Intermediate Econometrics

IMQF & MEAE 2024/25

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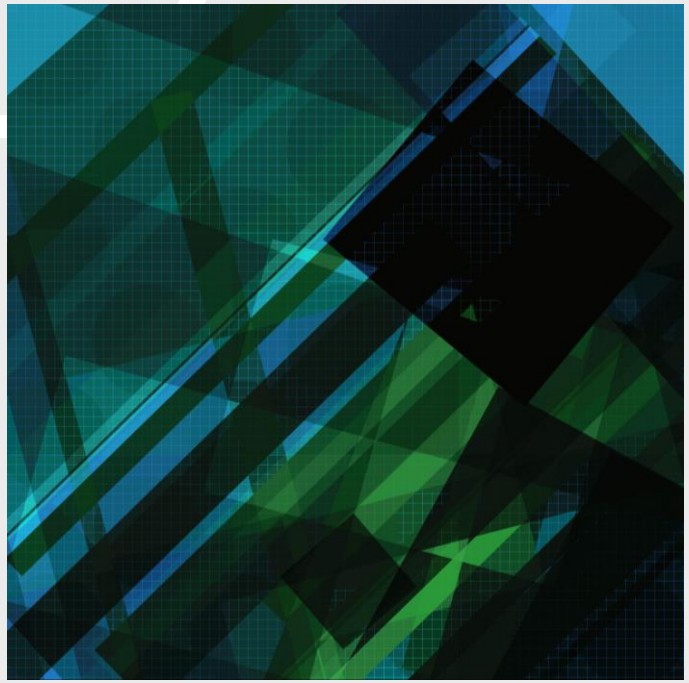
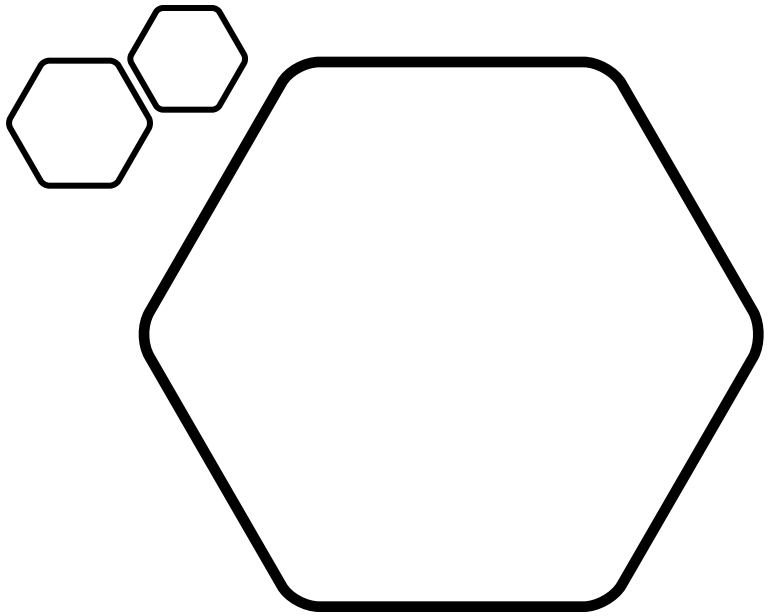
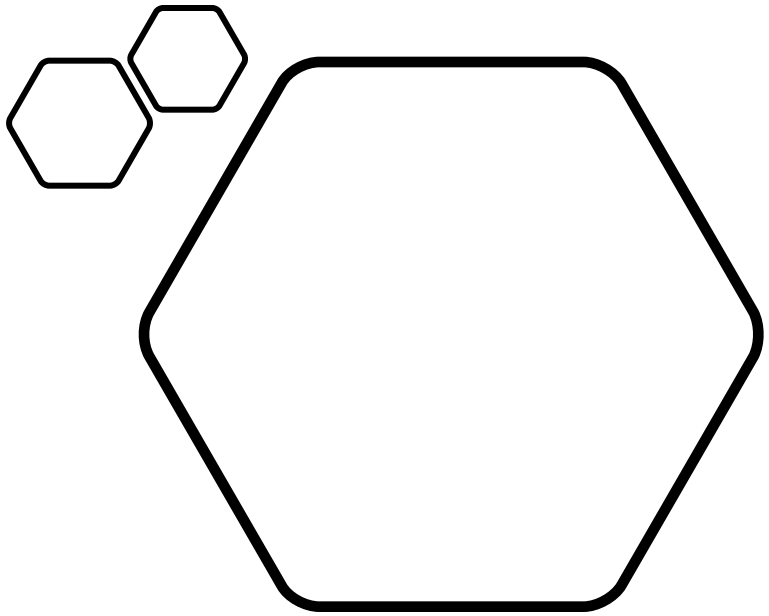


INTRODUCTION



- What is Econometrics?
- The Stages of Econometrics Work
- The Structure of Economic Data

