

# Forecasting Methods / Métodos de Previsão

## Week 1

ISCTE - IUL, Gestão, Econ, Fin, Contab.

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# Program

## 1 Introduction

- 1 Forecasting needs and the importance of forecasting in the enterprise.
- 2 The different forecasting methods.
- 3 Choosing a forecasting method. Guidelines.

## 2 Causal models

- 1 The classical model of linear regression.
- 2 Extensions of the classical model. Violation of the basic assumptions - heteroscedasticity, autocorrelation and multicollinearity.
- 3 Dummy variables, nonlinear models, models with qualitative dependent variable, information criteria AIC and SBC, Wald, Likelihood ratio and Lagrange Multiplier tests

## 3 Time Series models







- 1 Decomposition methods.
- 2 Smoothing methods.
- 3 Auto-regressive and moving average models. The Box-Jenkins methodology.

# Evaluation Methodology

- The continuous evaluation includes the realization of:
  - One written test (50%);
  - Practical assignments (50%).
- In the written test the students can use the formulas, the statistical tables and one calculator.

- Software: Eviews

# Bibliography

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-  Gujarati, D. (2004), Basic Econometrics, McGraw-Hill, N. York (pdf).
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# Forecasting Methods - Introduction

- **Forecasting** is important - forecasts are constantly made in business, economics, government, finance, and many other fields, and much depends upon them.
- There are **good** and **bad ways** to forecast: this course is about the good ways - modern, quantitative, statistical/econometric methods of producing and evaluating forecasts.
- **Forecasting** is the establishment of future expectations by the analysis of past data, or the formation of opinions.
- **Forecasting** is an uncertain process: since it is not possible to predict accurately what the future will be.

- Three basic types of forecasting methods:
  - **Time series methods** (data based, **quantitative methods**)
  - **Causal models or regression methods** (data based, **quantitative methods**)
  - **Qualitative methods** (subjective methods based on intuition and experience).



## Qualitative Forecasting Methods

- **Delphi Method** – an iterative group process where a group of experts (decision makers, staff personnel, respondents) attempt to reach consensus
- **Jury of Executive Opinion** – uses opinions of high level managers often combined with statistical models, the result is a group estimate (long-range planning)
- **Sales Force Composite** – each salesperson estimates sale in his/her own region and forecast are combined for an overall forecast
- **Consumer Market Survey** – solicits input from customers and potential customers regarding future purchase, used for forecast and product designs & planning

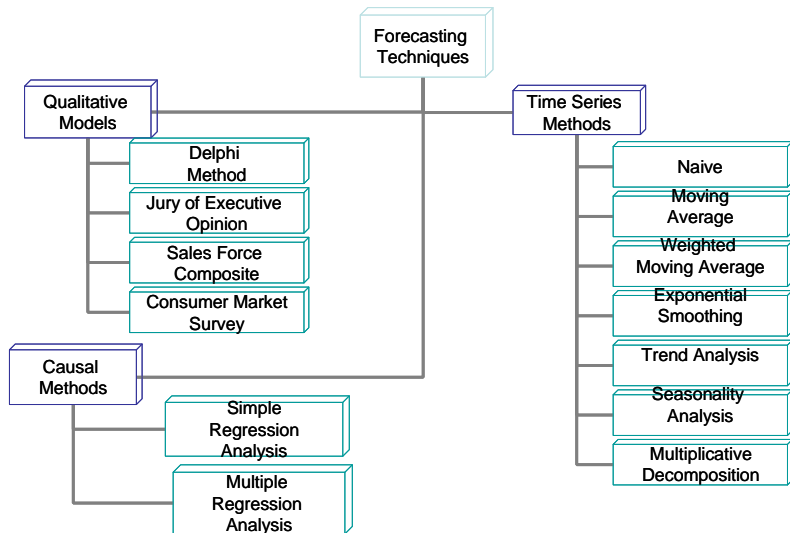
# Causal Forecasting Methods

- **Regression (or causal) forecasting methods:** attempt to develop a mathematical relationship (in the form of a regression model) between two or more variables. They are appropriate when considering causal relationship between variables (e.g. sales could be forecasted by reference to changes in advertising expenditure).

# Causal Forecasting Methods

- **Time Series** techniques – involves consideration of historical data (one variable), obtaining future estimates based on past values.
- Assumptions of Time Series Models
  - There is information about the past;
  - This information can be quantified in the form of data;
  - The pattern of the past will continue into the future.

# Forecasting Methods - Introduction



# Forecasting Methods - Introduction

- Forecasting Horizons

- Long Term

- 5+ years into the future
    - plant location, product planning
    - Principally judgement-based

- Medium Term

- 1 season to 2 years
    - Aggregate planning, capacity planning, sales forecasts
    - Mixture of quantitative methods and judgement

- **Short Term**

- 1 day to 1 year, less than 1 season
    - Demand forecasting, staffing levels, exchange rates, inventory levels
    - Quantitative methods

# Forecasting Methods - Introduction

- Some principles of all forecasting techniques:
  - Forecasting is almost always wrong (because of randomness)
  - Every forecast should include an estimate of error (difference between the forecast and the actual data)
  - The longer the forecast horizon the worst is the forecast
  - Sophisticated forecasting techniques do not mean better forecasts
  - Forecasting is still an art rather than an esoteric science
  - The true objective of forecasting is to make the forecasting error as slight as possible
  - A large degree of error may indicate that either the forecasting technique is the wrong one or it needs to be adjusted by changing its parameters

# Forecasting Methods - Introduction

- Choosing a forecast method:
  - No method remains superior under all conditions.
  - Apply multiple forecasting methods to a problem
  - Scenario planning prepares “what-if” questions and produces possible outcomes

# Forecasting Methods - Introduction

- Steps in forecasting
  - Determine the objective of the forecast
  - Identify items or quantities to be forecasted
  - Determine time horizon of the forecast
  - Select the forecasting model(s)
  - Gather the data to make the forecast
  - Validate the forecasting model
  - Make forecast and implement results
- It is clear that no forecasting technique is appropriate for all situations. There is substantial evidence to demonstrate that combining individual forecasts produces gains in forecasting accuracy. There is also evidence that adding quantitative forecasts to qualitative forecasts reduces accuracy. Research has not yet revealed the conditions or methods for the optimal combinations of forecasts.



# Forecasting Methods - Introduction

- Uses of Forecasts

Accounting	cost/profit estimates
Finance	cash flow and funding, asset/stock returns
	exchange rates, volatility
Human resources	hiring/recruiting/training
Marketing	pricing/promotion/strategy
Product/service design	new products and services
Operations planning and control	what, where, when to produce /prices
Economics	GDP, unemployment, interest rates