

APPROACHES TO INVENTORY MANAGEMENT IN SUPPLY CHAINS: A COMPARATIVE STUDY

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Various studies on global economical trends emphasize that supply chains, rather than individual enterprises compete with each other on the global market. Still, most of the research on inventory models focuses on centralized decision models for individual companies. Extension of these results to supply chains receives growing attention only in the past years.

In this study we present and compare four different approaches to inventory management in supply chains:

- the decomposition approach, where each company optimizes its own production and inventories without considering how this affects its partners' situation;
- the integrated approach, which assumes complete trust between the partners who minimize the total production and logistic cost throughout the supply chain;
- the coordination approach, in which self-interested autonomous partners adopt some coordination mechanism to mutually benefit from the decrease of costs in the supply chain; and finally,
- the bilevel approach, where the partner who decides first predicts and takes into account the response that it can expect from its self-interested partners.

Each of these approaches will be illustrated on a simple two-level single-item lot sizing problem.

In the study we analyze the assumptions made by each of the approaches about the cooperation between the partners, especially regarding the information sharing aspects and the contractual requirements. The potential consequences of violating the assumptions will also be investigated. Computational tractability and extensibility to multiple partners or levels in the supply chain will also be considered. Finally, we compare the implied cost, both for the supply chain and for the individual partners, by theoretical considerations and by numerical experiments on the sample problem.

Keywords: Inventory management, supply chain, decomposition, coordination, bilevel optimization.