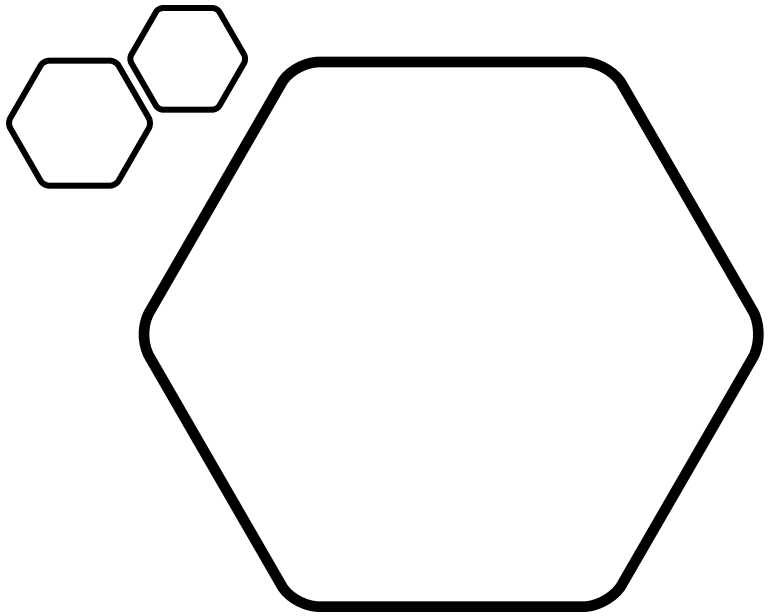
Introduction



- What is Econometrics?

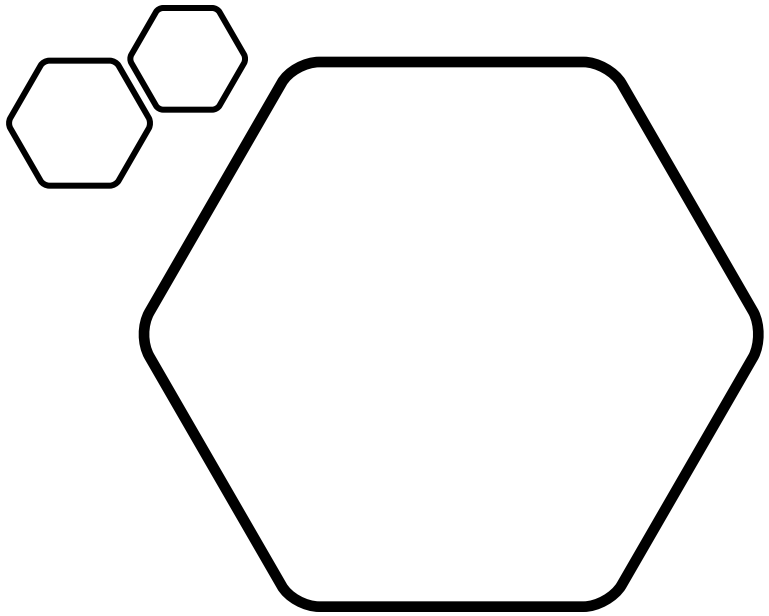
- Responses vary from the silly “Econometrics is what econometricians do” to the serious “Econometrics is the study of the application of statistical methods to the analysis of economic phenomena”

Introduction (II)



- Econometrics is the interaction of economic theory, observed data and statistical methods
- The interaction of these three that makes econometrics interesting, challenging, and, perverse, difficult

Introduction (III)

