At the Chair of Logistics and Supply Chain Management of TUM School of Management, we are looking for an interested and qualified student to conduct his/her

## Master's Thesis

on the topic

# The Impact of Demand Variability on Rolling-Horizon Planning in the Stochastic Economic Lot Scheduling Problem

The Stochastic Economic Lot Scheduling Problem (SELSP) is a single-machine multi-product production planning problem that considers the trade-off between large lots to save setups and frequent switching to react to uncertain demand. The problem is highly relevant to make-to-stock industries where setups remain significant, such as chemicals. The problem is difficult as it involves scheduling, lot sizing and safety stock planning in an integrated way. The deterministic problem has been proven to be NP-hard, and the stochastic version can be considered even more difficult.

The goal of this thesis is to evaluate the impact of demand variability on the SELSP. To do so, a rolling-horizon mixed-integer linear programming (MILP) model should be set up that uses expected demands and thus ignores demand uncertainty. This model should be compared to state-of-the-art heuristic solution procedures for the SELSP that take into account the demand uncertainty in some way. The performance difference should be quantified for different levels of demand uncertainty and planning horizons. Based on this, recommendations for practitioners should be derived when to use a rolling horizon MILP and when heuristics are preferrable depending on the variability level of demand.

**Key project tasks:**

- Develop a rolling-horizon MILP formulation for the SELSP
- Implement state-of-the-art heuristics for the SELSP in Python
- Compare the performance of the MILP to the heuristics on a variety of instances
- Quantify the impact of demand variability on the performance of the MILP

**Requirements:**

This thesis is suitable for master's students in Management and Technology. The ability to work independently, as well as analytical skills, are required. Profound programming skills in Python (e.g. from the course Computational Logistics) and good knowledge of mixed-integer linear programming are required. Knowledge of inventory management is beneficial but not required.

**Earliest begin:** April 2025

**Supervisor:** Patrick Helm

**Application:** Email with curriculum vitae and transcript of records to logtheses.log@mgt.tum.de