Chapter 38
Risk Evaluation in the Insurance Company Using REFII Model

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ABSTRACT

A business case describes a problem present in all insurance companies: portfolio risk evaluation. Such analysis deals with determining the risk level as well as main risk factors. In the specific case, an insurance company is faced with market share growth and profit decline. Discovered knowledge about the level of risk and main risk factors was not used to increase premium for the riskiest portfolio segments due to a specific market situation, which could lead to loss of clients in the long run. Instead, additional analysis was conducted using data mining methods resulting in a solution, which stopped further profit decline and lowered the risk level for the riskiest portfolio segments. The central role for the unexpected revealed knowledge in the chapter acts as the REFII model. The REFII model is an authorial mathematical model for time series data mining. The main purpose of that model is to automate time series analysis, through a unique transformation model of time series.

INTRODUCTION

The presented business case is concentrated on an insurance company, which decides to move its focus from a saturated life insurance market to a more profitable car insurance market. After two years, their profit and market share was up, but they also faced rising expenses due to increasing risk of their customers. A profile analysis was done to identify most risky clients. Their first intention, increasing price for the most risky segment, was rejected once they realized that the competitors might use it to differentiate. They did an additional analysis on temporal data and found some new interesting patterns which marketing department used to develop a strategy resulting in increased loyalty level and lower losses.

Portfolio risk assessment is one of the fundamental analytic activities in the insurance industry. Risk based segmentation enables the development of the price strategy. As the riskiness of the portfolio may vary by time, insurance services prices must be corrected.

In lowering the prices, due to estimated decline of risk, there's no danger of market share loss and losing the customer to competitors (Berry, 1997).

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Price increase on the other hand is accompanied by risk of losing clients. If the estimated cost of losing market share is less than the estimated cost of claims for a given risk segment, insurance companies decide to take that route.

In an ideal situation, one would be able to decrease the portfolio risk level while keeping the same or even lower prices. Data mining methods can sometimes be useful in pursuing this aim (Berry, 1997; Han, 2000; Kantardžić, 2003). There is no recipe for it and data mining methods must be applied in an interaction of multidisciplinary expert knowledge Thomas (2002). This interaction often includes trial and error methodology and participation of several organizational units.

Results of one analysis can lead to new hypothesis so that next step s in the analysis are focused on their approval/rejection. If the main factors, which affect the risk level, are found the unpopular price increase can be avoided.

BACKGROUND

As data mining techniques have become more popular, they have become increasingly involved in risk evaluation in insurance companies (Apte, 1999; Chidanand, 1999; Pyle, 1999; Smith, 2000). Who is the riskiest client, who could have a car accident with highest probability during the lifetime of the contract, which is the low risk segment in insurance portfolio? This, and similar questions preoccupy portfolio managers in insurance companies.

Applied data mining model for the risk evaluation in insurance companies could vary (Apte, 1999). It can be built using probabilistic models (Chidanand, 1999), Fuzzy logic (Derik, 1995), Neural networks (Alexander, 1995), logistic regression (Kolyshkina, 2002), or linear models (Samson, 1997).

For the risk evaluation in insurance companies there is no prescribed solutions for using data mining techniques. Each case demands a solution regarding its specific business environment and client profiles. This chapter represents one solution based on data mining techniques for a specific case in insurance business.

The central role for success is presented as a case study and time series analysis. In traditional time series data mining analysis, there is a lot of different methods which solve a particular kind of problem. As a result of this approach, we have a situation in which if we want to solve a problem of discovering patterns in time series, we could use methods which are described by Pratt (2001), Xsniaping (1998), and Han (2000).

Many different methods for different kind of problems exist in scientific works. There are many different methods for solving seasonal oscillations, recognition time segments, similarity search, etc.

The suggested solution for all mentioned problems presented in the chapter is REFII model (Klepac, 2005), as a fully automated preparation tool which gives solution for problems such as:

- Discover seasonal oscillation;
- Discover cyclic oscillation;
- Discover rules from time series;
- Discover episodes from time series;
- Discover similarity of time segments;
- Discover correlation between time segments;
- Discover rules from in domain of finances from time series;
- Connect time series and standard data mining methods;
- Analyze time series with the help of data mining methods (clustering of time segments, classification of time segments).

The chapter shows a few of mentioned functionalities, which lead us to the solution.