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)

Country	Year	GDP	Export	Import	Exchange Rate	Investment
China	2010	40	1,6	1,4	6,75	7,2
China	2011	44,6	1,8	1,6	6,35	7,6
China	2012	50	2,05	1,8	6,3	8,1
China	2013	54	2,21	2	6,05	8,6
China	2014	58	2,35	2,15	6,1	9
China	2015	60,5	2,47	2,2	6,25	9,3
Russia	2010	46,3	400	250	30,4	9,2
Russia	2011	55	515	320	29,3	10,1
Russia	2012	59,1	530	340	31	10,8
Russia	2013	61	523	341	31,9	11,2
Russia	2014	59,2	497	308	38,6	10,5
Russia	2015	55,3	343	193	61	9
Italy	2010	1,8	460	500	0,75	0,4
Italy	2011	1,9	485	520	0,74	0,42
Italy	2012	1,8	480	510	0,8	0,39
Italy	2013	1,7	470	500	0,78	0,37
Italy	2014	1,7	460	490	0,82	0,38
Italy	2015	1,8	475	510	0,85	0,4
Algeria	2010	13	60	50	75	3,2
Algeria	2011	14,2	70	55	74	3,4
Algeria	2012	15,5	75	60	80	3,6
Algeria	2013	16,2	80	65	80,5	3,8
Algeria	2014	16,7	85	70	85	4
Algeria	2015	17	90	75	90	4,2
USA	2010	15	1,84	2,3	1,33	2,8
USA	2011	15,5	1,96	2,35	1,39	2,9
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	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

Variable	***Coefficient***	***Std. Error***	***t-Statistic***	***Prob.***
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?