Interdicting Interdependent Contraband Smuggling, Money and Money Laundering Networks

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Abstract

This paper focuses on the problem of interdicting the interdependent contraband smuggling, money and money laundering (ICSML) networks of a transnational criminal organization (TCO). There are four interdependencies among these networks: money flows from the physical contraband smuggling network to the money network, monetary support from the money network flows to the smuggling network, money flows from the money network to the laundering network and incentives from the laundering network flow to the physical and money networks. The goal of the TCO is to maximize a (weighted) balance between the profit and scale of the contraband smuggling business. The goal of law enforcement is to minimize the best possible performance of the TCO. A bi-level integer programming model is built to address the two-player nature of this decision-making environment that specifically captures the interdependencies of the criminal networks. A dual-based reformulation is applied to address the bi-level problem. Case studies of applying this reformulation technique to realistic data sets are presented with a particular focus on understanding how inaccurate information about the structure of the ICSML networks impacts the performance of interdiction decisions. Sensitivity analysis is performed to analyze this impact by examining selected interdictions for perturbations of the network. Insights obtained include an understanding of effective interdiction policies for these types of networks and what type of information is most critical to capture in order to make effective interdiction decisions.

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