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Towards Effective Hedging For Construction Concessions Delays

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Abstract

Public Private Partnerships' (PPPs) financial risks are addressed through various financial instruments including hedging. Hedging arrangements affect the cost of debt or the breakage costs anticipated in termination compensation, while they are associated with significant costs for the concessionaire. Therefore, the capital structuring of a PPP should appropriately integrate hedging as a risk reduction technique that is inherent to the whole project's financial analysis. An appropriately structured hedging strategy should, also, be able to anticipate the occurrence of other risks and especially those that result in schedule overruns. An accurate benchmarking of hedging costs in relation to schedule overruns could increase the effectiveness of the risk reduction strategy by indicating boundary values for both the time period and costs, wherein hedging is efficient in concession projects with construction delays. This paper addresses the issue of applying hedging in PPPs and highlights the implications of schedule overruns to the efficiency of this technique. An approach to ensure the timely evaluation of efficient hedging for reducing risks in the case of construction delays is proposed; it forms a first step towards the provision of a practice for analysts to decide on the proper application of hedging in PPPs.

Keywords

Public Private Partnerships, Hedging, Construction delays, Schedule overrun

1. Introduction

Public Private Partnerships (PPPs) are exposed to several types of risks in their life cycle, which normally spans two to three decades depending on the type of the partnership. The long period of exposure to risks may render the various risk prevention and mitigation strategies inappropriate due to unexpected or poorly estimated changes of conditions that affect the effectiveness of the applied strategies. A recent example is that of the global economic and financial crisis that affected both existing, as well as planned PPP programs through changes of the credit costs, fluctuations of the exchange rates, changes of the demand for services and infrastructure provided under the PPP scheme, etc. (Burger *et al.*, 2009). In such situations the financial structure of the PPP often requires significant amendments that are feasible only by renegotiations, which, however, may be lengthy and tend to favor those members in the partnership (almost always the private sector partners) who are in an advantageous position at the time and conditions

of renegotiations (Rui Cunha and Sanford, 2010; de Los Angeles Baeza and Vassallo, 2010). Therefore, what is required is a constant monitoring of the risks and a timely application of effective risk response tools, in order to avoid the costly and time-consuming renegotiation processes.

This paper argues that due to the interdependencies between risks, it is possible to use the same risk response tools to effectively manage different types of risks. The analysis focuses on the concurrent management of the schedule overrun risk and the macro-economic risks with the use of derivatives. A brief presentation of hedging tools applicable to PPPs sets the framework for the analysis and, then, an example of the impact of schedule overruns on the efficiency of the hedging strategy is presented. The paper concludes with a suggestion for mitigating technical risks such as construction delays with the use of derivatives.

2. Hedging basics and application in PPPs

Hedging is a general approach to mitigate risks that may involve several tools and techniques aiming at balancing potential losses from an action by securing potential gains from another action that is negatively correlated with the hedged one. Since, in most of the cases, such a negative correlation is either infeasible or partial between different physical commodities, several financial instruments, such as options, futures and swaps have been developed for use in hedging. As with all risk mitigation techniques, hedging is associated with certain costs that contribute as cash outflows to the financing scheme; therefore, the effectiveness of hedging tools is of significant importance to the project's financial structure.

Deloitte's (2013) summary of the items that are eligible for hedging according to the International Accounting Standard - IAS 39 and its subsequent amendments until 2008 refers to:

- Single recognized assets or liabilities, firm commitments, highly probable forecast transactions or net investments in a foreign operation.
- Groups of all the above provided they present similar risk characteristics.
- Held-to-maturity investments either for foreign currency or credit risk, except from interest or prepayment risk.
- Portions of the cash flows or fair values of a financial asset or financial liability or a non-financial item for foreign currency risk only for all risks of the entire item.
- Portion of the portfolio of financial assets or financial liabilities that share the risk being hedged only in the case of a portfolio hedge of interest rate risk.
- Foreign currency risk of a highly probable intragroup forecast transaction (only under certain conditions).

There are three types of hedging relationships recognized in the context of hedge accounting (Deloitte, 2013), namely: a) a fair value hedge, b) a cash flow hedge, and c) a hedge of a net investment in a foreign operation. In all cases, the hedging relationship should result to the partial offsetting of the changes of the hedged item by the changes of the hedging instrument in the case of occurrence of the anticipated risk (IASB, 2004).

