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# Optimal Resource Allocation across Related Channels

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## Abstract

In this paper, we consider resource allocation strategies of a limited resource across two related channels in a multi-period setting. We study a stochastic control problem where the objective is to determine the optimal limited resource allocation policy across two related channels and optimal transshipment policy between these two channels. We characterize some structural results of the optimal resource allocation policy and show that it is determined by three monotone curves.

*Keywords:* Resource allocation, Dynamic programming, Optimal policies

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## 1. Introduction

There are many scenarios where a rational agent (e.g. a firm, a public organization) allocate available resources into his different branches in order to complete the task or obtain social rewards. For example, in manufacturer industry, a centralized firm has to find an effective way to allocate the limited capacity into different regions every day to minimize the total cost where each region faces stochastic demand and can make some transshipment if necessary after demand realization. In retailing industry, as digital online channel is playing more and more important role in firms' sales, many firms begin to consider so called "omni-channel" strategy, thus an omni-channel retailer has to figure out a way to configure appropriate allocation and transshipment strategies in the offline and online channels. In health care community, the hospital needs to allocate some common limited resources, such as equipments, doctors and

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