Master Affaires internationales
QUANTITATIVE TOOLS - LEVEL 2

1 st semester 2017/2018

This class requires sound basic knowledge of statistics and financial calculations like those taught in Level 1 (please refer to the level 1 syllabus). There are no other prerequisites..

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OBJECTIVES AND CONTENTS

Teaching QUANTITATIVE TOOLS - level 2 of Political Economical and Social Sciences, is designed for students who wish to extend a little further the knowledge obtained in the module « Quantitative Tools - level 1 ». It is essentially an extension with no real increase of the technical level.

It is particularly directed to those intending to work in research laboratories, especially in business and humanitarian organizations and international agencies. The instruments are illuminated by examples from the fields of security, energy, sustainable development and course of international relations.

This course aims to facilitate the study and drafting of the final essays required from students at the end of their degree.

Language of instruction: English or French.

TEACHINGS

Courses-seminars « Quantitative Tools - Level 1 » and « Quantitative Tools - Level 2 » are taught in French or English and are coordinated by Didier Schlacther, engineer and economist, Professor at Sciences - Po and Maitre de Conference at ENA. The team is made up experts. (d.schlacther@wanadoo.fr)

TEACHING METHODS

The form adopted for this teaching is « course – seminar » featuring one part with lectures on the basic principles and theories and some practical tutorials. The limited number of students should guarantee a high level of student-teacher interactivity. We strongly insist on the practical aspects of the discipline.

SELECTED BIBLIOGRAPHY

Basic books:

In english :
- G. KELLER, B. WARRACK, Statistics for management and economics, Thomson, Brooks/Cole, Pacific Grove, 2003.
- F. K. REILLY, K.C. BROWN, Investment analysis and Portfolio Management, Thomson South Western, 2006

In French
- D. SCHLACTHER, Comprendre les mathématiques financières, Hachette, coll. Les Fondamentaux, 4° ed. 2012 (book noted **A** in the programme)
- D. SCHLACTHER, De l'analyse à la prévision, Ellipses, 4° ed. 1984, chap. 12 and 13 (book noted **B**)
- D. SCHLACTHER, De l'analyse à la prévixsion, Hachette, coll. Les Fondamentaux, 5° ed. 2009 (book noted **C** in the programme) - 3 volumes
  - Tome I : Comprendre la Statistique descriptive statique (book noted **C1**)
  - Tome II: Comprendre la Statistique descriptive temporelle (book noted **C2**)
  - Tome III: Comprendre la Statistique inductive, ajustements, lois (book noted **C3**)

Complementary readings

- G. FERREOL, D. SCHLACTHER, Dictionnaire des Techniques Quantitatives appliquées aux sciences économiques et sociales, A. Colin, coll. U, 1995
- P. BONNEAU, Mathématiques Financières, Dunod, 1986
- D. SCHLACTHER, Calcul financier, Hachette, coll. PES, 1989
- D. SCHLACTHER, Comprendre la formulation mathématique en économie, Hachette, Coll. Les Fondamentaux, 4° ed. 2004

TOOLS

Using a financial and statistical calculator with one and two variables is essential. The Casio FC100 model is relatively easy to use.
The use of a computer and an Excel spreadsheet will be developed in the tutorials.

ASSESSMENT

The module is validated exclusively by continuous assessment -2 in-conference assessments of one hour each. Assessments may incorporate the use of simple Excel spreadsheet, the student having his own computer.

DETAILED PROGRAMME

I – Two characters descriptive statistics apllied to business

Here we develop the analysis of possible links between economic variables and especially the explanatory scope of these links. We will also focus on the analysis of time series variables of the company.

1 / Recall on the principles of the linear fit (**ref. library: Chap1 C3**)
- Method of ordinary least squares (OLS)

2 / Correlation (**ref. library: Chap2 C3**)
- Study of the scope and limitations of correlation measurements.
- Precautions to be taken as part of adjustments semilog and log-log.
- Study of correlations in the delayed adjustments
- Interpretation of results. We strongly insist on the significance of a correlation coefficient.

3 / linearizable Adjustments. (*development of Quantitative Tools 1*) (**ref. library : C3 Chap 3**)
- Adjustments semilogarithmic
- Adjustments logarithmic
Applications: Adjustment and semi-logarithmic measure of growth, evolution of the turnover of a company, measuring price elasticity of demand with the use of log-log graphs.
- Using Excel

4 / Chronological series (**ref. library : C2 Chap 6, 7**)
- The main movements in a series: trend, seasonality, random variations, cycles.
- Determination of the trend
- Seasonal Adjustment/ de-seasoning
- Using Excel
Applications to foreign trade statistics, productive activities with a strong seasonality.

II – The probability at the business' service

This part is an introduction the polls' techniques. It includes a focus on information that can get from this type of analysis.
1 / The law of large numbers (**ref. library : C3 Chap5, B chap.12**)
- Intuitive Interpretation of the Bienaymé - Tchebichef inequality

2 / The Gauss law (**ref. library : C3 Chap 6 and** 7**, B chap.12**)
- Principles
- Applications and basic calculations

3 / Study of large samples (**ref. library: B, Chap13**)
- Principles for conducting a sample
- Mean and confidence interval
- Proportion and confidence interval
- Search the size of a sample corresponding to previously defined criteria in terms of confidence intervals.

III – Elements for financial calculations
1 / Loans and amortization (**ref. library: A Chap 4**)
- Basic Principles
- Repayment in fine, reimbursement by constant annuities
- Search of actuarial rates, rates of investment, rate of returns in simple cases
- Study of amortization of borrowing and impact on the company's accounts.
- Application in very specific cases

2 / The basic principles of bonds (**ref. library: A Chap 6**)
- Amortization of debt issued at par and redeemed at par.
- Amortization of loans issued at a discount and redeemed at par.
- Refunds and reimbursements by constant annuities.
- Search of actuarial rates and rates of investment made by the debenture.
- Simple applications corresponding to the life of a company as well as government bonds.

IV – The compagny and the decision ti invest
1 / Investment Choice (**ref. library: A Chap 7**)
- The criteria for choosing investment
- Choosing a discount rate and its consequences

2 / The decision to invest. I (**ref. library: A Chap 7**)
- The comparison of different investment projects
- Method of cash flows; method of accounting income
- Net Present Value (NPV) - Rate of reinvesting cash flows
- internal Rate of Return (IRR) - Replacement rate cash flows
- Payback updated
- Comparison of two projects - Different selection criteria
- Applications in concrete cases to justify an investment decision.-