Faculty of economics, Commercial and Management Sciences
Department of commerce

Specialty: International Commerce & Finance Module: Advanced Econometric Academic year 2024/2025

## Exercises series N°4

#### Exercise 1 choose the correct answer for the following question

#### 1. Which of the following is a key advantage of using panel data?

- a. It reduces the number of observations
- b. It avoids the use of time series techniques
- c. It captures both individual and time variation in the data
- d. It requires fewer explanatory variables

### 2. Why is panel data considered superior to purely cross-sectional data?

- a. Because it assumes homogeneity across individuals
- b. Because it helps in identifying and controlling for individual-specific effects
- c. Because it eliminates the need for control variables
- d. Because it is always balanced

## 3. Panel data models are especially useful because:

- a. They ignore differences between individuals
- b. They are not influenced by time
- c. They allow us to study dynamic changes and control for hidden variables
- d. They are easier to estimate than OLS

#### 4. What is one reason researchers prefer panel data models?

- a. They can observe the impact of variables across individuals and over time
- b. They avoid the use of econometric techniques
- c. They reduce the need for data cleaning
- d. They guarantee unbiased estimates in all cases

#### 5. In a fixed effects model, unobserved individual-specific effects are:

- a. Assumed to be random and uncorrelated with the independent variables
- b. Assumed to be constant and correlated with the independent variables
- c. Time-varying and stochastic
- d. Ignored in the model

# 6. Which of the following methods allows different intercepts for each cross-sectional unit?

- a. Pooled OLS
- b. Random Effects Model
- c. Fixed Effects Model
- d. All the above

#### 7. In the Random Effects model, the individual-specific effect is:

- a. Treated as a fixed unknown parameter
- b. Correlated with explanatory variables
- c. Treated as a random variable uncorrelated with regressors
- d. Eliminated through demeaning

#### 8. The Hausman test is used to:

- a. Test if coefficients are statistically significant
- b. Choose between fixed effects and random effects models
- c. Test for serial correlation
- d. Determine the optimal lag length

# 9. In a balanced panel dataset:

- a. Each individual is observed in only one time period
- b. The number of individuals equals the number of time periods
- c. All individuals are observed in the same number of time periods
- d. Some individuals are missing in some time periods

#### 10. The Random Effects model is more efficient than Fixed Effects model only when:

- a. There is autocorrelation
- a. The random effects are correlated with the explanatory variables
- b. The Hausman test rejects the null
- c. The random effects are uncorrelated with the explanatory variables

### 11. Which of the following is a key assumption in the Random Effects model?

- a. Errors are normally distributed
- b. Individual effects are fixed constants
- c. Random effects are uncorrelated with independent variable
- d. There is multicollinearity in the data

#### 12. What does the coefficient of advertising = 2.45 in the Fixed Effects model mean?

- a. For every 1 unit increase in *advertising*, *sales* increase by 2.45 units, controlling for firm-specific effects.
- b. SALES increase by 2.45 units each year regardless of advertising.
- c. The average advertising spending across firms is 2.45.
- d. Advertising does not significantly affect sales.

# 13. Which model assumes that firm-specific effects are uncorrelated with the independent variables?

- a. Fixed Effects
- b. Random Effects
- c. Pooled OLS
- d. All of the above

# 14. What would be a reason to prefer the Fixed Effects model over Random Effects?

- a. The t-statistic is larger in Fixed Effects.
- b. The Fixed Effects model has a higher R-squared.
- c. If a **Hausman test** shows that the unobserved effects are **correlated** with independent variable.
- d. The Random Effects model includes a constant term.

# 15. Suppose you ran the Hausman test and the p-value was 0.01. Which model should you use?

- a. Fixed Effects
- b. Random Effects
- c. Pooled OLS
- d. Difference-in-Difference

#### Exercises 2

This study aims to investigate the relationship between **GDP** and four key macroeconomic variables—exports, imports, exchange rate, and investment—across five countries (China, USA, Russia, Italy and Algeria) over a five-year period (2010–2015). The data is

- **GDP** (in trillion national currency)
- Exports (in billion USD)
- Imports (in billion USD)
- Exchange Rate (National currency per 1 USD)
- **Investment** (in trillion national currency)

