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Real options-based Valuation of Infrastructure Expansion: The Case of a Brazilian Port

Pedro Godinho, University of Coimbra, CeBER, Faculty of Economics, Portugal
João Carlos Souza, Graduate Program in Applied Computing (PPCA), University of Brasília, Brazil
Pedro Torres, University of Coimbra, CeBER, Faculty of Economics, Portugal
Email: <pgodinho@fe.uc.pt>

Abstract

This study uses a Monte Carlo-based real options approach to analyse the expansion of a port. A stochastic model is defined for the project and a methodology is proposed for determining the optimal moment for expanding the terminal. The model is applied to a terminal of the Santarém port, in Brazil, but it can be easily extended to other types of infrastructures, resorting to a common spreadsheet and a simulation add-in. The application of the model and the methodology allow the quantification of both the possibility of expanding the terminal and the flexibility to determine when to expand. We conclude that deterministic cash flow models, based on the expected value, may lead to important biases in projects with capacity constraints. We also conclude that the expansion option may have a high value, which is strongly determined by the initial conditions, and that the expansion thresholds (the values of demand that trigger the expansion) change significantly along the project. The study proposes a methodology to determine the optimal expansion timing that can be used to evaluate other cases. The simulation model proves to be easy to apply and adapt to different initial conditions and to other contexts.

Keywords: Ports, Simulation, Real Options.
