

Econ 371
Exam #4 - Practice

Multiple Choice (5 points each): For each of the following, select the single most appropriate option to complete the statement.

- 1) The following will not cause correlation between X and u in the simple regression model:
- a) simultaneous causality.
 - b) omitted variables.
 - c) irrelevance of the regressor.
 - d) errors in variables.

Answer: c

- 2) The conditions for a valid instruments do not include the following:
- a) each instrument must be uncorrelated with the error term.
 - b) each one of the instrumental variables must be normally distributed.
 - c) at least one of the instruments must enter the population regression of X on the Z 's and the W 's.
 - d) perfect multicollinearity between the predicted endogenous variables and the exogenous variables must be ruled out.

Answer: b

- 3) The rule-of-thumb for checking for weak instruments is as follows: for the case of a single endogenous regressor,
- a) a first stage F must be statistically significant to indicate a strong instrument.
 - b) a first stage $F > 1.96$ indicates that the instruments are weak.
 - c) the t-statistic on each of the instruments must exceed at least 1.64.
 - d) a first stage $F < 10$ indicates that the instruments are weak.

Answer: d

- 4) The following are reasons for studying randomized controlled experiment in an econometrics course, with the exception of
- a) at a conceptual level, the notion of an ideal randomized controlled experiment provides a benchmark against which to judge estimates of causal effects in practice.
 - b) when experiments are actually conducted, their results can be very influential, so it is important to understand the limitations and threats to validity of actual experiments as well as their strength.
 - c) randomized controlled experiments in economics are common.
 - d) external circumstances sometimes produce what appears to be randomization.

Answer: c

- 5) The Hawthorne effect refers to
- subjects dropping out of the study after being randomly assigned to the treatment or control group.
 - the failure of individuals to follow completely the randomized treatment protocol.
 - the phenomenon that subjects in an experiment can change their behavior merely by being included in the experiment.
 - assigning individuals, in part, as a result of their characteristics or preferences.

Answer: c

- 6) Causal effects that depend on the value of an observable variable, say W_i ,
- cannot be estimated.
 - can be estimate by interacting the treatment variable with W_i .
 - result in the OLS estimator being inefficient.
 - requires use of homoskedasticity-only standard errors.

Answer: b

- 7) Time series variables fail to be stationary when
- the economy experiences severe fluctuations.
 - the population regression has breaks.
 - there is strong seasonal variation in the data.
 - there are no trends.

Answer: b

- 8) In order to make reliable forecasts with time series data, all of the following conditions are needed with the exception of
- coefficients having been estimated precisely.
 - the regression having high explanatory power.
 - the regression being stable.
 - the presence of omitted variable bias.

Answer: d

- 9) One of the sources of error in the RMSFE in the AR(1) model is

- a) the error in estimating the coefficients β_0 and β_1 .
- b) due to measuring variables in logarithms.
- c) that the value of the explanatory variable is not known with certainty when making a forecast.
- d) the model only looks at the previous period's value of Y when the entire history should be taken into account.

Answer: a

- 10) To choose the number of lags in either an autoregression or in a time series regression model with multiple predictors, you can use any of the following test statistics with the exception of the
- a) F-statistic.
 - b) Akaike Information Criterion.
 - c) Bayes Information Criterion.
 - d) Augmented Dickey-Fuller test.

Answer: d

Problems: Provide the requested information for each of the following questions. Be sure to show your work.

- 11) Consider the following population regression model relating the dependent variable Y_i and regressor X_i ,

$$Y_i = \beta_0 + \beta_1 X_i + u_i, \quad i = 1, \dots, n.$$

$$X_i \equiv Y_i + Z_i$$

where Z is a valid instrument for X .

- a) Explain why you should not use OLS to estimate β_1 .

Answer: Substitution of the first equation into the identity shows that X is correlated with the error term. Hence estimation with OLS results in an inconsistent estimator.

- b) To generate a consistent estimator for β_1 what should you do?