China 2011 44,6 1,8 1,6 6,35   China 2012 50 2,05 1,8 6,35   China 2013 54 2,21 2 6,05   China 2014 58 2,35 2,15 6,1   China 2015 60,5 2,47 2,2 6,25   China 2010 46,3 400 250 30,4   China 2011 55 5,515 320 29,3 11   China 2012 59,1 530 340 31 11   China 2012 59,1 530 340 31   China 2013 61 523 341 31,9 1   China 2013 61 523 341 31,9 1   China 2015 55,3 343 193 61   China 2011 1,8 460 500 0,75   China 2011 1,9 485 520 0,74 0,74   China 2011 1,9 485 520 0,74   China 2012 1,8 480 510 0,8 0   China 2012 1,8 480 510 0,8 0   China 2013 1,7 470 500 0,78 0   China 2014 1,7 460 490 0,82 0   China 2014 1,7 460 490 0,82 0   China 2015 1,8 475 510 0,8 0   China 2015 1,8 475 510 0,8   China 2015 1,8 475 1,2 475 1,2 475 1,2 475 1,2 475 1,2 475 1	Country	Year	GDP		Export	Import	Exchange Rate	Investment
China 2012 50 2,05 1,8 6,3 6,3 6,1 6,1 6,1 6,1 6,1 6,1 6,1 6,1 6,1 6,1	China		2010	40	1,6	1,4	6,75	7,2
China 2013 54 2,21 2 6,05 China 2014 58 2,35 2,15 6,1 China 2015 60,5 2,47 2,2 6,25 Russia 2010 46,3 400 250 30,4 Russia 2011 55 515 320 29,3 1 Russia 2012 59,1 530 340 31 1 Russia 2014 59,2 497 308 38,6 1 Russia 2015 55,3 343 193 61 Russia 2015 55,3 343 193 61 Rusly 2010 1,8 460 500 0,75 Italy 2011 1,9 485 520 0,74 0 Italy 2012 1,8 480 510 0,8 00 Italy 2013 1,7 470 500 0,78 0 Italy 2014 1,7 460 490 0,82 0 Italy 2015 1,8 475 510 0,85 Algeria 2010 13 60 50 75 Algeria 2011 14,2 70 55 74 Algeria 2012 15,5 75 60 80 Algeria 2014 16,7 85 70 85 Algeria 2015 1,8 42,3 1,33 USA 2014 15,5 1,96 2,35 1,39 USA 2012 16,8 2,12 2,48 1,32 USA 2013 16,8 2,12 2,48 1,32 USA 2013 16,8 2,12 2,48 1,32 USA 2014 17,4 2,21 2,55 1,26	China		2011	44,6	1,8	1,6	6,35	7,6
China 2014 58 2,35 2,15 6,1 China 2015 60,5 2,47 2,2 6,25 Russia 2010 46,3 400 250 30,4 Russia 2011 55 515 320 29,3 1 Russia 2012 59,1 530 340 31 31,9 Russia 2013 61 523 341 31,9 1 Russia 2014 59,2 497 308 38,6 1 Russia 2015 55,3 343 193 61 Russia 2015 55,3 343 193 61 Russia 2015 1,8 460 500 0,75 Rusly 2010 1,8 460 500 0,75 Rusly 2011 1,9 485 520 0,74 0,8 0 Rusly 2012 1,8 480 510 0,8 0,8 0 Rusly 2013 1,7 470 500 0,78 0 Rusly 2014 1,7 460 490 0,82 0 Rusly 2015 1,8 475 510 0,85 Rusly 2016 13 60 50 75 Rusly 2017 14,2 70 55 74 Rusleria 2011 14,2 70 55 74 Rusleria 2011 14,2 70 55 75 60 80 Rusleria 2013 16,2 80 65 80,5 Rusleria 2014 16,7 85 70 85 Rusleria 2015 17 90 75 90 Rusl 204 15,5 1,96 2,35 1,39 Rusl 205 16,8 2,12 2,48 1,32 Rusl 205 16,8 2,12 2,48 1,32 Rusl 205 16,8 2,12 2,48 1,32 Rusl 205 17,4 2,21 2,55 1,26	China		2012	50	2,05	1,8	6,3	8,1
China         2015         60,5         2,47         2,2         6,25           Russia         2010         46,3         400         250         30,4           Russia         2011         55         515         320         29,3         11           Russia         2012         59,1         530         340         31         11           Russia         2013         61         523         341         31,9         1           Russia         2014         59,2         497         308         38,6         11           Russia         2014         59,2         497         308         38,6         11           Russia         2015         55,3         343         193         61         61           Italy         2010         1,8         460         500         0,75         61           Italy         2011         1,9         485         520         0,74         0           Italy         2012         1,8         480         510         0,8         0           Italy         2013         1,7         470         500         0,78         0           Italy         2014	China		2013	54	2,21	2	6,05	8,6
Russia         2010         46,3         400         250         30,4           Russia         2011         55         515         320         29,3         1           Russia         2012         59,1         530         340         31         1           Russia         2013         61         523         341         31,9         1           Russia         2014         59,2         497         308         38,6         1           Russia         2015         55,3         343         193         61         1           Italy         2010         1,8         460         500         0,75         6           Italy         2011         1,9         485         520         0,74         0           Italy         2012         1,8         480         510         0,8         0           Italy         2013         1,7         470         500         0,78         0           Italy         2014         1,7         460         490         0,82         0           Italy         2014         1,7         460         490         0,85         0           Italy	China		2014	58	2,35	2,15	6,1	9
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Russia         2012         59,1         530         340         31         11           Russia         2013         61         523         341         31,9         1           Russia         2014         59,2         497         308         38,6         1           Russia         2015         55,3         343         193         61           Italy         2010         1,8         460         500         0,75         6           Italy         2011         1,9         485         520         0,74         0           Italy         2012         1,8         480         510         0,8         0           Italy         2013         1,7         470         500         0,78         0           Italy         2014         1,7         460         490         0,82         0           Italy         2015         1,8         475         510         0,85         0           Italy         2015         1,8         475         510         0,85         0           Italy         2015         1,8         475         510         0,85         0           Algeria <td< td=""><td>Russia</td><td></td><td>2010</td><td>46,3</td><td>400</td><td>250</td><td>30,4</td><td>9,2</td></td<>	Russia		2010	46,3	400	250	30,4	9,2