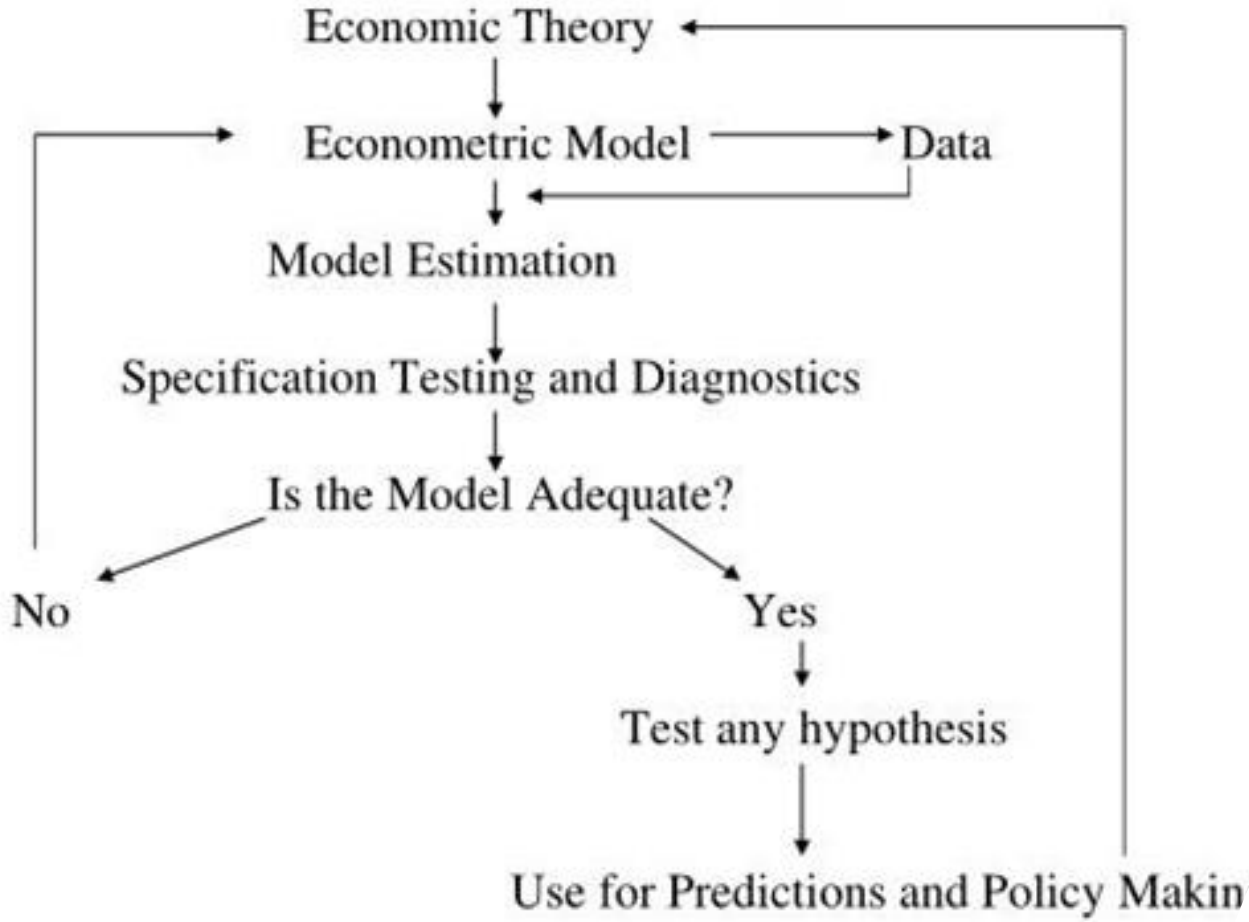


- Econometric methods are used in many branches of the economy, including finance, labor economics, macroeconomics, microeconomics, marketing, and economic policy

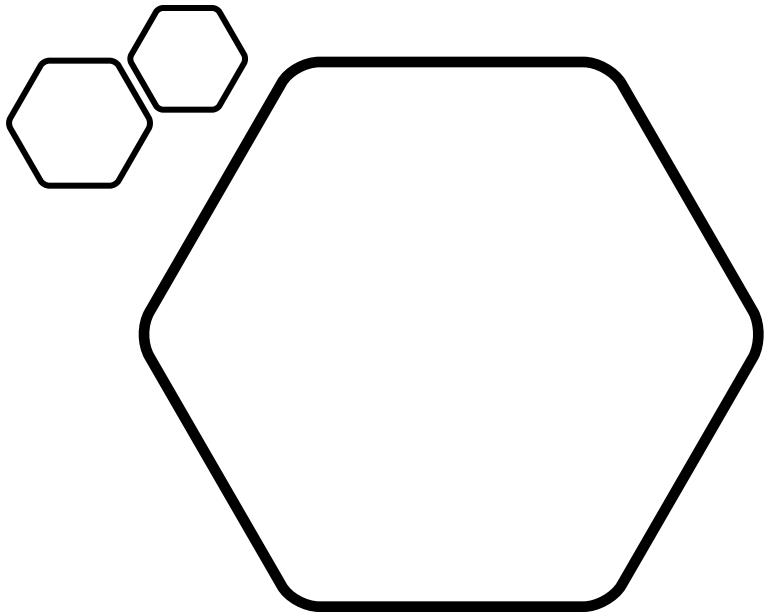
- Application will be found far more broadly, in virtually all the social sciences and elsewhere

Applied Econometrics

The Stages of Applied Econometric Analysis



About econometrics: cooperation vs specific



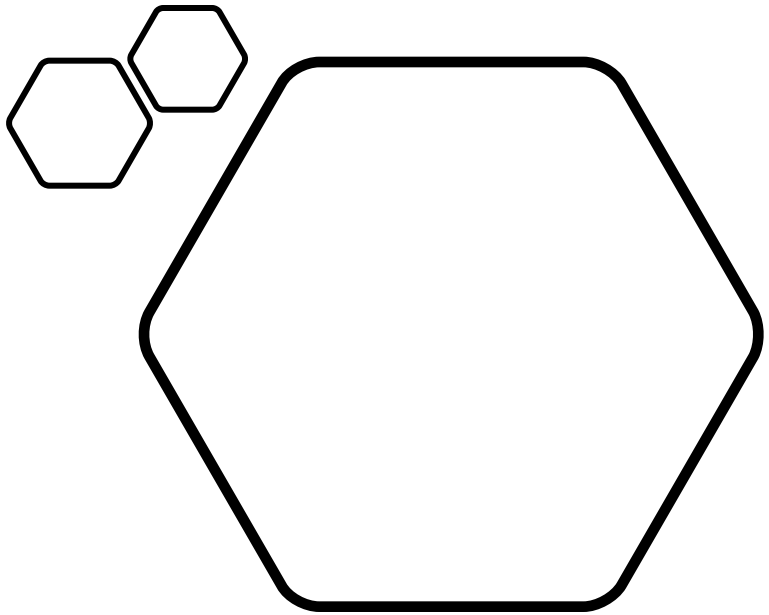
- Economics and econometrics
- Demand for money model:

$$m = f(Y,r), \text{ where}$$

m –real money; Y – real income and r –interest rate.

