Chapter 2
Bootstrap Evaluation of Expert Panel Opinion in Case Studies Solved by REPOMP

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ABSTRACT

This chapter discusses several applications of the REPOMP procedure (Randomized Expert Panel Opinion Marginalizing Procedure). It analyzes the subjective opinion of an expert panel in a multi-criteria decision making situation. It starts with an expert panel constructing a hierarchical structure of criteria to evaluate the alternatives. At a next stage, the same expert panel evaluates the relative weight of each criterion and the degree of compliance of each alternative with those criteria. Then a randomized procedure is applied to calculate the marginal indicator of each alternative and make the final ordering based on it. Additional simulation procedure is applied to analyze the distribution of that marginal indicator. The alternatives are also being allocated to indifference classes using hypothesis testing procedures. The analyzed examples refer to issues in environmental management, energy efficiency and spatial data infrastructures.

INTRODUCTION

Practical tasks of various types are characterized by substantial level of complexity that stems from the huge amount of information that needs to be processed. It is a common approach to use the opinion of experts to tackle the problem in question. Quantitative analysis is one common solution and offers a way to measure and represent the decision based on the dependent quantities. It uses utility theory (von Neumann & Morgenstern, 1947) and subjective statistics (Wright &

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Ayton, 1994), both of which take into account the subjective preferences and the expectations of the decision analyst. The quantitative decision analysis is also an useful approach in the cases, where it is necessary to make a choice of one out of several alternatives under the condition that the problem is information-wise rich, strongly depends on uncertainty and is being evaluated from a set of contradicting criteria by a group of people. The task of bringing the multi-dimensional subjective estimates, given by the experts, to a total marginal indicator of the quality of each alternative is one of substantial complexity. The REPOMP method that has been developed is a simplified way of tackling this complex task (Tenekedjiev, Kamenova, & Nikolova, 2004).

BACKGROUND

Due to its generalized nature, the REPOMP method may be applied and adapted to a series of problems. This book chapter shall give detailed discussion on the REPOMP method. After that a set of examples shall demonstrate its application in practical case studies.

Example 1 analyzes good practices in the European Union's Member States regarding the collection, usage, and dissemination of full-range spatial data (and spatial meta-data) following the INSPIRE directive (European Commission, 2007). This task has been initially discussed in (Ivanova et al., 2013). The examples starts with a discussion on the progress of work in the national spatial data infrastructure of 26 countries from the European Union. Initial screening outlines only 13 out of these 26 countries to be subjected to further analysis. As a result of the analysis, two countries should be outlined as a reference point in the exchange of good practices and in the elaboration of the spatial data infrastructure in the 27-th country. The experts that are involved in the analysis, identify three marginal criteria, related to quality of the infrastructure, usefulness and technical status of development and implementation.

Example 2 analyzes eight alternatives for modernization and deployment of energy-efficiency measures for public buildings. The case study was initially discussed in (Parushev et al., 2006). A five-storey education building constructed in 1969 is analyzed. The heating volume of the building is 6480m^3, and 16.7% of the facade is a wall, the rest being windows. Four marginal criteria are identified, focusing on technical, financial, and environmental issues of the problem. The alternatives envisage activities such as all-wall isolation (alternative 1), partial thermal isolation (alternative 2), full replacement of window framings (alternative 3), partial replacement of window framings (alternative 4), hydro-isolation of the roof (alternative 5), automated thermal regulation (alternative 6), improvement of maintenance (alternative 7), reduction of heat losses (alternative 8).

Example 3 analyzes two technologies regarding optimized waste treatment. The case study was initially discussed by Tenekedjiev, Kamenova and Nikolova (2004). An answer to the question of whether municipal solid waste (after separating wastes that can be recycled and used) should be directly disposed or thermally processed first is necessary to be identified. Those two alternatives will be referred to as "landfill" and "incineration" (although the second alternative also envisages subsequent landfill of the ash). There is no necessity to go into too many details on the waste treatment technology, for example the necessary land space is not defined, as well as its location, the possible liabilities, etc. In this way, the alternative technologies can be characterized only with the help of statistical data. Experts identify five marginal criteria, referring to environmental impact, economic sustainability, technological feasibility, juridical impact, and social acceptance.