

*The Hong Kong Polytechnic University
Department of Logistics and Maritime Studies
Research Seminar*

Dynamic Hedging for the Real Option Management of Electricity Storage

by

Prof. Stein-Erik FLETEN
Professor of Operations Research
Department of Industrial Economics and Technology Management
Norwegian University of Science and Technology

Date: 8 January 2019 (Tuesday)
Time: 10:30am - 11:30am
Venue: R501, Shirley Chan Building
The Hong Kong Polytechnic University

(Conducted in English)

Abstract:

We model the risk management problem of an operator of electricity storage who participates in a wholesale electricity market and hedges risk by trading currency forwards as well as power futures contracts. Our model considers three types of risks: operational risk due to future supply uncertainty, exchange rate risk when operations and trading takes places in different currencies, and profit risks due to power price variability. We model the problem as a multistage stochastic programming problem and propose a sequential solution approach to handle the high complexity of the optimization problem. Our contribution is three-fold: first, we show how currency risk and currency derivatives can be included in real option models of electricity storage; second, we introduce variables for accurate replication of the cash flow structure from a portfolio of financial contracts; and third, we compare optimization under a risk measure with simple hedging strategies often used in practice. For the case of a Norwegian hydropower producer, we quantify the reduction in risk through currency hedging when there is currency risk. We find that currency hedging leads to a moderate decrease of the profit risk, and that considering monthly power futures in the hedging strategy allows for precision hedging that can contribute to substantial reductions in risk.

Bio:

Stein-Erik is professor of Operations Research in the Department of Industrial Economics and Technology Management, Norwegian University of Science and Technology. His research interests lie in the domains of energy analytics and stochastic programming. These interests concern development and implementation of financial engineering models and methods for engineering-economic analysis of investment in, and operations of energy businesses. This comprises replacement, (dis)investment and other strategic decisions, development of various types of energy price models and improving business processes involving energy through quantitative-oriented approaches. He is particularly interested in applications where there are challenges to managing the uncertainty of energy prices and other related factors.

Please email to clare.lau@polyu.edu.hk for enquiries.

All are welcome!