- Defining variables
- Form of function *f (.)*
- Quantification of the above relationship (estimate and predict economic variables)

About econometrics: cooperation vs specific (II)

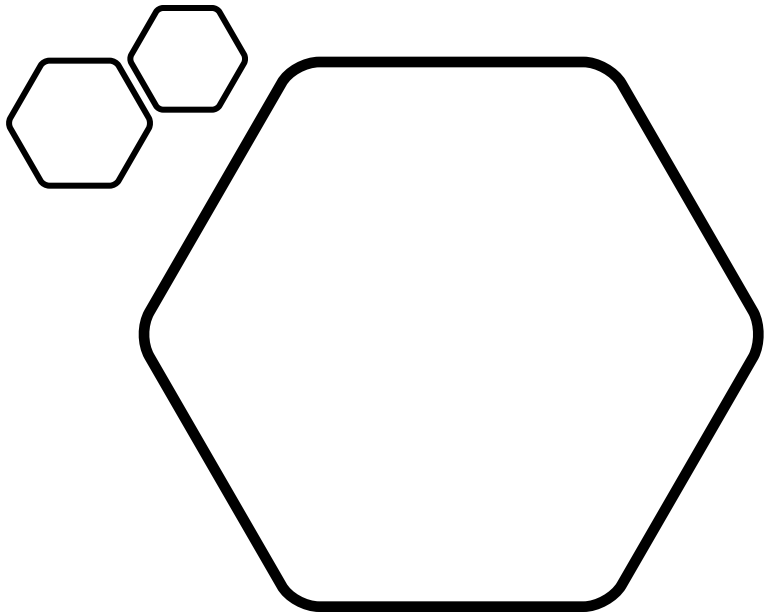


- Statistics and econometrics
- Econometric model:

$$m = \beta_1 + \beta_2 Y + \beta_3 r + \varepsilon.$$

- Most important component of any econometric analysis: dealing with *error term* or *disturbance term* ε
- Development of statistical techniques appropriate to the empirical problems characterizing the science of econometrics

The Structure of Economic Data

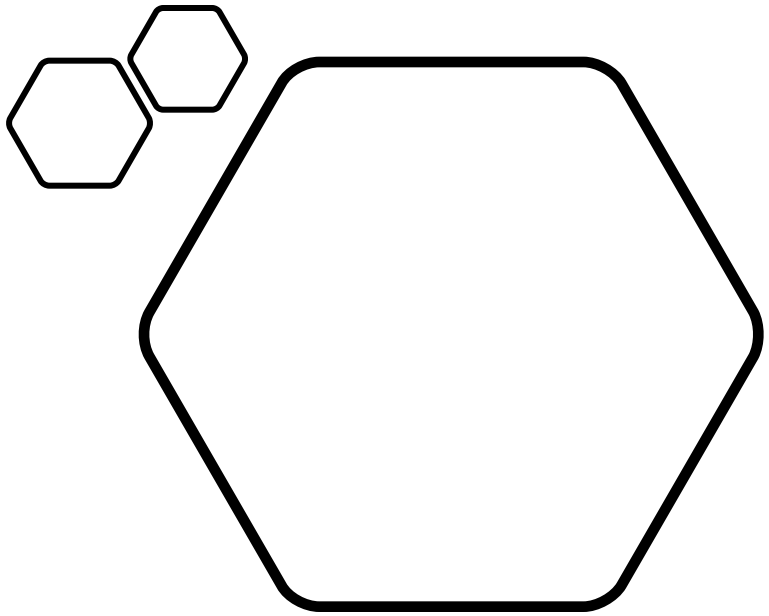


- There are three different types of economic data:

1) Cross-sectional
2) Time series
3) Panel data

+ Dummy variables

Cross-Sectional Data



- Data on different entities (individuals) – workers, consumers, firms, governmental unites, countries , and so forth – for a single time period

- For example, the data on GDP in 2016 for OECD countries or data on income for 2016 LFS in Serbia

Example 1: Cross-sectional data (source: Wooldridge, 2021)

TABLE 1.1 A Cross-Sectional Data Set on Wages and Other Individual Characteristics

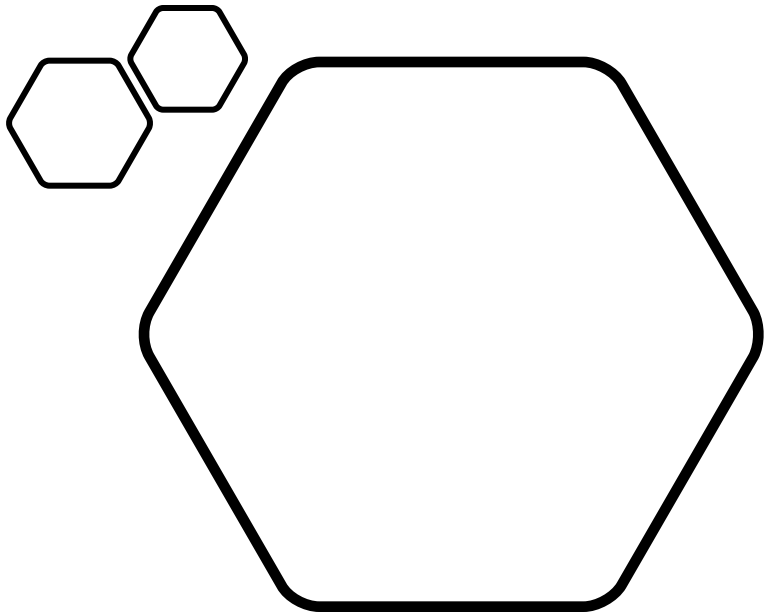
obsno	wage	educ	exper	female	married
1	3.10	11	2	1	0
2	3.24	12	22	1	1
3	3.00	11	2	0	0
4	6.00	8	44	0	1
5	5.30	12	7	0	1
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.
525	11.56	16	5	0	1
526	3.50	14	5	1	0

