

Real Option Analysis on Optimal Reserve Management for Strategic Resources

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Abstract

The importance of strategic resources which are essential inputs in major industries is recently increasing as partly influenced by resource nationalism. Accordingly, the role of public storage for strategic resources such as nickel, iron, and rare minerals needs to be enforced to properly secure these resources. In Korea with notably low self-sufficiency rate for energy resource, this issue has a particular relevance for that most of strategic resources are imported.

The purpose of this paper is to study the optimal reserve management for resources which are strategically important in maintaining economic activities for industrial sector. In the paper, we exclusively focus on coal, iron and rare minerals. Real option models are developed to analyze optimal timing for resource release and stockpile in the presence of stochastic resource price. Based on empirical estimation results of price process for each resource, we present various types of models incorporating a traditional geometric Brownian motion or mean-reverting process. The optimal release and stockpile thresholds are identified by making use of critical price for the strategic resource. The appropriate scale of reserve is then derived to maintain domestic demand.

This paper contributes to enhancing understanding on rational economic management for strategic resource and to providing budgetary information to expand reserve capacity in Korea. Several possible extension of the model will be discussed including a game-theoretic preemptive strategy to secure overseas resources.

Reference

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