

An Application of Risk-Constrained Optimization® (RCO) to a Problem of International Trade



Vladimir A. Masch

Risk Evaluation and Management, Inc.

Warren, NJ 07059, USA

(skipandscan@optonline.net)

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The complexity, uncertainty, and perils of the 21st century generate a large number of crucially important complex and long-term socio-economic and technical problems. Solving these problems requires the application of advanced analytical tools that combine computers and sophisticated mathematical models. Using such a combination demands, however, embedding it in an ensemble of techniques that would neutralize potentially dangerous miscalculations.

Risk-Constrained Optimization® (RCO) provides the necessary ensemble of many novel concepts, models and methods that are critical to each other's success. Perhaps the most important of them is imposing on optimization models an additional function of self-filtering, so that they become very efficient "optimizing filters." Possibly with some modifications, all these techniques, associated with seven diverse disciplines, appear to be necessary components of any dependable methodology of decision making for non-trivial (complex and long-term) problems.

Thus, for the first time in more than 60 years, RCO legitimizes the high-level analytical use of a "computer-optimization model" combination. Describing that function of RCO is the first goal of the present paper.

Also, RCO is the only currently existing methodology for strategic risk management. (The second goal.) RCO constructs a set of robust and flexible, reasonably good and safe long-range candidate strategies. The final strategy is selected from that set subjectively. As with any protective equipment, RCO could reduce the need for knowledge about the future.

Then, as an inseparable component of the outlined above ensemble, RCO introduces a new paradigm of economic decision making -- "catastrophe avoidance," which replaces the current paradigm of utility or profit maximization. Also, economics should be nudging people and organizations toward making socially beneficial decisions. RCO -- or some its equivalent, if it appears and is better -- should become an important part of a badly needed radical transformation of the theory and practice of economics, Operations Research, and adjacent disciplines. (The third goal.)

This paper demonstrates the RCO methodology on the problem of USA-China trade under conditions of radical uncertainty. It is a problem of enormous complexity; we can barely start dealing with it here, in an article focused on RCO. Nevertheless, the approach taken is dismissing the incredibly dangerous assumptions of abstract theory of international trade that, applied in the real world, have destroyed the beneficial social balance, created with enormous difficulties in progressive societies in the last 200 years. (The fourth goal.)

Keywords: Paradigm of economic decision making, Decision making under uncertainty, Risk management, Scenario planning, International trade, Political economy.