

# DEALING WITH UNCERTAINTY IN THE MARITIME INVENTORY ROUTING PROBLEM

FILIPE RODRIGUES

Maritime transportation is one of the most common ways to transport goods. However, this kind of transportation is characterized by high levels of uncertainty, since the weather conditions have a great impact in the sailing times.

We consider a single product maritime inventory routing problem in which the production and consumption rates are constant over the planning horizon. The problem involves a heterogeneous fleet and multiple production and consumption ports with limited storage capacity.

The impact of the uncertainty in the sailing times is analysed according to five different approaches: deterministic model, deterministic model with safety stocks, robust optimization, stochastic programming, and a stochastic model using the conditional value at risk measure. This last approach has never been used to solve this problem. The non-deterministic approaches assume two-stage decisions, where the routing as well as the quantities to load/unload are fixed before the uncertainty is revealed, while the visit time to ports and the inventory levels are adjusted to the scenario. For each approach, a mathematical formulation is proposed. An extensive computational comparison of the proposed approaches, based on several quality parameters, is carried out over a set of 21 instances. The obtained results show that substantial gains can be obtained when the uncertainty is incorporated into the model.

UNIVERSITY OF AVEIRO, CAMPUS UNIVERSITÁRIO DE SANTIAGO, 3810-193 AVEIRO,  
PORTUGAL

*Email address:* [fmgrodrigues@ua.pt](mailto:fmgrodrigues@ua.pt)