

## ABSTRACT

### **Using Real Options for Revenue Risk Mitigation in Transportation Project Financing**

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Effective risk management is essential for success in transportation project financing arrangements such as build–operate–transfer (BOT). Both sponsors and lenders consider the revenue risk an extremely important factor when they assess a BOT project’s feasibility. One potential strategy for mitigating the revenue risk is a revenue guarantee, in which a guarantor secures a minimum amount of revenue for a project; such guarantees take the form of a put option. However, the inclusion of such guarantees in BOT arrangements is hampered by the lack of methods to determine the value, or the fair price, of these types of options. Current valuation techniques lack the flexibility to structure the options in a manner that is affordable to the government and attractive to the private sector. This significant shortcoming opens a research opportunity to explore the development of methods for valuing more flexible and affordable guarantee structures. This paper presents two new valuation methods, the multi–least squares Monte Carlo method and the multi-exercise boundary method, which model the revenue guarantee as a multiple-exercise real option. The two valuation methods successfully combine Monte Carlo simulation and dynamic programming techniques to price multiple exercise real options. A hypothetical case study illustrates the application and the potential of the two methods to serve as tools for risk mitigation in BOT projects.

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