Answer: The instrumental variable estimator is consistent and in this case is

$$\hat{\beta}_1^{2SLS} = \frac{s_{ZY}}{s_{ZX}}.$$

12) To analyze the effect of a minimum wage increase, a famous study used a quasi-experiment for two adjacent states: New Jersey and (Eastern) Pennsylvania. A $\hat{\beta}_1^{diffs-in-diffs}$ was calculated by comparing average employment changes per restaurant between to treatment group (New Jersey) and the control group (Pennsylvania). In addition, the authors provide data on the employment changes between “low wage” restaurants and “high wage” restaurants in New Jersey only. A restaurant was classified as “low wage,” if the starting wage in the first wave of surveys was at the then prevailing minimum wage of \$4.25. A “high wage” restaurant was a place with a starting wage close to or above the \$5.25 minimum wage after the increase.

a) Explain why employment changes of the “high wage” and “low wage” restaurants might constitute a quasi-experiment. Which is the treatment group and which the control group?

Answer: In the above example, the increase in wages (“treatment”) occurs not because of changes in the demand or supply of labor, but because of an external event, namely the raising of the minimum wage in New Jersey. This is therefore a good example of a “natural experiment.” The treatment group is the “low wage” restaurants, since the wages there are actually changed. The “high wage” restaurants are the control group.

b) The following information is provided

	<i>Low wage</i>	<i>High wage</i>
<i>FTE Employment before</i>	19.56	22.25
<i>FTE Employment after</i>	20.88	20.21

Where *FTE* is “full time equivalent” and the numbers are average employment per restaurant.

Calculate the change in the treatment group, the change in the control group, and finally $\hat{\beta}_1^{diffs-in-diffs}$. Since minimum wages represent a price floor, did you expect $\hat{\beta}_1^{diffs-in-diffs}$ to be positive or negative?

Answer: change in treatment group: + 1.32, change in control group: - 2.04, $\hat{\beta}_1^{diffs-in-diffs} = 3.36$. The prior expectation would be negative.

c) The standard error for $\hat{\beta}_1^{diffs-in-diffs}$ is 1.48. Test whether or not this is statistically significant, given that there are 174 observations.

Answer: The t -statistic is 2.27, making the coefficient statistically significant at the 5% level (two-sided test).

13) Having learned in macroeconomics that consumption depends on disposable income, you want to determine whether or not disposable income helps predict future consumption. You collect data for the sample period 1962:I to 1995:IV and plot the two variables.

a) To determine whether or not past values of personal disposable income growth rates help to predict consumption growth rates, you estimate the following relationship.

$$\begin{aligned} \widehat{\Delta \text{Ln}C_t} = & 1.695 + 0.126 \Delta \text{Ln}C_{t-1} + 0.153 \Delta \text{Ln}C_{t-2}, \\ & (0.484) \quad (0.099) \quad (0.103) \\ & + 0.294 \Delta \text{Ln}C_{t-3} - 0.008 \Delta \text{Ln}C_{t-4} \\ & (0.103) \quad (0.102) \\ & + 0.088 \Delta \text{Ln}Y_{t-1} - 0.031 \Delta \text{Ln}Y_{t-2} - 0.050 \Delta \text{Ln}Y_{t-3} - 0.091 \Delta \text{Ln}Y_{t-4} \\ & (0.076) \quad (0.078) \quad (0.078) \quad (0.074) \end{aligned}$$

The Granger causality test for the exclusion on all four lags of the GDP growth rate is 0.98. Find the critical value for the 1%, the 5%, and the 10% level from the relevant table and make a decision on whether or not these additional variables Granger cause the change in the growth rate of consumption.

Answer: The critical value for $F_{4,\infty}$ is 3.32, 2.37, and 1.94 respectively. The decision is therefore not to reject the null hypothesis at the 1% significance level.

b) You are somewhat surprised about the result in the previous question and wonder, how sensitive it is with regard to the lag length in the ADL(p,q) model. As a result, you calculate BIC and AIC of p and q from 0 to 6. The results are displayed in the accompanying table:

p,q	BIC	AIC
0	5.061	5.039
1	5.052	4.988
2	5.095	4.989
3	5.110	4.960
4	5.165	4.972
5	5.206	4.973
6	5.270	4.992

Which values for p and q should you choose?

Answer: The minimum for both the AIC and the BIC is at $p=q=1$.

- c) Estimating an ADL(1,1) model gives you a t-statistic of 1.28 on the coefficient of lagged disposable income growth. What does the Granger causality test suggest about the inclusion of lagged income growth as a predictor of consumption growth?

Answer: For a single restriction, $t = F^2$ and the critical value is therefore 1.96 for the t -statistic. Hence you cannot reject the null hypothesis that the coefficient on lagged disposable income growth is zero, or that disposable income growth does not Granger cause consumption growth.