

ABSTRACT

Benedyk, Irina Vladimirovna. M.S., Purdue University, December 2015. **Risk Management in a Dynamic Model of Intermodal Facility Investment with Uncertainty**. Major Professor: Srinivas Peeta.

This study proposes a scenario-based model with a downside risk constraint to find a robust investment plan for development of intermodal facilities under demand uncertainty. A mixed integer dynamic capacitated intermodal facility location model is developed to model commodity flow distribution and optimal investment decision-making at the national level in the United States (U.S.). A scenario-based analysis is used to analyze the impact of two infrastructure projects on future commodity flow distribution: (1) the Panama Canal expansion; (2) the building of a new port in Nova Scotia. The model results suggest that the development of the port in Jacksonville as an optimal choice is highly dependent on the building of the Nova Scotia port. Next, the downside risk impact i.e., failure to achieve revenue at a desired target level, is incorporated in modeling framework to capture the impact of risk associated with uncertainty in commodity flow distribution. The downside risk analyses reveals that investing in intermodal facility projects is preferable over investing in ports when low downside risk is allowed, and vice versa when high downside risk is allowed. With lower allowed downside risk value, total average costs and cost variance increase. The results suggest the need for prioritizing port projects in New Orleans, Charleston and Boston under any downside risk value. Inland intermodal terminals in California should be simultaneous developed with the port of Los Angeles / Long Beach if value of allowed downside risk is increased. Further increase of allowed downside risk value makes the development of ports in Jacksonville economically efficient. In summary, our model suggests the need to consider the risk associated with project selection when choosing between port expansion and intermodal project selection.