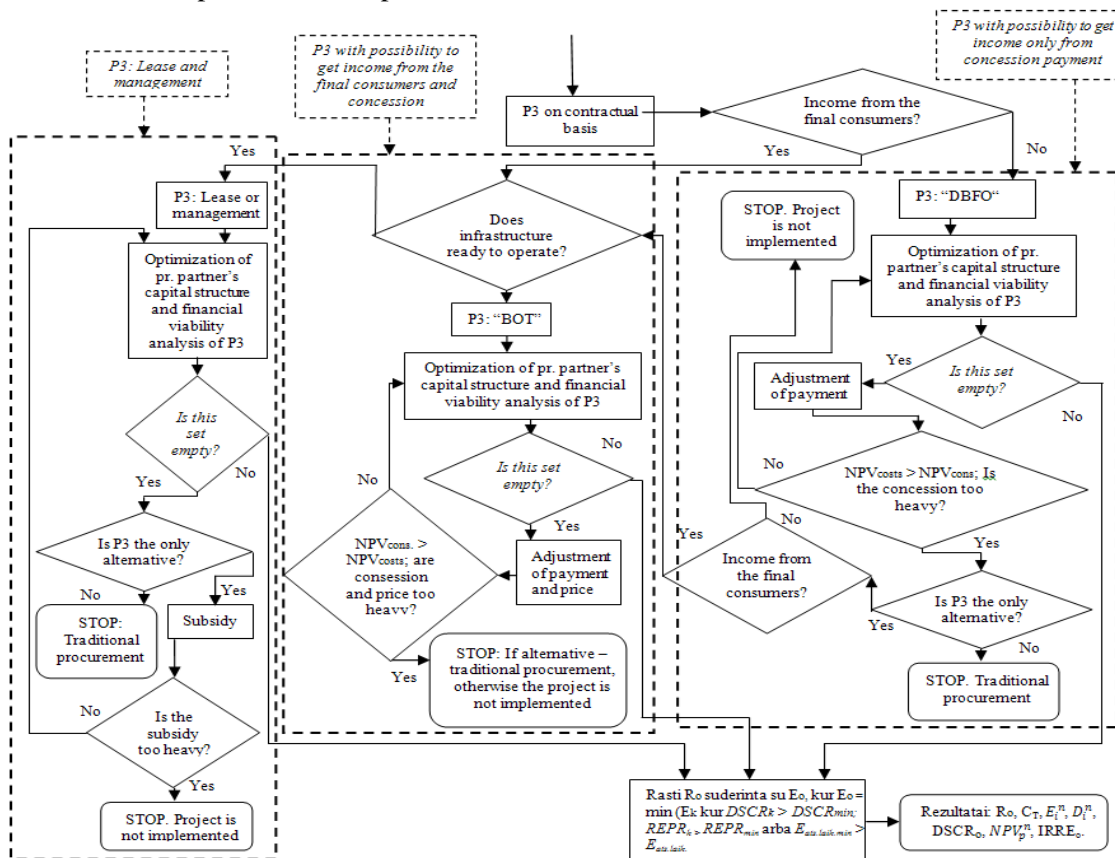

Figure 4. Framework for capital structure optimization and financial viability analysis of P3 on contractual basis *(designed in accordance with Hall (2008), Zhang (2005a), Grimsey and Lewis (2005))*

The consistent implementation of these steps allow to successfully to determining the conditions of private entity's participation, selecting the rational form of P3, forming its optimal structure of capital and evaluating its financial viability under contractual basis P3.

Conclusions

The model is based on systemizing literature and modeling in it proposed various aspects of capital structure optimization in P3, and it is opened for further discussions and development.

Considering the model the process of capital structure optimization starts with the accomplishment of appropriate preparative actions such as the evaluation of services importance regarding public interest, financial possibilities of public body to finance the project by solely budget resources and the choice of rational basis of P3. The accomplishment of these actions allows to objectively to evaluating the requirements of private sector's involvement in the provision of public services and laying foundations for the further successful formation of P3 and optimization of its capital structure.

In institutional basis P3 the optimum structure of public-private ownership depends on the capital costs spread and the potential savings from the private management. The larger spread between capital coast rates and the smaller the savings resulting from private sector participation, the smaller share of private partner's investments is efficient regarding the public entity. The optimization of private partner's capital structure is based on the self-financing part of construction costs under requirements of all stakeholders. Modelling ration between borrowed capital and equity the structure is optimized where the biggest possible internal rate of return on equity under satisfied requirements of all stakeholders is achieved. The financial viability of P3 determines the satisfaction of all its participants' requirements.

Suggestions. For the faciliation of all mentioned optimization processes it is recommend to use the method of linear programing which allows to avoiding the monotonous evaluating of every iterations by searching the most rational capital structure.

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