Hedging strategies have been applied in PPPs through several forms and tools; however, it is evident that they are dominantly addressing risks of financial/economic nature (Devapriya, 2006; Chaied and Errunza, 2007; Estache *et al.*, 2007) such as currency risks, inflation rate risks, interest rate risks, credit risks and demand risks. Although there is an undoubted interdependency between technical and financial risks, in the sense that the occurrence of a design fault risk or a cost and schedule overrun risk may cause a critical time delay for the project's completion allowing the occurrence of several financial risks, such as interest rate or credit risks, there is a distinct philosophy of risk response strategies for the two risk categories; technical risks are managed contractually, while financial risks are managed through insurance or

financial instruments such as derivatives (Checcherita and Gifford, 2007; Gatti, 2008). Figure 1 illustrates a very usual, initial classification and risk allocation of PPPs risks along with the usual risk response tools per risks category.

The use of hedging instruments dominantly for financial risks is justifiable considering that technical risks are translated either as construction costs or schedule overruns. Given that technical risks are anticipated in the pre-completion phase, when no revenues are produced from the project, in the case of construction costs overruns there is no direct offsetting of the changes between the hedged item and the hedged instrument; in other words, there's no direct loss of cash inflows to hedge. In the second case, i.e. that of a schedule overrun, it is evident that time, itself, does not qualify as an item for hedging (Deloitte, 2013).

Risks Interest rate, Exchange, Inflation, Environmental, Regulatory, Legal, Credit/Counterparty		Risks allocation tools Derivatives, Insurance	
Project's Lifecycle			
Pre-completion phase		Post-completion phase	
Risks Activity planning, Technological, Construction	Risks allocation tools Turnkey contracts	Risks Supply, Operational, Market	Risks allocation tools Put or Pay agreements, O&M agreements, Offtake agreements

Figure 1: Risks Allocation and Response Tools for Different Types of Risks (modified from Gatti, 2008)

As a result, managing risks in PPPs remains fragmented, in terms of coherence of risk response tools applied to the phases of the project's life cycle. The effect of this situation is that in cases of considerable construction delays, the concessionaire may be involved in extra costs for applying hedging instruments that are of no use, since the project delays to turn to the post-completion phase. Considering: a) that the financial structure of a PPP project, including risks response strategies, is finalized early in the project's development, and b) that the constructor, in most cases, is tightly related to the concessionaire, it is evident that hedging can be a considerable extra burden for the concessionaire. A very good example of such a situation is presented by Lambropoulos *et al.*, (2013) regarding the motorway concessions, which are, currently, under development in Greece. As explained there, the financial crisis in combination with land-expropriation and permissions issuance delays have resulted to considerable schedule overruns that in turn generated insuperable difficulties with regard to construction funding, construction development, and projects' viability (Lambropoulos *et al.*, 2013). A critical issue in these disastrous conditions was that when it became evident that the swaps applied by the concessionaires to hedge the loans were of no use, the costs for an effective cancelling or rearrangement of them had become very significant to allow a costs relief for the concessionaires and a change in managing financial risks in these PPPs (Lambropoulos *et al.*, 2013).

Based on the above, it becomes evident that a continuous monitoring of the effectiveness of the applied hedging instruments becomes imperative, but it may not be sufficient. A smart structuring of a derivatives portfolio that could comprehensively and simultaneously deal with technical and financial risks in both

the pre-completion and post-completion phase of the PPP project should be pursued to ensure project's funding and viability in the long term. The next sections discuss at a high level such an approach.

3. Hedge effectiveness in PPPs

"Hedge effectiveness is the degree to which changes in the fair value or cash flows of the hedged item that are attributable to a hedged risk are offset by changes in the fair value or cash flows of the hedging instrument" (IASB, 2004). According to the international accounting standards, hedge effectiveness should be periodically monitored through quantitative or qualitative methods, in both a retrospective and prospective basis to demonstrate existing and justify anticipated hedge effectiveness (FiNCAD, 2011).

