Robust Capacity Planning Under Service Constraints

Hussein Naseraldin* Opher Baron**
*ORT Braude College of Engineering
Karmiel, Israel

**Rotman School of Management, University of Toronto, Canada

nhussein@braude.ac.il opher.baron@rotman.utoronto.ca

Capacity planning is an essential strategic decision. Uncertainty and long horizon are two complicating factors that make this decision hard to take. We propose various models of capacity planning in an uncertain environment where customers demand must be satisfied under a certain service level constraint in single server queues. We utilize the robust optimization approach to tackle the problem at hand and propose optimal solution as for how to determine the capacity levels of a server in an M/M/1 and M/G/1 regimes. Sensitivity analysis and the price of robustness in capacity planning are also explored. For that purpose, we propose and compare three types of models: a nominal model, a robust model, and a globalized robust model. In the first, we plan while ignoring the uncertainty. In the second, we plan against uncertainty that was defined as a multi-dimensional box uncertainty. In the third model, we add on the uncertainty another aspect that allows for incorporating rare events.