

# Dynamic Nonlinear Pricing of Inventories over Finite Sales Horizons

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## Abstract

We present three dynamic pricing models in a setting where customers can be incentivized to purchase multiple units. We assume a finite sales horizon with a sunk investment in limited inventories, where customer demands form a compound Poisson process that is price dependent. The dynamic linear pricing (DLP) model charges a uniform price that depends on the time-to-go and the remaining capacity. The dynamic nonlinear pricing (DNP) model allows complete freedom in pricing different bundle sizes. We also study dynamic block pricing (DBP) as an intermediate scheme where prices are linear within each block, where the block can be either fixed or flexible. For all models, we present optimality analysis and structural results and compare their relative performances, both theoretically and numerically. We find that DNP can lead to a very significant improvement as compared to DLP. The proposed DBP heuristic, which has significant computational and implementation advantages, performs nearly as well as DNP for the multiplicative utility model.

Key words: revenue management, multi-unit demand, customer choice, dynamic nonlinear pricing, dynamic linear pricing, dynamic block pricing

## Speaker's Profile:

Dr Michael Li is currently an associate professor with tenure at Nanyang Business School of Nanyang Technological University (NTU). He graduated with a mathematics degree from the Beijing Normal University in 1983. He earned a PhD in Mathematics from the University of Regina in 1988 and a PhD in Business Administration 1993 from the University of British Columbia. He joined NTU in 1994.

Dr Li has been conducting interdisciplinary research projects in operations research, transportation studies and applied economics. He has published over 30 articles in international journals, including *Production and Operations Management*, *Transportation Science*, *Transportation Research*, *European Journal of Operational Research*, *Operations Research Letters*, *International Journal of Transport Economics*, among others.

He had provided expert/advisory services to several public agencies and organizations, including the Parliamentary Committee in Transport (1996), APEC Transportation Ministerial Forum (1997), PECC Transportation Task Force (2007-2000), Land Transport Authority (2012), Civil Aviation Authority of Singapore (2012), Public Transport Council (2018), among others.