An example of such a retrospective analysis for a PPP construction project illustrates the significance of monitoring hedge effectiveness. Hypothetically, a concessionaire enters on January 1, 2008, a 20-year period swap contract to hedge a floating interest rate to a fixed one for a given loan of €100M that is payable in equal semestrial installments. Based on the EURIBOR fluctuation from 2007 until today, which is presented in Figure 2, it is evident that the concessionaire raised the loan service costs by entering the contract and, therefore, hedging was highly ineffective.
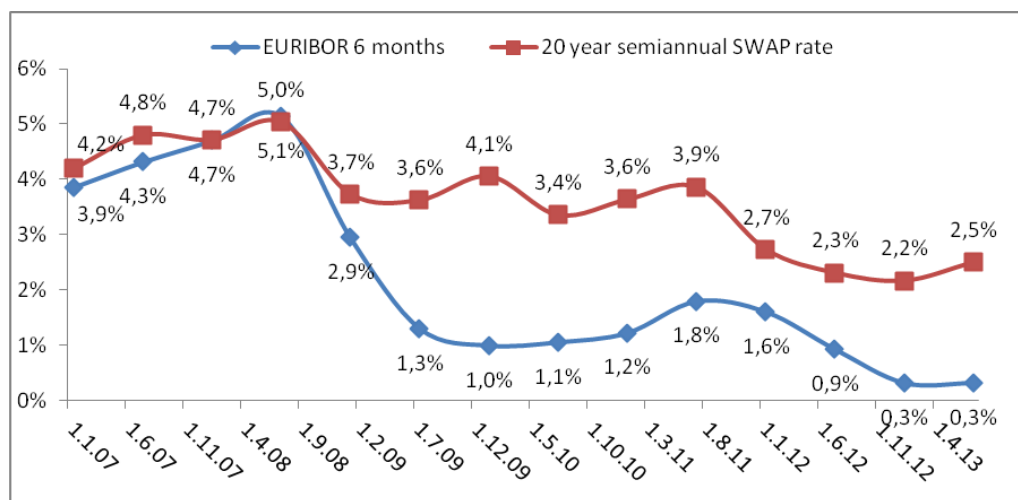

Figure 2: Fluctuation of EURIBOR and Swap Rates for the Period 2007-2013

Figure 2 indicates that from the beginning of 2009 the concessionaire should exit the swap, and potentially enter, today, a new one at the rate of 2.5% having already benefited from the low floating interest rate of the period 2009-2013. Every semester of delay from exiting the swap would incur high costs, which are calculated from the difference between the net present value of the cash flows of floating interest minus the respective one for the cash flows of fixed interest for the remaining period between the exit date and the date of the swap termination. Table 1 presents such calculations.

Table 1: Calculated Costs for Exiting the Swap (*per the example*)

Exit date	31-12-08	31-12-09	31-12-10	31-12-11	31-12-12
Exit cost (€)	11,063,564	15,457,219	17,990,083	24,406,619	33,062,091

It is obvious from the figures in Table 1 that the monitoring of project development becomes even more critical in the case of PPPs, because the financial costs incurred are very significant. Ideally, the schedule plan should include a milestone for taking action with regard to the effectiveness of hedging, in case of

schedule delays; however, such estimation is extremely difficult due to the various uncertainties involved (e.g., fluctuations of swaps rates and interest rates). Given that under certain conditions (e.g. the contract and the funding scheme) the financial costs associated to schedule delays could be affordable for a certain time period, the determination of this period becomes critical. This is because it would provide for both the creditors and the concessionaire a time buffer to adjust their policies and deal comprehensively with the construction costs due to delays and the financial costs incurred due to delays and the developments in the financial market as well. The next section presents a comprehensive approach to ensure the existence of such a period and to estimate it; a numerical example is roughly given for explanatory reasons.

4. Evaluation of hedge effectiveness in the case of construction delays in PPP projects

A well known and tested method in project monitoring is the Earned Value Management (EVM), which applies to all kinds of projects and provides a comprehensive approach that integrates cost, schedule and scope monitored data to form the project's performance baseline. Despite the criticism for its effectiveness, especially compared to other more elaborated similar approaches such as the Earned Schedule Management (ESM) (Tzaveas *et al.*, 2010), it remains a valid and commonly used method for project monitoring with wide application in the construction industry.

