

# FINANCIAL MATHEMATICS AND ENGINEERING AS THE TEACHING SUBJECTS ON THE MANAGEMENT FACULTY AT TECHNICAL UNIVERSITY

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**Abstract** — *Engineer of today – technical university graduate also requires practical knowledge How to manage of financial instruments. The problems of financial instruments are considered within a framework of following subjects (didactic classes): financial mathematics and financial engineering. First of all, financial mathematics is a science of changing money value during the time. Various methods of interest calculation, cash inflow calculation and influence of inflation or capital discounting on money value are considered on the financial mathematics classes. There are considered methods of capital instalments' calculation and calculation of interests connected with credits. The financial engineering goes for new financial instruments designing and researches. Various kinds of future contracts are considered heading to options, especially. Studying the financial engineering, students are acquainted with binomial tree and martingal methods with the purpose of options value calculation. During more advanced classes (with extended curriculum), the stochastic processes and the chaos theories and those theories applications at Polish Stock Exchange are presented because of shares prices fluctuation.*

Our technical university graduates of specialising in management of finances have possibility to get to know present trend of scientific approach to financial management issues.

## INTRODUCTION

Since 1989 at Polish technical universities in greater range than previously the introduction to the study programs of the subjects connected with the company and production management has been started. Furthermore, this has revealed that the engineer of today, who has graduated from technical university, needs practical knowledge how to manage the financial instruments. These issues are realized within the lessons at the subjects (didactical lessons) named Financial Mathematics and Engineering.

In present work the range of the above realized subjects at Technical University of Czestochowa will be discussed.

## FINANCIAL MATHEMATICS.

Financial Mathematics is, first of all, the science about the change of the value of money in time. At the didactical

lessons concerning these problems different ways of calculating money in time are considered.

Calculation of the value of money in time:

- future value of money – common interest: the simple interests' general account and for yearly units of time, 360- days calendar, regular payments of amounts in equal time distances, an average interest rate,
- future value of money – composed interest: cumulated interests, capitalized m times in the year with the fixed and yearly changeable bank rate, continuous capitalization, average interest rate, effective interest rate, equivalent interest rate,
- flow of liabilities – composed interests: yearly payments, intra yearly payments, real value of capital – the influence of inflation,
- current value of money: common discount - yearly annuities, compound discount – yearly, intra yearly and continuous capitalization, yearly payments, perpetuity,
- repayment of the debt in capital instalments at the fixed height: the amounts of the instalments for payment, the height of the due interests, the amounts of payments, the sum of interests,
- the repayment of the debt in fixed amounts of payment: the height of the fixed payments, the height of the capital instalment, the height of the interests, the sum of the interests.

This information allows the student, who will graduate in the near future to safely operate with his/her capital within financial institutions as well as to safely operate with the borrowed money for a company development.

## FINANCIAL ENGINEERING.

Financial Engineering concerns, above all, the study and construction of new financial instruments. Since the mentioned year of the transformations of the Polish economy different new financial institutions including the Money Exchange and Forward Exchange Markets have been risen in our country.

These changes involve from the person managing a company to have the theoretical recognition of the connected problems. The person should also be able to take advantage of the offered financial instruments. In particular the knowledge of forward contracts is important, including:

- forward contracts, futures, swaps,

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- options: “call” and “put” depending on the date of realization (European and American) and the type (stocks, indexes, currencies).

This is connected with the price of the options:

- buyer of the “call” options,
- buyer of the “put” options,
- writer of the “call” option,
- writer of the “put” option.

It is necessary also to be able to find these dependences on the profits and losses graph with regard to the interpretation of the beginning of the coordinate system.

There is also discussed the “lever” effect, buying on margin, different combinations of options.

Students are also acquainted with the binomial tree method and its application to the calculation of the stocks’ value and pricing the value of options. The results acquired through this method are comparable to these acquired through the use of the Black – Scholes equation.

There is the possibility to extend this knowledge basing on the monographic subject – facultative, from the range of the application of the stochastic processes in examining the Stock Exchange Market.

### **CONCLUSION.**

Described in the present work issues compose the modern instruments for work with money and financial instruments with which the future Master gets acquainted when graduating from our University at the Faculty of Management.

Our didactical experiences prove enormous usefulness of this knowledge for the graduated student managing the company in economy market.

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