

Accepted Manuscript

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Lin Tian, Yanming Ge, Yifan Xu

PII: S0360-8352(18)30473-X
DOI: <https://doi.org/10.1016/j.cie.2018.10.003>
Reference: CAIE 5442

To appear in: *Computers & Industrial Engineering*

Received Date: 27 December 2017
Revised Date: 6 June 2018
Accepted Date: 1 October 2018

Please cite this article as: Tian, L., Ge, Y., Xu, Y., A Stochastic Multi-channel Revenue Management Model with Time-dependent Demand, *Computers & Industrial Engineering* (2018), doi: <https://doi.org/10.1016/j.cie.2018.10.003>

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A Stochastic Multi-channel Revenue Management Model with Time-dependent Demand

Lin Tian¹, Yanming Ge^{1;2*}, Yifan Xu¹

1 School of Management, Fudan University, Shanghai, 200433, China

2 College of Information Technology, Shanghai Ocean University, Shanghai, 201306, China

*corresponding author

tian.lin@mail.shufe.edu.cn, ymge@shou.edu.cn, yfxu@fudan.edu.cn

Abstract

E-commerce has seen rapid growth in recent years and many firms (e.g., airline companies) sell directly to their customers through different online channels or agents (e.g., Expedia, Ctrip, Qunar, eLong) by paying different proportional fees. Besides the firm's revenue management decision of dynamically allocating its limited inventory to different demand classes, it may also get a different margin for selling the same product through different channels (at the same price). This paper examines the firm's optimal channel control strategy with combining its revenue management decision. We propose a multi-period multi-channel continuous-time model with time-dependent arrival rates. The market prices are different in different periods. The firm needs to decide the protection levels for all periods and the channel control strategy in each period. By developing a stochastic (Hamiltonian) channel control system and using the Maximum Principle, the optimal channel control rules are found and a threshold channel control policy is proposed. Based on the channel control policy, we show that there exist the unique optimal protection levels for all periods.

Key words: Multi-channel; Revenue management; Time-dependent demand; Stochastic control

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