Russia         2013         61         523         341         31,9         1           Russia         2014         59,2         497         308         38,6         10           Russia         2015         55,3         343         193         61           Italy         2010         1,8         460         500         0,75           Italy         2011         1,9         485         520         0,74         0           Italy         2012         1,8         480         510         0,8         0           Italy         2013         1,7         470         500         0,78         0           Italy         2014         1,7         460         490         0,82         0           Italy         2015         1,8         475         510         0,85         0           Algeria         2010         13         60         50         75         4           Algeria         2011         14,2         70         55         74         4           Algeria         2012         15,5         75         60         80         80           Algeria         2013	Russia		2011	55	515	320	29,3	10,1
Russia       2014       59,2       497       308       38,6       11         Russia       2015       55,3       343       193       61         Italy       2010       1,8       460       500       0,75       0         Italy       2011       1,9       485       520       0,74       0       0         Italy       2012       1,8       480       510       0,8       0       0         Italy       2013       1,7       470       500       0,78       0       0         Italy       2014       1,7       460       490       0,82       0       0         Italy       2015       1,8       475       510       0,85       0	Russia		2012	59,1	530	340	31	10,8
Russia       2015       55,3       343       193       61         Italy       2010       1,8       460       500       0,75         Italy       2011       1,9       485       520       0,74       0         Italy       2012       1,8       480       510       0,8       0         Italy       2013       1,7       470       500       0,78       0         Italy       2014       1,7       460       490       0,82       0         Italy       2014       1,7       460       490       0,82       0         Italy       2015       1,8       475       510       0,85       0         Algeria       2010       13       60       50       75       0       0,85       0         Algeria       2011       14,2       70       55       74       0       0       80       0       0       80       0       0       80       0       0       80       0       0       80       0       0       80       0       0       80       0       0       80       0       0       0       0       0       0	Russia		2013	61	523	341	31,9	11,2
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Italy         2011         1,9         485         520         0,74         0           Italy         2012         1,8         480         510         0,8         0           Italy         2013         1,7         470         500         0,78         0           Italy         2014         1,7         460         490         0,82         0           Italy         2015         1,8         475         510         0,85         0           Italy         2015         1,8         475         510         0,85         0           Italy         2015         1,8         475         510         0,85         0           Italy         2010         13         60         50         75         0           Algeria         2010         13         60         50         75         74           Algeria         2012         15,5         75         60         80         80           Algeria         2013         16,2         80         65         80,5         80,5           Algeria         2014         16,7         85         70         85         90           USA	Russia		2015	55,3	343	193	61	9
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Algeria     2010     13     60     50     75       Algeria     2011     14,2     70     55     74       Algeria     2012     15,5     75     60     80       Algeria     2013     16,2     80     65     80,5       Algeria     2014     16,7     85     70     85       Algeria     2015     17     90     75     90       USA     2010     15     1,84     2,3     1,33       USA     2011     15,5     1,96     2,35     1,39       USA     2012     16,2     2,04     2,4     1,28       USA     2013     16,8     2,12     2,48     1,32       USA     2014     17,4     2,21     2,55     1,26	Italy		2014	1,7	460	490	0,82	0,38
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Algeria     2012     15,5     75     60     80       Algeria     2013     16,2     80     65     80,5       Algeria     2014     16,7     85     70     85       Algeria     2015     17     90     75     90       USA     2010     15     1,84     2,3     1,33       USA     2011     15,5     1,96     2,35     1,39       USA     2012     16,2     2,04     2,4     1,28       USA     2013     16,8     2,12     2,48     1,32       USA     2014     17,4     2,21     2,55     1,26	Algeria		2010	13	60	50	75	3,2
Algeria 2013 16,2 80 65 80,5 Algeria 2014 16,7 85 70 85 Algeria 2015 17 90 75 90  USA 2010 15 1,84 2,3 1,33  USA 2011 15,5 1,96 2,35 1,39  USA 2012 16,2 2,04 2,4 1,28  USA 2013 16,8 2,12 2,48 1,32  USA 2014 17,4 2,21 2,55 1,26	Algeria		2011	14,2	70	55	74	3,4
Algeria 2014 16,7 85 70 85 Algeria 2015 17 90 75 90 USA 2010 15 1,84 2,3 1,33 USA 2011 15,5 1,96 2,35 1,39 USA 2012 16,2 2,04 2,4 1,28 USA 2013 16,8 2,12 2,48 1,32 USA 2014 17,4 2,21 2,55 1,26	Algeria		2012	15,5	75	60	80	3,6
Algeria 2015 17 90 75 90  USA 2010 15 1,84 2,3 1,33  USA 2011 15,5 1,96 2,35 1,39  USA 2012 16,2 2,04 2,4 1,28  USA 2013 16,8 2,12 2,48 1,32  USA 2014 17,4 2,21 2,55 1,26	Algeria		2013	16,2			80,5	3,8
USA 2010 15 1,84 2,3 1,33 USA 2011 15,5 1,96 2,35 1,39 USA 2012 16,2 2,04 2,4 1,28 USA 2013 16,8 2,12 2,48 1,32 USA 2014 17,4 2,21 2,55 1,26	Algeria		2014	16,7	85	70	85	4
USA 2011 15,5 1,96 2,35 1,39 USA 2012 16,2 2,04 2,4 1,28 USA 2013 16,8 2,12 2,48 1,32 USA 2014 17,4 2,21 2,55 1,26	Algeria		2015	17	90	75	90	4,2
USA 2012 16,2 2,04 2,4 1,28 USA 2013 16,8 2,12 2,48 1,32 USA 2014 17,4 2,21 2,55 1,26	USA		2010	15	1,84	2,3	1,33	2,8
USA 2013 16,8 2,12 2,48 1,32 USA 2014 17,4 2,21 2,55 1,26	USA		2011	15,5	1,96	2,35	1,39	2,9
USA 2014 17,4 2,21 2,55 1,26	USA		2012	16,2	2,04	2,4	1,28	3,1
	USA		2013	16,8	2,12	2,48	1,32	3,3
USA 2015 18 2,3 2,62 1,11	USA		2014	17,4	2,21	2,55	1,26	3,5
	USA		2015	18	2,3	2,62	1,11	3,7