Example 2: Cross-sectional data (source: Wooldridge, 2021)

TABLE 1.2 A Data Set on Economic Growth Rates and Country Characteristics

obsno	country	gpcrgdp	govcons60	second60
1	Argentina	0.89	9	32
2	Austria	3.32	16	50
3	Belgium	2.56	13	69
4	Bolivia	1.24	18	12
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
61	Zimbabwe	2.30	17	6

Time Series Data



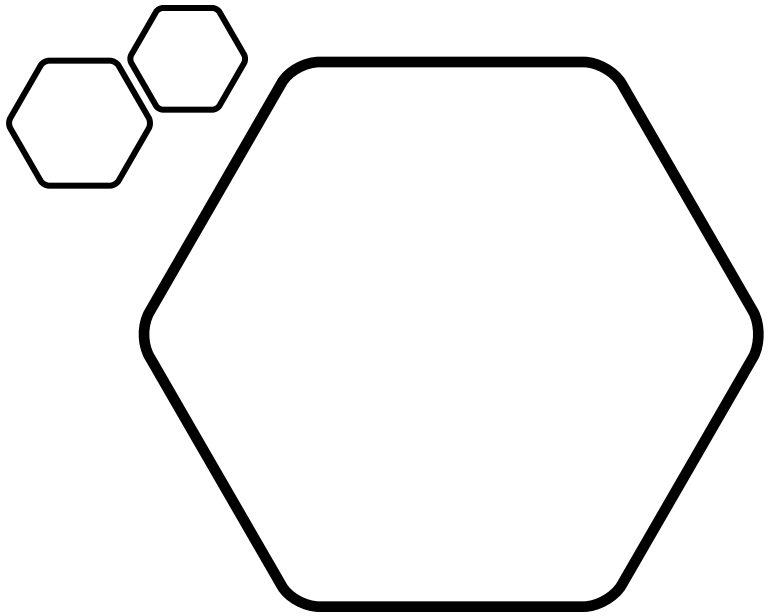
- Data for a single entity (person, firm, country) collected at multiple time periods or data set consists of observations on a variable over time

- Examples of time-series data include stock prices, money supply, consumer price index, GDP, annual homicide rates, and automobile sales figures

- Time is important dimension and the chronological ordering of observation in a time series carries potentially important information

Time Series Data (II)

- More difficult to analyze because economic time series are dependent across time and data sets are related (often, strongly related) to their recent history
- Some modifications to standard econometric techniques have been developed to address specific nature of economic variables
- Data frequency at which data are collected (daily, weekly, monthly, quarterly or annually)
- Some specifics of TS data: trends, seasonality, volatility, and non-standard observations (i.e., structural brakes)



Example 3: Time series data (source: Wooldridge, 2021)

