

# FUZZY MATHEMATICS AND CAPITAL BUDGETING

Dóra Szabados

In my thesis I review the basic definitions of fuzzy mathematics and present a method used in capital budgeting with the application of fuzziness.

Fuzzy set theory was first introduced by computer scientist L. A. Zadeh in 1965 whose purpose was to generalize the classical notion of a set and a proposition to accommodate fuzziness in the sense that it is contained in human language. The vagueness of language, its mathematical representation and processing is one of the major areas of fuzzy set theory.

The first chapter is about fuzzy set theory – the definition of membership function and fuzzy operators that correspond to “and”, “or” and “not” in human language. Later I introduce Alpha-cuts, which are the processes where a fuzzy set has at least some minimal degree of membership alpha; and fuzzy numbers, normal, convex and bounded fuzzy sets. Fuzzy algebra and geometry have some properties which I describe in one of the sections.

Fuzzification was first presented by Turksen in 1991 and it is the construction and design of fuzzy set membership functions. The construction methods have 3 segments: manual, automatic and adaptive approaches which are presented in my thesis.

In the second chapter I write about the definitions of capital budgeting and modified methods of internal rate of return and net present value. The calculations of my case study are based on *Métodos Modificados de Avaliação de Investimentos em Condições de Incerteza: Uma Abordagem Baseada em Números Fuzzy* by S. Filho. Our company would like to invest in the water sector in Ghana, but this deal carries several risks related to the country’s political and agricultural position. I analyze the project under two different conditions: deterministic and fuzzy. At the end I describe the conclusion of the study.

The long term investment planning, analyzing and deciding process called capital budgeting is most important to companies, since capital investment projects make up some of their most important financial investments. Capital budgeting decisions are surrounded by a lot of uncertainties: investment in the present and in the future which is full of risks and unknown factors which increase with the length of the project.