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# Quantitative methods for economics, finance and management

2019/2020



### ***"Quantitative methods for economics, finance and management"***

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# LAB 1 (1/2)

23.09.2019



# Lab-1: Data-structure

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3 TYPES OF DATA :

1) CROSS-SECTION

2) TIME SERIES

3) PANEL DATA

- $N$  INDIVIDUALS DENOTED BY  $i$ , THAT IS  $i = 1, 2, \dots, N-1, N$ 
    - ↳ MIGHT BE
      - ↳ HOUSEHOLDS
      - ↳ FIRMS
      - ↳ COUNTRIES
- REPRESENTS AN INDIVIDUAL INDEX
- MICRO-DATA → MICROECONOMETRICS
- MACRO-DATA → MACROECONOMETRICS

# Lab-1: Data-structure

- $T$  PERIODS DENOTED BY  $(t)$  → REPRESENTS A TIME INDEX  
THAT IS  $t = 1, 2, \dots, T-1, T$

↳ MIGHT BE  $\begin{cases} \rightarrow \text{DAILY} \rightarrow \text{HIGH FREQUENCY DATA} \\ \rightarrow \text{MONTHLY} \\ \rightarrow \text{YEARLY} \end{cases}$

- $X$  IS A VARIABLE, SAY "INCOME"

1) CROSS-SECTION DATA

$$X = [X_1 \ X_2 \ X_3 \ \dots \ X_i \ \dots \ X_N]$$

$(1, N)$       ↳ THE GENERIC  $i$  (INDIVIDUAL)

2) TIME-SERIES DATA

$$X = [X_1 \ X_2 \ X_3 \ \dots \ X_t \ \dots \ X_T]$$

$(1, T)$       ↳ THE OBSERVATION AT TIME  $t$

## Lab-1: Data-structure

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3) PANEL DATA IS OBTAINED BY "POOLING"

CROSS-SECTIONAL AND TIME-SERIES DATA.

- PANEL DATA IS ALSO KNOWN AS "LONGITUDINAL" DATA.
- PANEL DATA IT IS A DATASET IN WHICH THE BEHAVIOR OF ENTITIES (STATISTICAL UNITS) ARE OBSERVED OVER TIME

# Lab-1: Data-structure

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THE TYPICAL STRUCTURE OF PANEL DATA IS :

COUNTRY	YEAR	Y	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>
1	2000	0.3	0.2	0.1	0.01
1	2001	3	2	0.5	0.7
1	2002	~	~	~	~
⋮					
1	2010	~	~	~	~
2	2000	~	~	~	~
⋮					
2	2010	~	~	~	~
⋮					
⋮					
N	2000	3	2	1	0.5
N	2007	3	2	3	0.4
⋮					
N	2010	2	1	0.4	0.3

# Lab-1: Data-structure

IN OTHER WORDS, THE PANEL DATA STRUCTURE IS:

TIME-SERIES  
FOR  
INDIVIDUAL  
"1"

$y_{1,1}$	$X_{1,1,1}$	...	$X_{1,1,K}$
$y_{2,1}$	$X_{2,1,1}$		$X_{2,1,K}$
⋮	⋮		⋮
$y_{t,1}$	$X_{t,1,1}$		$X_{t,1,K}$
⋮	⋮		⋮
$y_{T,1}$	$X_{T,1,1}$		$X_{T,1,K}$
⋮	⋮		⋮

HERE WE HAVE  
OTHER DATA

TIME SERIES  
FOR  
INDIVIDUAL  
"N"

$y_{1,N}$	$X_{1,N,1}$		$X_{1,N,K}$
$y_{2,N}$	$X_{2,N,1}$		$X_{2,N,K}$
⋮	⋮		⋮
$y_{T,N}$	$X_{T,N,1}$		$X_{T,N,K}$

OBS. IN THE FIRST PERIOD  
OF INDIVIDUAL 1

OF VARIABLE K  
(K=2: SECOND  
VARIABLE)

- $K = 1, 2$
- 1: IS THE NUMBER OF ROOMS
  - 2: DISTANCE FROM THE CENTER

$y$ : PRICE OF HOUSES



## Lab-1: Descriptive Statistics

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IN GENERAL THE VARIABLES CAN BE CLASSIFIED IN 2 GROUPS:

1) QUANTITATIVE VARIABLES ARE EXPRESSED IN UNIT OF MEASUREMENT

2) QUALITATIVE " " ARE USED TO CATEGORISE GROUPS

• EXAMPLE: | 1) GDP OF COUNTRIES (GROSS-DOMESTIC PRODUCT)  
| 2) LEVEL OF EDUCATION

• BEFORE ENGAGING ANY REGRESSION ANALYSIS, IT IS VERY IMPORTANT TO KNOW THE FEATURES OF OUR DATASET

TYPES OF ANALYSIS → UNIVARIATE } ANALYSIS  
→ BIVARIATE }

# Lab-1: Descriptive Statistics

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- UNIVARIATE ANALYSIS INCLUDES DESCRIPTIVE STATISTICS ON THE EMPIRICAL DISTRIBUTION OF EACH SINGLE VARIABLE
- BIVARIATE ANALYSIS REFERS TO THE INVESTIGATION OF THE RELATIONSHIP BETWEEN 2 TYPES OF VARIABLES.
- THIS UNIVARIATE ANALYSIS PROVIDES INFORMATION ABOUT:
  - 1) MEASURE OF "CENTRAL TENDENCY" (EXAMPLES: SAMPLE AVERAGE, MEDIAN)
  - 2) " " OF DISPERSION (SAMPLE VARIANCE, STANDARD DEVIATION)
  - 3) " " OF NORMALITY (KURTOSIS AND SKEWNESS)

KURTOSIS MEASURES THE DEGREE OF SHARPNESS  
SKEWNESS " " " OF SYMMETRY

## Lab-1: Descriptive Statistics

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- HISTOGRAM IS A PLOT OF THE UNDERLYING FREQUENCY DISTRIBUTION OF A SET OF CONTINUOUS DATA.
- HISTOGRAM  $\neq$  BAR CHART