Evaluating the effectiveness of hedging in the case of construction delays in PPP projects could be achieved as demonstrated in the following simplified example. Suppose that the development of a PPP project with a construction period of six years is presented in Figure 3.
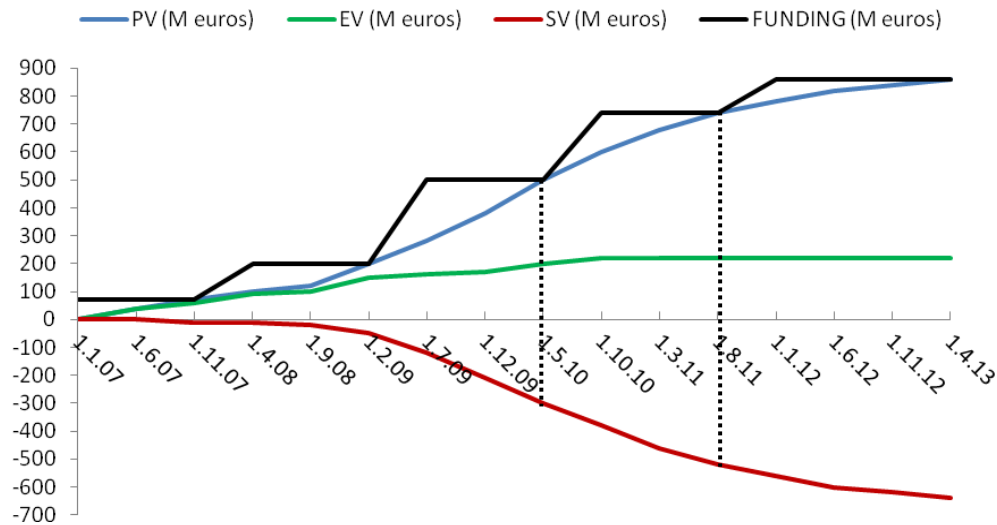

Figure 3: Using Earned Value Management to evaluate hedge effectiveness in the case of construction delays

As illustrated from the earned value (EV) curve in Figure 3, the project's delay starts at the third monitoring period; a full cease of works starts at the ninth monitoring period and goes on. This results to a schedule variance (SV) that increases significantly, especially after the sixth period, and indicates the need of immediate action in terms of project development performance. At the same time, the funding, which in this example is materialized with periodic installments every three monitoring periods, is considered upfront to the construction works, thus ensuring the constructor's ability to fund the project's development. Such a funding scheme provides the opportunity to the constructor to exploit the amount that remains intact, until it is used for the project's development. Therefore, at each specific time during the construction development, the constructor may re-invest an amount that equals the non-used funds. In this way, the constructor creates an inflow that depending on the available deposit interest rates provides

with a time period to re-evaluate all costs, including hedging ones, and decide whether a financial policy shift is required based on the forecasts of the anticipated construction delays. In the example, the amount that would be feasible to use according to the described approach would be €20M as shown in Figure 3, which corresponds to the schedule variance between the dashed lines that indicate the boundaries of the last period where funding would be available before the cease of works.

The described approach requires the following prerequisites and assumptions to be valid: a) the project's cost variance (CV) should be constantly zero, b) the deposit interest rates should be non-zero, c) the funding scheme should allow the upfront installments for the construction works period, and d) the funding scheme should not be rigidly dependent to the project's development. These assumptions imply a risk allocation that would be in favor of the project's development instead of the constructor's, the concessionaire's and the creditors' direct interests. Indeed, in current practice funding is, normally, provided after the evaluation of the works progress and, furthermore, it is equivalent to this progress; therefore, not only there is no potential for the creation of the described time buffer by the use of available (to the constructor) funds, but, also, a schedule delay results to less or even cease of funding. The proposed approach would allow for a time period of negotiations between the project's stakeholders, with the project on foot, even though funding would be problematic due to schedule delays. The shift of the risk allocation at the expense of the creditors, which the proposed approach implies, is balanced by the extra risk that the constructor bears concerning the obligation to retain the CV at a constantly zero value. It is evident that such a risk allocation requires a solid contractual background that should also involve some more fundamental contractual provisions, such as:

- A detailed risk management plan for schedule delay risks. Considering that schedule delays may occur due to reasons or omissions, which are outside the control of the constructor (e.g. land expropriation, archaeological findings, etc.), the related risks should not result to the project's halting; instead, there should be detailed contractual provisions on the management of these risks to allow the project's completion at the expense of the contractual party that bears the risk.
- An obligation for the state and the concessionaire to complete all necessary pre-construction actions prior to the initiation of the project's construction phase. Such an obligation could take the form of a subcontract with specific deliverables that would ensure the unhindered project's development by minimizing all the schedule delay risk sources that are irrelevant to the project's works. In this way, the remaining schedule delay risk could be allocated to the constructor, who could have absolute responsibility to monitor and mitigate the risk.
- An obligation for the creditor to provide an additional loan for a predefined time period, valid after the complete use of the surplus created as described above and only in cases of long delays. Such a loan would ensure the project's funding at the expense of the party responsible for the cause of the delay.