TABLE 1.3 Minimum Wage, Unemployment, and Related Data for Puerto Rico

obsno	year	avgmin	avgcov	prunemp	prgnp
1	1950	0.20	20.1	15.4	878.7
2	1951	0.21	20.7	16.0	925.0
3	1952	0.23	22.6	14.8	1015.9
.	.	.	.	.	.
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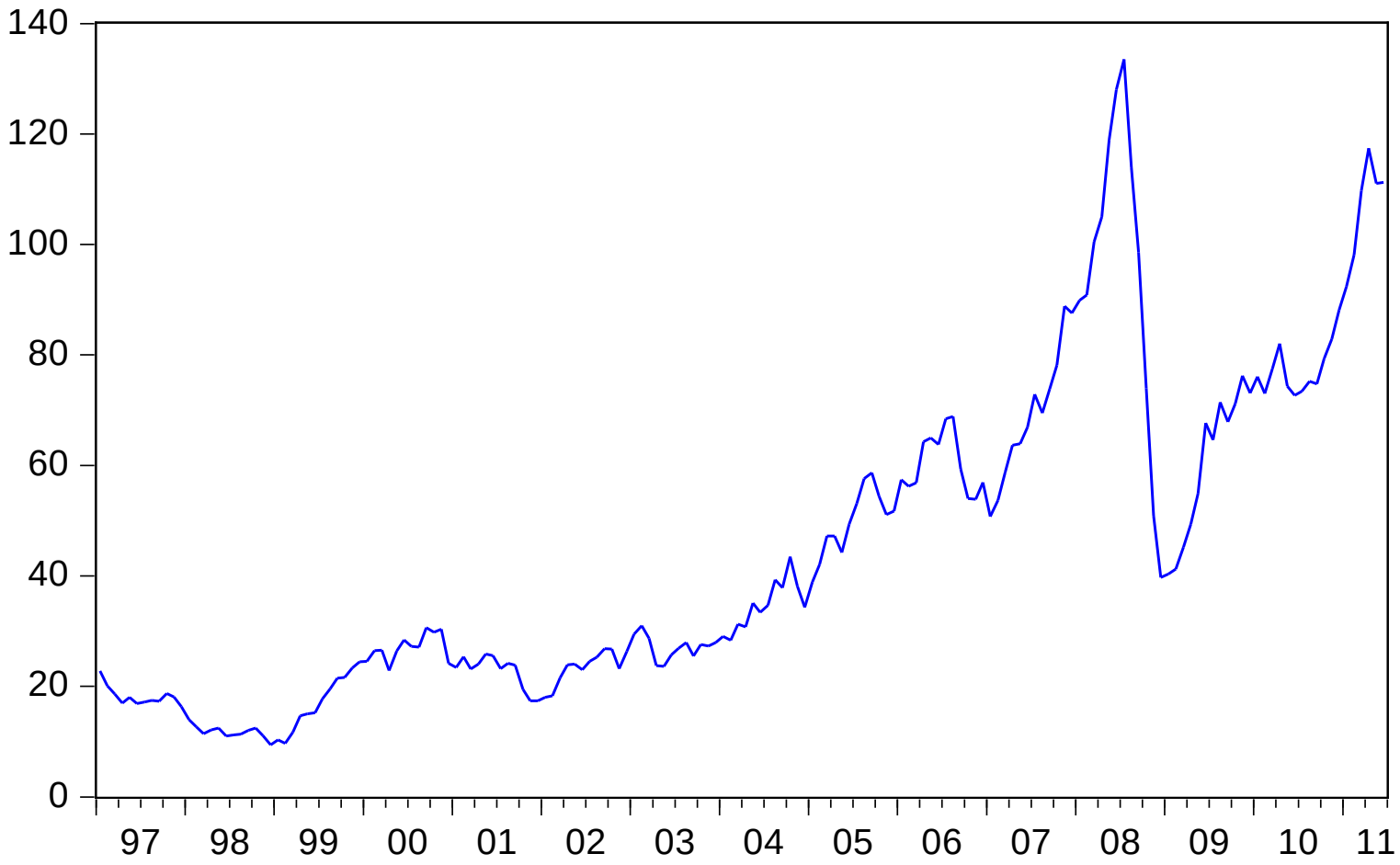
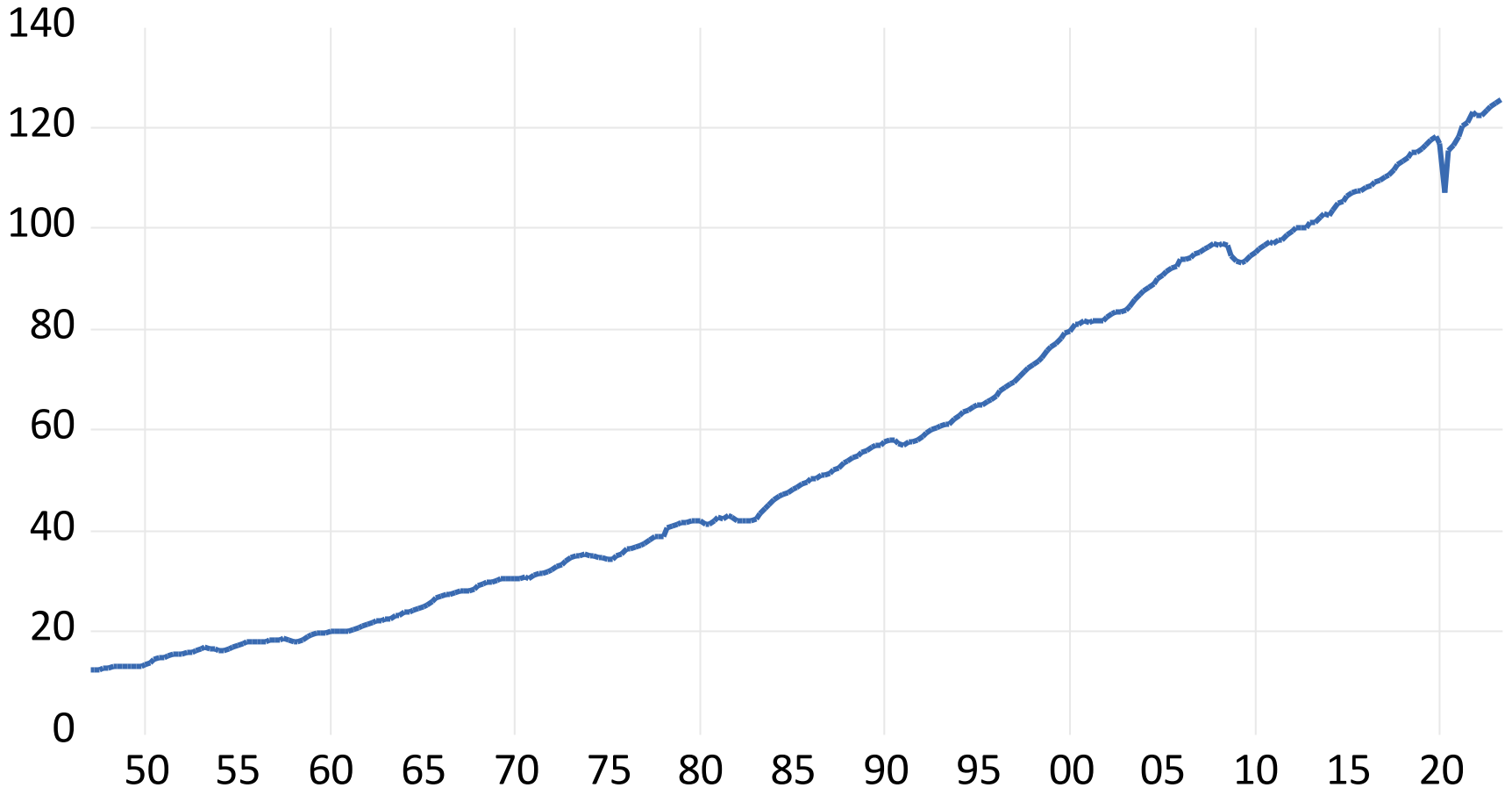
.	.	.	.	.	.
37	1986	3.35	58.1	18.9	4281.6
38	1987	3.35	58.2	16.8	4496.7

