Early termination in PPP infrastructure projects: a pricing mechanism based on Real Options Theory

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Abstract

This paper uses the Real Options Theory in PPP infrastructure projects to value early termination in the toll road concessions as a contractual compensation mechanism focused on the point of view of private investors. In that sense, considering a stochastic compensation fee we priced early termination mechanism as an option to abandon the toll road concession where we applied an analytical solution. Additionally, the idiosyncratic features from the compensation fee are incorporated into the analysis taking into account the future uncertainty of the project to provide more realism in the determination of the early termination mechanism and its valuation.

Keywords: Infrastructure projects, early termination mechanism, option to abandon.

Introduction

Public-private partnerships (PPP) have been extensively used to attract private participation in infrastructure projects under contractual relationships between public and private parties. Based on the PPP scheme, the infrastructure is delivered by the Government to private party known as the concessionaire (or the special purpose vehicle - SPV). The SPV must finance, build, and operate infrastructure projects based on a concession agreement conceded by the government for a long concession period[3], which should be enough to ensure a required rate of return given a revenue scheme based on a fee collection (Yescombe, 2002; Grimsey and Lewis 2002). Because of these features, infrastructure projects are exposed to several risks which should be allocated between all parties involved in the agreement to control and manage them. So that the analysis of risk is essential in PPP projects.

Gatti (2008) suggest that the allocation all the risks among both public and private parts is required given that the SPV may be exposed to high losses when risks are not managed

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[3] This type of agreement is known as BOMT contract. Although, the BOMT is one of the main non-recourse project financing schemes in practice there are other kinds of contracts. See Yescombe (2002) and Gatti (2008), for more details.

correctly. When PPP projects face risk events, the public and private parties usually conduct renegotiations and attempt to take steps to resolve the problem rather than immediately terminating the project. However, many projects were terminated earlier before the expiry date[4] like Caselli, Marciante and Gatti (2009) and Xiong and Zhang (2014) suggested.

On the other hand, Guasch and Straub (2009) stated that many PPP projects have suffered serious difficulties owing to poor management of risks involved and some of these have been terminated earlier. Furthermore, Talus (2009) identified several reasons for early termination, such as asymmetric bidding information, unreasonable risk management and allocation, weak oversight, changes in law, financing failure, default by the parties, conflicts of interest, and force majeure events. Similarly, in the literature other reasons are identified such as the inexperienced government bodies and lack of proper understanding of PPPs as well as the general corruption and untrustworthiness of public officials (Guasch and Straub, 2009; Galilea and Medda, 2010; Iossa and Martimort, 2016), and either the inappropriate risk sharing will or inability to identify and manage them (Wang, Dulaimi and Aguria, 2004; Gatti, 2008; Ameyaw and Chan, 2015).

Zhang and Xiong (2015) and Song, Hu, and Feng (2018) argued that both renegotiation and early termination of PPP projects are very common in practice, and early termination take place when renegotiations fail. Furthermore, Zhang and Xiong (2015) states that renegotiation and early-termination could greatly reduce the strengths and advantages of PPP projects because unexpected risk events and ealry termination may occur with high costs for the government due to the huge compensation to the concessionaire, additional financial costs, and arbitration fees. Therefore, there are still many challenges for PPPs, among which renegotiations and early terminations are two issues to be tackled.

In early termination in PPP projects an appropriate trigger should be identified according to the parties' respective responsibilities within the concession agreement as well it may determine reasonable, fair, and effective compensation mechanisms. The main concern for Government is looking at the best scheme to value the compensation mechanism like Iossa and Martimort (2016) and Giraldo (2019) suggested. Despite the vast literature on PPP projects about of risk analysis and the valuation (Grimsey and Lewis 2002; Iyer and Sagheer, 2011; Ashuri et al., 2012; Liu, Yu, and Cheah, 2014; Attarzadeh et al., 2017; Carbonara and Pellegrino, 2018), there is still a lack in the empirical literature to assess completely effective compensation mechanisms in PPP projects when early termination of the contract take place.

This paper contributes to the literature about compensation mechanisms in PPP projects. We use the Real Options Theory in PPP infrastructure projects to value early termination in a toll road concession as a contractual compensation mechanism focused on the point of view of

[4] In fact, a recent report issued by the World Bank indicates that a significant number of projects (661 of 7.120) were terminated earlier between 1980 and 2018.

private investors. In that sense, by considering a stochastic compensation fee we priced early termination as an option to abandon the concession into an analytical solution where the uncertainty about the future traffic volume is incorporated in the analysis.

This paper is organized as follows. Section 2 presents a general literature review of the real options theory in PPP projects to value compensation mechanism like early termination. Section 3 presents the model set up to value the mechanism of the early termination. Finally, section 4 presents a numerical example and Section 5 concludes.