#### Tasks:

- 1. Import the dataset into Eviews, make the necessary transformations?
- 2. What kind of the data is this?
- 3. Write the regression model?
- 4. Estimate the model?
- 5. Interpret the signs and significance of the estimated coefficients.
- 6. Report and interpret the R-squared value.
- 7. Test for individual country effects. How do results vary across countries?
- 8. Discuss whether a fixed or random effects model is more appropriate using the Hausman test.
- 9. Run the diagnostic check, what do you think?

#### Exercise 3

You want to estimate the effect of **education** and **experience** on **productivity**, while controlling for **unobserved**, **time-invariant traits** like personality or family background (which are not measured but may influence productivity).

Dependent Variable: PRODUCTIVITY
Method: Panel Least Squares (Fixed Effects)

Sample: 2010 2019 Periods included: 10 Cross-sections included: 5

Total panel (balanced) observations: 50

v artable	Coefficient	Sta. Error	t-Statistic	Prob.
<b>EDUCATION</b>	1.8000	0.300	000 6.00	0000 0.
EVDEDIENG	E 0.000	00 0150	000 400	0000

 EDUCATION
 1.800000
 0.300000
 6.000000
 0.0000

 EXPERIENCE
 0.600000
 0.150000
 4.000000
 0.0002

 C
 12.2025
 0.210
 0.0000

 R-squared
 0.850000

Adjusted R-squared 0.820000 F-statistic 28.00000 Prob(F-statistic) 0.000000

cross-section id	fixed effect
individual 1	+2.50
INDIVIDUAL 2	-1.00
INDIVIDUAL_3	+0.80
INDIVIDUAL 4	-0.70
INDIVIDUAL 5	-1.60

# **Tasks**

- 1. Which model is appropriate to estimate this relationship, write the regression model?
- 2. Based on the table, interpret the results of regression?
- 3. What the R-squared tell about the model fit?
- 4. Interpret the cross section effect?