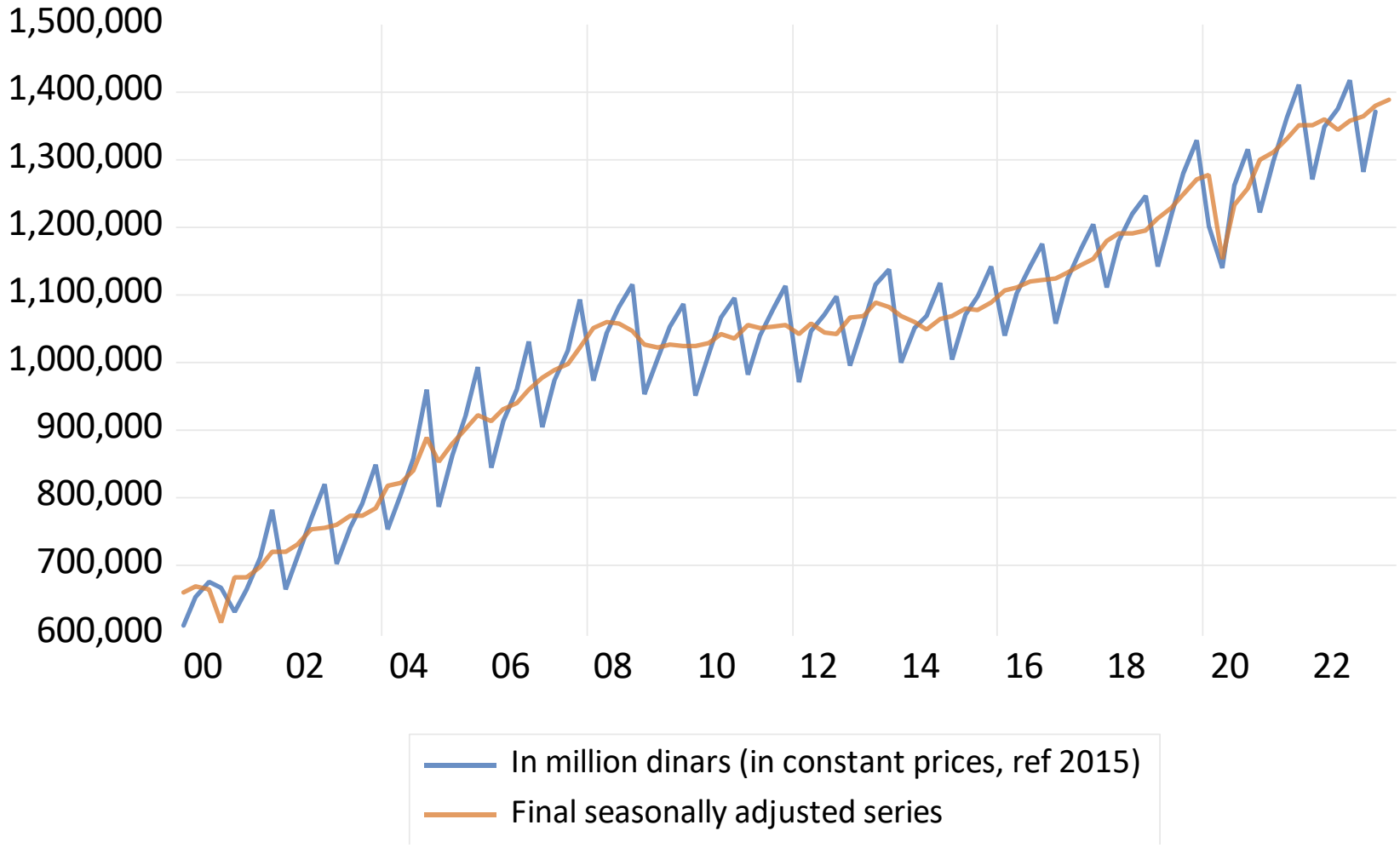
Example 4: Oil price (USD per barrel, period: 1997M1-2011M6)



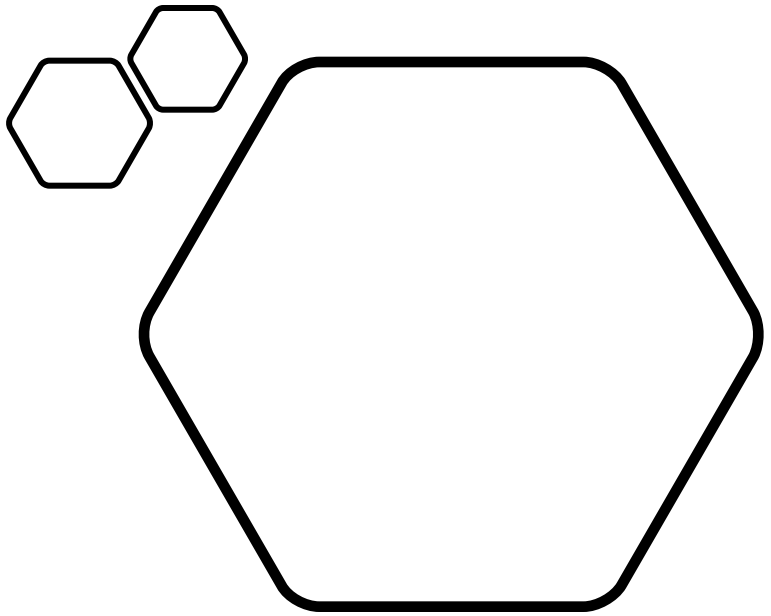
Example 5: US data on GDP (SA, in billions of 2012 dollars, period: 1947Q1-2023Q2)



