
Dynamic Programming at Work

Organizer:

Eligius Hendrix

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10:30 - Dynamic Programming to Detect a New Class of Ordering Policies for Perishables

Author: Rene Haijema

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Abstract: We present a new class of stock-level dependent ordering policies for the periodic review of perishables with a short fixed maximum shelf life. The new class, denoted by (s,S,q,Q) policies, is a periodic review (s,S) policy restricted by a minimum (q) and maximum (Q) order size. The new class is detected by following a stochastic dynamic programming procedure to compute an optimal stock-age dependent policy. Via simulation near optimal parameter values (s,S,q,Q) are read, which may be different for each review period. The (s,S,q,Q) policy performs nearly optimal and shows much lower average costs (often more than 7%) than simple (s,S) policies for a variety of numerical cases where outdating and shortages are inevitable.

Keywords: Inventory control, dynamic programming, perishables

11:00 - On the Role of the Water Pollution Cost Function in Determining Efficient Inter-industry Water Pollution Abatement

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Abstract: In linked terrestrial and marine ecosystems, diffuse source (agricultural) water pollution leads to downstream environmental degradation and subsequent losses in marine values. Sustainable economic development requires balancing of marginal costs and benefits from water pollution abatement. Several studies now aim to determine these efficient rates of water pollution abatement, though little attention is given to the shape of the water pollution cost function. The objective of this paper is to identify how water pollution abatement across agricultural industries is dependent on the choice of the adopted water pollution cost function. Using an optimal control approach with an application to the cane and cattle industries in Tropical Australia, we show that efficient water pollution abatement per (agricultural) industry is dependent on abatement by all (agricultural) industries when marine water pollution costs are non-linearly increasing in the level of water pollution.

Keywords: Optimal control, global optimization, water pollution management

11:30 - Dynamic Programming at Work

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Abstract: Dynamic programming focuses on the question when, in which situation to take which decision. In our experience it is not straightforward for students and researchers to grasp its concepts and to come to workable implementations. In this presentation we discuss its use for answering several practical questions from engineering and economics. When to release water in reservoir or lake management? How long should queues before traffic lights be in order to switch colour? Which actions to take consecutively in an agro-logistics supply chain? How fast should the European Union revise fishing quota? Does price variation influence deforestation in Latin America? Will pollution of several industries in Australia lead to closure of some? How to control the energy consumption of an electric car? We go through the steps and challenges to answer these questions via dynamic programming and focus on fishing quota questions.

Keywords: Dynamic programming, fishery, application