The described contractual framework would explicitly manage schedule delay risks and provide a time buffer for reconsidering the applied hedging instruments and, potentially, revising them in the case of long schedule delays.

5. Conclusions

Managing financial and construction costs in PPP construction projects is a challenging task that becomes even more demanding in the case of schedule overruns. The efficiency of the tools used to manage financial risks requires constant monitoring and timely reaction on behalf of the constructor. This paper presents an approach that aims at two goals: a) to successfully manage schedule delay risk sources and, explicitly, allocate them in a way to ensure the project's development, and b) to provide a time period for the estimation of the effectiveness of hedging tools and timely decision on their use with appropriate modifications. The proposed approach requires a contractual background that would re-allocate the schedule delay risk to all the main stakeholders of a PPP, by identifying the sources of delay and

respectively allocating the risk to the party that controls them. The critical provisions of such a background are proposed and should be applicable in the cases where the schedule delay risk is grossly defined. It is anticipated that the on-going research will allow the elaboration of a full method to directly evaluate the efficiency of hedging tools in the case of construction delays in PPP projects.

6. References

Burger, P., Tyson, J., Karpowicz, I., and Coelho, M.D. (2009). "*The effects of the financial crisis on Public-Private Partnerships*". IMF Fiscal Affairs Department WP/09/144, Washington DC: International Monetary Fund.

Chaieb, I. and Errunza, V. (2007). "International asset pricing under segmentation and PPP deviations". *Journal of Financial Economics*, Vol.86, No.2, pp 543-578.

Checherita, C. and Gifford, J. (2007). "Risk sharing in Public-Private Partnerships: General considerations and an evaluation of the U.S. practice in road transportation" In: Transportation Research Forum, *Transportation Research Forum, 48th Annual Forum*. Boston, Massachusettes 15-17 March 2007. North Dakota, U.S.A.: Transportation Research Forum.

Devapriya, K.A.K. (2006). "Governance issues in financing of public-private partnership organizations in network infrastructure industries". *International Journal of Project Management*, Vol.24, No.7, pp 557-565.

Estache, A., Juan, E., and Trujillo, L. (2007). "*Public-Private Partnerships in transport*". Sustainable Development Vice-Presidency WPS 4436, The World Bank.

Gatti, S. (2008). *Project finance in theory and practice: designing, structuring, and financing private and public projects*, Elsevier Inc., United States of America.

de Los Angeles Baeza, M., and Vassallo, J.M. (2010). "Private concession contracts for toll roads in Spain: analysis and recommendations". *Public Money & Management*, Vol.30, No.5, pp 299-304.

Deloitte (2013). IAS 39: Financial Instruments: Recognition and Measurement. Online at: http://www. iasplus.com/en/standards/ias/ias39. Accessed on August 5, 2013.

FinancialCAD – FiNCAD (2011). Basics of hedge effectiveness testing and measurement [pdf] Canada: FinancialCAD, Online at: http://www.cmegroup.com/education/files/basics-of-hedge-effectiveness.pdf. Accessed on August 14, 2013.

International Accounting Standards Board – IASB (2004). *International Accounting Standard - IAS 39: Financial Instruments: Recognition and Measurement*, London: IASB.

Lambropoulos, S., Marinelli, M., and Pantouvakis, J.-P. (2013). "Ex post risk analysis of Greek motorway concessions in distress". In: Hajdu, M. and Skibniewski, M.J. (2013) (eds.). *Proceedings of Creative Construction 2013 Conference*, July 6-9, Budapest, Hungary, pp 440-450.

Rui Cunha, M., and Sanford, B. (2010). "Revisiting the strengths and limitations of regulatory contracts in infrastructure industries". *Journal of Infrastructure Systems*, Vol.16, No.4, pp 334-342.

Tzaveas, T., Katsavounis, S. and Kalfakakou, G. (2010). Analysis of project performance of a real case study and assessment of Earned Value and Earned Schedule Techniques for the prediction of project completion date. In J.P. Pantouvakis (2010) (ed.). *Proceedings of the PM-05 – Fifth Scientific Conference on Project Management, Advancing Project Management for the 21st Century "Concepts, Tools & Techniques for Managing Successful Projects"*, May 29-31, Heraklion, Crete, Greece, pp 752-759.