Example 6: Serbian data on GDP (period: 2000Q1-2023Q2)



Panel Data/Longitudinal Data



- Same cross-sectional units (individuals, firms, or countries) are followed over a given period
- As an example, suppose we have wage, education or employment history for a set of individuals followed over a ten-years period or data on GDP for 20 OECD countries from 1997 – 2022
- Observing the same units over time leaves to several advantages, but more needs to be done in terms of modification and embellishment to standard econometric techniques

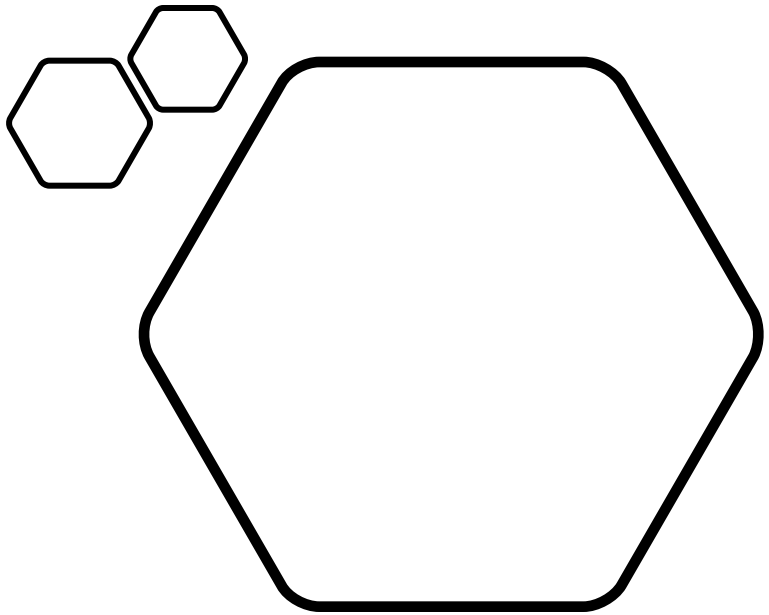
Example 7: Panel data (source: Wooldridge, 2021)

TABLE 1.5 A Two-Year Panel Data Set on City Crime Statistics

obsno	city	year	murders	population	unem	police
1	1	1986	5	350,000	8.7	440
2	1	1990	8	359,200	7.2	471
3	2	1986	2	64,300	5.4	75
4	2	1990	1	65,100	5.5	75
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
297	149	1986	10	260,700	9.6	286
298	149	1990	6	245,000	9.8	334
299	150	1986	25	543,000	4.3	520
300	150	1990	32	546,200	5.2	493

Example 8: panel of 12 CEE countries (N=12) in period 1995-2018 (T=24)

The Structure of Economic Data - Notation

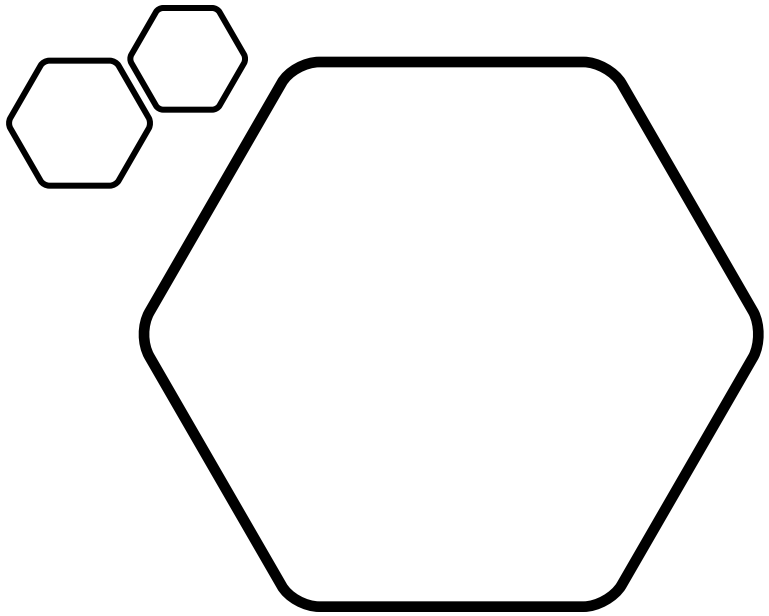


1) Cross-sectional: Y_i , i =1,2,…,N (n)

2) Time series: Y_t , t=1,2,…, T

3) Panel data: Y_{it} , i and t defined as above
(number of obs. N x T)

Econometric software



- All major commercial software packages for econometrics can be used
- Tables in this course reproduce EViews output. Output from other applications look very similar
- Practical lessons in EViews (Stata) will be provided to the students enrolled in this course