



# A royalty negotiation model for BOT (build–operate–transfer) projects: The operational revenue-based model

Chao-Chung Kang<sup>a,\*</sup>, Cheng-Min Feng<sup>b,1</sup>, Chiu-Yen Kuo<sup>b</sup>

<sup>a</sup> Department of Business Administration and Graduate Institute of Management, Providence University, 200, Chung-Chi, Rd., Shalu, Taichung Hsien 433, Taiwan

<sup>b</sup> Institute of Traffic and Transportation, National Chiao Tung University, 114, 4F, Sec.1, Chung Hsiao W. Rd., Taipei 100, Taiwan

## ARTICLE INFO

### Article history:

Received 22 September 2009

Received in revised form 18 May 2011

Accepted 18 May 2011

### Keywords:

BOT project

Royalty

Negotiation

Bi-level programming

## ABSTRACT

Whilst few studies have explored royalty negotiations for build, operate and transfer (BOT) projects, some works have proposed numerous royalty formulas to evaluate royalty amounts or franchise fees for a BOT project. Despite this, the royalty negotiation process is one of the many critical negotiation items of a concession contract. This study not only developed a royalty negotiation model for BOT projects, but also developed the iterative algorithm for the BLP problem for the government and the private sector. In addition, the factors incorporated into the iterative algorithm for the BLP problem include the concession rate, learning rate, and the time value discount rate for both parties. Moreover, this paper conducted a case study of the Taipei Port Container Logistic BOT Project using LINGO and MATLAB programming. The results show that the two parties involved completed royalty negotiation at the sixth negotiation. The objective function value for lower-level programming was 1.062 and the government finance recovery rate for higher-level programming was 11.832. The findings show that the government can receive the royalty, which is calculated by using 0.012% of the operating revenue of this BOT project, from the concessionaire. Therefore, the royalty negotiation model based on the operating revenue developed herein; could be employed to explain the negotiation behavior.

© 2011 Elsevier Ltd. All rights reserved.

## 1. Introduction

The Build, Operate and Transfer (BOT) is a project financing approach in which a private entity receives a concession from the private or public sector to finance, design, contract, and operate a facility for a specific period, often as long as 20 or 30 years. After the concession periods ends, the ownership is transferred back to the granting entity. During the concession period the project proponent is allowed to charge the users of the facility appropriate tolls, fees, rentals, and charges stated in the concession contract [1,2]. This enables the project proponent to recover its investment, operating and maintenance expenses in the project. The BOT approach has been widely employed to implement infrastructure projects, including rail, port, telecommunications, toll road, and highway, etc., in many developed and developing countries around the world [1]. Some BOT cases are the 80 km elevated toll expressway in metropolitan Bangkok in Thailand; the 1200 MW Hab River Project in Pakistan; the 300 MW coal-fired projects in the Philippines; Mexico's 5400 km BOT road-building project; and the Europe Disneyland project, and so on [1].

The royalty should be written in the BOT agreement through the negotiation by both parties [3]. Obviously, it is a revenue sharing scheme between the government and private sectors through the bargaining process for a BOT concession contract. The government or private sector can adopt many methods for royalty computation, such as pre-tax profit-based royalty,

\* Corresponding author. Tel.: +886 4 26328001; fax: +886 4 26328001x13312.

E-mail addresses: [cckang@pu.edu.tw](mailto:cckang@pu.edu.tw) (C.-C. Kang), [cmfeng@cc.nctu.edu.tw](mailto:cmfeng@cc.nctu.edu.tw) (C.-M. Feng).

<sup>1</sup> Fax: +886 2 23494956.