

Course

Advanced Inventory Theory

Date:	14 September, 12 October, 9 & 30 November 2016
Time:	10.00 – 16.00 h.
Location:	Utrecht
Course leaders:	Prof. Rommert Dekker, Prof. Geert-Jan van Houtum
Days:	4
ECTS:	1 (attendance) / 4 (attendance + assignment)
Course fee:	Free for TRAIL/Beta/OML members, others please contact the TRAIL office
Registration:	www.gp-oml.nl

Objectives

- Students will learn an exact analysis for relatively simple inventory models
- Students will learn what can be done via approximate performance evaluation when an exact performance evaluation is not possible.
- Students will learn about heuristics for cases where an exact optimization is not possible or has a too high computational complexity.
- Students will be exposed to open research problems.

Course description

We discuss two types of inventory models:

1. Single-location inventory models for inventories in general,
2. Spare parts inventory models.

The first part will be mainly based on chapters of the book of Axsäter (2015). We start with various single-location, single-item inventory models, and analyze e.g. base stock policies, (r,Q) policies, and (s,S) policies. Next, we study a setting with multiple items and joint ordering costs (the “joint replenishment problem”) and a setting with multiple demand classes and so-called critical level policies.

The second part will be based on chapters of the book of Van Houtum and Kranenburg (2015). In spare parts inventory problems, the focus is generally on the system availabilities of the machines for which spare parts are taken on stock. This leads to multi-item inventory models with various types of system-oriented service level constraints. We show how to derive efficient solutions in a single-location setting with one type of customers, and we formulate heuristics. Next, we study a single-echelon, multi-location setting with lateral transshipments and a two-echelon distribution setting (the “METRIC model”). We also show how these models can be and actually are applied in practice.

Connection with the course “Quantitative Modelling and Analysis of Supply Chains QMASC”:

The latter course is mainly related to our first part. While we focus on single-location models with additional features such as batching via (r,Q) and (s,S) policies, multiple items with joint replenishment costs and multiple demand classes, the course QMASC has a focus on multi-echelon production/inventory systems.

Assignment

Two sets of homework exercises.

Course materials

- Axsäter, S., Inventory Control, 3rd edition, Springer, 2015. (Chapters 3-7)
- Van Houtum, G.J., and Kranenburg, A.A., Spare Parts Inventory Control under System Availability Constraints, Springer, 2015. (Chapter 1, Sections 2.1-2.5, Chapters 3, 5, and 6)
- Handouts

Prerequisite

- Basic probability theory
- Basic knowledge of Markov processes and queueing theory (M|M|1, M|G| ∞ , M|G|c|c queue)

Lecture scheme and preparation

- First and second lecture day: First type of inventory models, by prof. Dekker.
- Third and fourth lecture day: Second type of inventory models, by prof. Van Houtum.
Participants who did not have any inventory theory course until now, can prepare themselves for this part by studying Sections 2.1-2.5 of Van Houtum and Kranenburg (2015). In these sections, the basic multi-item spare parts model is analyzed. This basic model forms a basis for the models of Chapters 3, 5, and 6, and is relatively easy for participants who had an inventory theory course during their master program; this model will be discussed only briefly at the third lecture day.