Chapter 14
Application of Adaptive Neurofuzzy Control in the Field of Credit Insurance

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ABSTRACT

Credit insurance is of vital importance for the trade sector and almost every related business. Moreover, every policy in credit insurance is tailor-made in order to suit in the best available way the unique needs and demands of the insured business. Thus, pricing of such service can be tricky for an insurance company. In the present chapter, this pricing problem in the field of credit insurance will be addressed through the use of intelligent control mechanisms. More specifically, a way of calculating the price of insurance policies that has to be paid by a prospective client of an insurance company will be suggested. The model will be created and implemented with the use of fuzzy logic, and more specifically, through the implementation of an adaptive neurofuzzy inference system. The training data that will be used for the tuning of the system will be derived from real anonymous insurance policies of the Greek insurance market.

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INTRODUCTION AND THEORETICAL BACKGROUND

The current paper is an attempt to research the application of a tool offered by the adaptive neurofuzzy inference system on the domain of credit insurance. The purpose of this paper is to explore the effectiveness of this alternative approach in order to automate the process of calculating prices of insurance credit policies.

There are many papers in literature which have previously addressed some applications of fuzzy logic in the field of insurance (Calibo et al. 2017), (Shapiro, 2005), (Sokolovska, 2017), (Yazdani and Kwasnicka, 2012). The first article that has made use of fuzzy logic in insurance was the one of DeWit (1982). One of the scopes of the formerly mentioned paper was to quantify fuzziness in the field of underwriting. Since then, there have been numerous other attempts that examine how fuzzy logic can be involved in the field of insurance. There are papers which examine the theoretical dimension of how fuzzy inference systems could be used in order to improve the processes of risk assessment and risk decision making (Shapiro, 2007). There have been efforts of evaluating credit risk using neurofuzzy logic (Sreekantha and Kulkarni, 2010) and attempts to develop fuzzy logic distribution for soft data and variables used for the corporate client credit risk assessment (Brkic et al., 2017).

The purpose of this paper is to address topics of credit insurance from the perspective of the credit insurance brokerage. Using anonymous credit insurance policies as an input in an adaptive neurofuzzy inference system, rules and results will be produced for the calculation of prices in credit insurance policies.

In order to facilitate the comprehension of the current investigation, an initial analysis regarding the basic concepts and definitions that govern the tools which are used in this chapter will be provided. More specifically, concepts stemming from different fields of professional activity will be combined. Definitions regarding the field of credit insurance as well as the field of intelligent control systems will be examined.

Trade credit insurance: "Trade credit insurance protects manufacturers, traders and service providers against losses from non-payment of a commercial trade debt. If a buyer does not pay (often due to bankruptcy or insolvency) or pays very late, the trade credit insurance policy will pay out a percentage of the outstanding debt. The primary function of trade credit insurance is to protect sellers against buyers that do not or cannot pay". (Moorcraft, 2018).

Control system: A system is anything that has receives inputs and produces outputs. A system that has to be controlled called a plant. A control system is a system that can transform the inputs to the plant in order to produce a desired output. From a more technical perspective, a control system is an interconnection of components which form a system configuration that is able to produce a desired system response. (Dorf and Bishop, 2011).

Fuzzy logic: "The basic idea of fuzzy logic is to associate a number with each object indicating the degree to which it belongs to a particular class of objects" (Pfeifer, 2013).

Fuzzy inference system (FIS): "A nonlinear mapping that derives its output based on fuzzy reasoning and a set of fuzzy if-then rules. The domain and range of the mapping could be fuzzy sets or points in multidimensional spaces." (Jang and Sun, 1997).

Adaptive neurofuzzy inference system (ANFIS): "There is a class of adaptive networks that are functionally equivalent to fuzzy inference systems. The architecture of these networks is referred to as ANFIS, which stands for adaptive network-based fuzzy inference system or semantically equivalently, adaptive neurofuzzy inference fuzzy inference system." (Jang and Sun, 1997).