

Chapter 76

Rough Set Analysis and Short–Medium Term Tourist Services Demand Forecasting

Emilio Celotto

Ca' Foscari University of Venice, Italy

Andrea Ellero

Ca' Foscari University of Venice, Italy

Paola Ferretti

Ca' Foscari University of Venice, Italy

ABSTRACT

Along with a growing interest in tourism research is the effort to establish innovative methodologies that are useful to guide the tourist operators and the policy makers in selecting forecasting techniques. Nevertheless, predicting tourist demand is still lacking at a microeconomic level, while it has become a flourishing theme of research uniquely at a macroeconomic level. The main goal is to analyze Italian tourists' behaviours on the basis of statistical surveys on households, life conditions, incomes, consumptions, travels, and vacation. This research is set in the framework of Rough Sets Theory, a Data Mining technique that can easily manage categorical variables. Hence, it is suitable for the exploitation of databases collecting sample surveys data. A large selection of variables from database Sinottica, containing information on social, cultural, and behavioural trends in Italy collected by means of a psychographic survey is provided by a leading market research organization, GfK Eurisko. By defining some decision rules, some interesting relations between consumer behaviours and their corresponding tourism choices are obtained.

INTRODUCTION

Different new artificial intelligence methodologies, as effectively described in (Munakata, 2008) may be compared together with reference to the

most recent tourism demand forecasting models following the frame defined in (Song & Li, 2008). As it is well-known, traditional non-causal time-series and causal econometric models are consolidated tools for macroeconomic forecasts and

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are able to predict tourist flows (arrivals, room nights) or turnover (expenditure, revenues, etc.) on the basis of macroeconomic variables (GDP, i.e. Gross Domestic Product, CPI, i.e. Consumer Price Index, currencies exchange rates, demographic variables, oil price, lagged flows, etc.). However their informative content is limited since they are lacking for what it concerns predicting tourist demand at a microeconomic level, analyzing tourist behaviours of specific segments (cultural tourism, nature-based tourism, rural tourism, sports tourism), in particular for what concerns the segmentation of the Italian demand (domestic and outbound) and understanding consumer-tourist behaviours on the basis of statistical surveys on households, life conditions, incomes, consumptions, travels and vacation. In fact, it is generally accepted that differences in motivations, attitudes to travel and tourist behaviours depend on different factors, such as age, income, household typology (single, couple with or without children, etc.), number of incomes per household. Another very important issue is the possibility of determining and verifying the relationship between tourism behaviour and other goods and services choices in order to identify some sentry variables that are able to tell in advance to the operators the most likely evolution of specific tourist segments: in other words, the target is to identify groups of goods whose consumption is correlated to travel choices.

To address the above outlined issues we will consider Rough Sets Theory (Pawlak, 1991) an artificial intelligence technique which basically leads to discover relationships in data through a data mining process. Rough Sets Theory does not require any statistical assumptions on data distributions but only the definition of condition and decision attributes to get inductive rules (*conditions* \rightarrow *decision*). Moreover every database table (row=objects, columns=attributes) containing both numeric and categorical data, can be translated into a set of decision rules.

Rough Sets Theory combines many important advantages: no assumptions about data are required; no need to define *a priori* functions or equations; categorical data are accepted; relationships between data are explained by simple inductive rules.

With the exception of some recent papers (see e.g. in Goh & Law, 2003; Law, Goh & Pine, 2004; Goh, Law & Mok, 2008), Rough Sets Analysis has been not intensively applied in tourism literature for predicting tourist demand, in particular at a microeconomic level.

The main objective of this paper is to produce models in terms of decision rules, which allow to discriminate between tourism choices by means of the differences in consumer behaviour. This way we can look for a set of “sentry variables,” that is variables which can anticipate some trends in tourism consumption.

The paper is organized as follows. Section 2 is devoted to the introduction of the main concepts of Rough Sets Theory. In Section 3 we consider some previous tourism studies that are related to Rough Sets. Section 4 analyzes the data set and depicts the main characteristics of the used software package. Section 5 presents the main rules discovered by the methodology. Section 6 ends the paper with some conclusive observations and hints for future research.

ROUGH SETS THEORY: SOME BASIC DEFINITIONS

Rough Sets theory has been presented as *a new mathematical tool for imperfect data analysis* in (Pawlak, 1991). It concerns approximated knowledge of data that are collected in data table by means of two alternative approaches: lower/upper approximations of a data set and decision rules. In fact, Pawlak wrote: “Approximations and decision rules are two different methods to express properties of data. Approximations suit better to

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