

# **Optimal Collection of Two Similar Products from N Ordered Customers**

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## **Abstract**

We develop and analyze a mathematical model for a specific stochastic vehicle routing problem in which a vehicle starts its route from a depot and visits  $N$  customers according to a particular sequence in order to collect from them two similar but not identical products. The actual quantity and the actual type of product that each customer possesses are revealed only when the vehicle arrives at the customer's site. It is assumed that the vehicle has two compartments. We name these compartments, compartment 1 and compartment 2. It is assumed that compartment 1 is suitable for loading product 1 and compartment 2 is suitable for loading product 2. However it is permitted to load items of product 1 into compartment 2 and items of product 2 into compartment 1. These actions cause extra costs that are due to extra labor. The vehicle is allowed during its route to return to the depot to unload the items of both products. The travel costs between consecutive customers and the travel costs between the customers and the depot are known. The objective is to find the routing strategy that minimizes the total expected cost among all possible strategies for servicing all customers. It is possible to find the optimal routing strategy by implementing a suitable stochastic dynamic programming algorithm.

## **Keywords**

Vehicle routing, collection of similar products, stochastic dynamic programming

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