MASTER M2

Econometrics I: Mid-Term Exam

November 6, 2012. 14h00-16h00

Question 1: 3 Points

1. What are the properties of the OLS estimator in finite sample when one considers i.i.d. data?
2. What are the asymptotic properties of the OLS estimator when one considers i.i.d. data?
3. Provide the formula of a consistent estimator of the variance of the OLS estimator under heteroskedasticity when one considers i.i.d. data.

Question 2: 4 Points

1. What are the properties of the OLS estimator in finite sample when one considers time series data?
2. What are the asymptotic properties of the OLS estimator when one considers time series data?
3. Provide the formula of a consistent estimator of the variance of the OLS estimator under serial correlation of unknown form when one considers time series data.

Question 3: 4 Points

1. What are the impacts on the OLS estimator and the regression fit when the explained variable is measured with errors? Be precise.
2. What are the impacts on the OLS estimator and the regression fit when an explanatory variable is measured with errors? Be precise.
3. What is the impact on the OLS estimator when one forgets an explanatory variable? Be precise.

Question 4: 3 Points

1. How do you assess by simulations the finite-sample properties of estimators and tests procedures? You can consider an example.
2. How do you assess by simulations the asymptotic theory of estimators and tests procedures? You can consider an example.

Question 5: 3 Points

Testing in the context of MLE.

Question 6: 3 Points

Tobit Model: Model and Estimation.

MASTER M2
Econometrics I: Examination
December 19, 2012. 9h30-12h30

Question 1: 4 Points. Consider the model $y_t = x_t'\beta^0 + u_t$ with $E[u_t \mid x_t] = 0$, with a sample (y_t, x_t), $t = 1, 2, ..., T$. Explain, with details, the different steps of the inference procedure. You have to give the assumptions, the formulaes of the different estimators; you have to give the properties of your estimators (bias, consistency, efficiency, etc...), and consider the possible case of heteroskedasticity and serial correlation. Likewise, you have to explain how to build a confidence interval of a particular parameter, how to test a hypothesis on a parameter and on two parameters.

Question 2: 6 Points. Assume that

$$y_i = \beta_0^0 + \beta_1^0 x_{i1} + \beta_2^0 x_{i2} + u_i, \text{ with } E[u_i \mid x_{i1}, z_{i1}, z_{i2}] = 0,$$

where z_{i1} and z_{i2} are instruments. We assume that we have an i.i.d. sample $(y_i, x_{i1}, x_{i2}, z_{i1}, z_{i2})$, $i = 1, 2, ..., N$.

1. Give an economic example of such framework.
2. What are the properties that should have the instruments (z_1, z_2)?
3. Explain how do you get the two-stage least-squares?
4. What are the properties of this estimator in finite sample? Asymptotically?
5. What is a weak instrument? How do you check that z_1 and z_2 are not weak instruments?
6. Give the formula of the optimal GMM estimator, as well as its asymptotic distribution.
7. How do you implement the optimal GMM estimator?
8. How do you test that the variable x_{i2} is endogenous? Provide all the calculations from the GMM asymptotic distributions.

Question 3: 3 Points. Consider an i.i.d. sample (y_i), i=1,2,...,N, from a random variable Y whose distribution is given by $P(Y = 0) = p_0$, $P(Y = 1) = p_1$, and $P(Y = 2) = 1 - p_0 - p_1$.

1. Compute the MLE of (p_0, p_1).
2. Compute the asymptotic variance of the MLE.
3. Provide a consistent estimator for the asymptotic variance of the MLE.
4. Write a test for the assumption $H_0 : p_0 p_1 = 1/5$ against $H_a : p_0 p_1 \neq 1/5$. Provide all the details.

Question 4: 5 Points. Consider the model

$$y_t = f_t + u_t$$
$$f_t = \omega + \rho f_{t-1} + v_t$$

where

$$(u_t, v_t)^\top \quad \text{i.i.d.} \quad \sim \quad \mathcal{N}\left(0, \left[\begin{array}{cc} \sigma_u^2 & \sigma_{uv} \\ \sigma_{uv} & \sigma_v^2 \end{array}\right]\right).$$

We assume that we observe y_t but not f_t.

1. What are the dynamics of y_t? You have to characterize all the parameters describing these dynamics in terms of $\theta = (\omega, \rho, \sigma_u^2, \sigma_{uv}, \sigma_v^2)'$.
2. Could you identify θ from the process y_t? If not, what do you propose as an identification assumption.
3. How do you test that $\rho = 1$? Give the different methods that you know.
4. In what follows, we assume that you rejected the non-stationarity assumption. Compute $E[y_t]$, $Var[y_t]$, $Cov[y_t, y_{t-h}]$ for any h.
5. How do you estimate the parameters of the identified model? We do not need details; provide a brief explanation on how you proceed.
6. After the estimation of the parameters, how do you check that the model describes well the data? Be precise.
7. In what follows, assume that θ is known perfectly. Compute the forecast of y_{t+1} at time t given $y_t, y_{t-1}, \ldots$, the forecasting error, as well as the 95% confidence interval of the forecast.
8. Assume now that we observe y_t and f_t. Compute the forecast of y_{t+1} at time t given $f_t, f_{t-1}, \ldots$, the forecasting error, as well as the 95% confidence interval of the forecast.
9. Compute the forecast of y_{t+1} at time t given $y_t, f_t, y_{t-1}, f_{t-1}, \ldots$, the forecasting error, as well as the 95% confidence interval of the forecast.
10. Comment the results of the previous three questions.
11. How do you implement out-of-sample forecasting?

Question 5: 2 Points. Write a Panel model with fixed effects.

1. What are the parameters that you can/cannot identify?
2. Provide consistent estimators of the parameters that you can identify.

the best reply(ies) of player 3 to (s_1, s_2). Does there exist a pure strategy s_3 of player 3 such that (s_1, s_2, s_3) is a Nash equilibrium ?

II- 4) We consider here mixed Nash equilibria. What is the best equilibrium payoff for player 3 ? What is the worst equilibrium payoff for player 3 ? What is the set of Nash equilibrium payoffs ?

Exercise III:

III-A) Let G be the following strategic game.

$$\begin{array}{c} \\ T \\ B \end{array} \begin{array}{c} \begin{array}{cc} L & R \end{array} \\ \begin{pmatrix} (0,0) & (4,0) \\ (0,4) & (3,3) \end{pmatrix} \end{array}$$

III-a) Compute the pure Nash equilibria of G

III-b) Compute the mixed Nash equilibria of G.

III-c) Compute the correlated equilibrium distributions of G.

III-B) Let G' be the following strategic game.

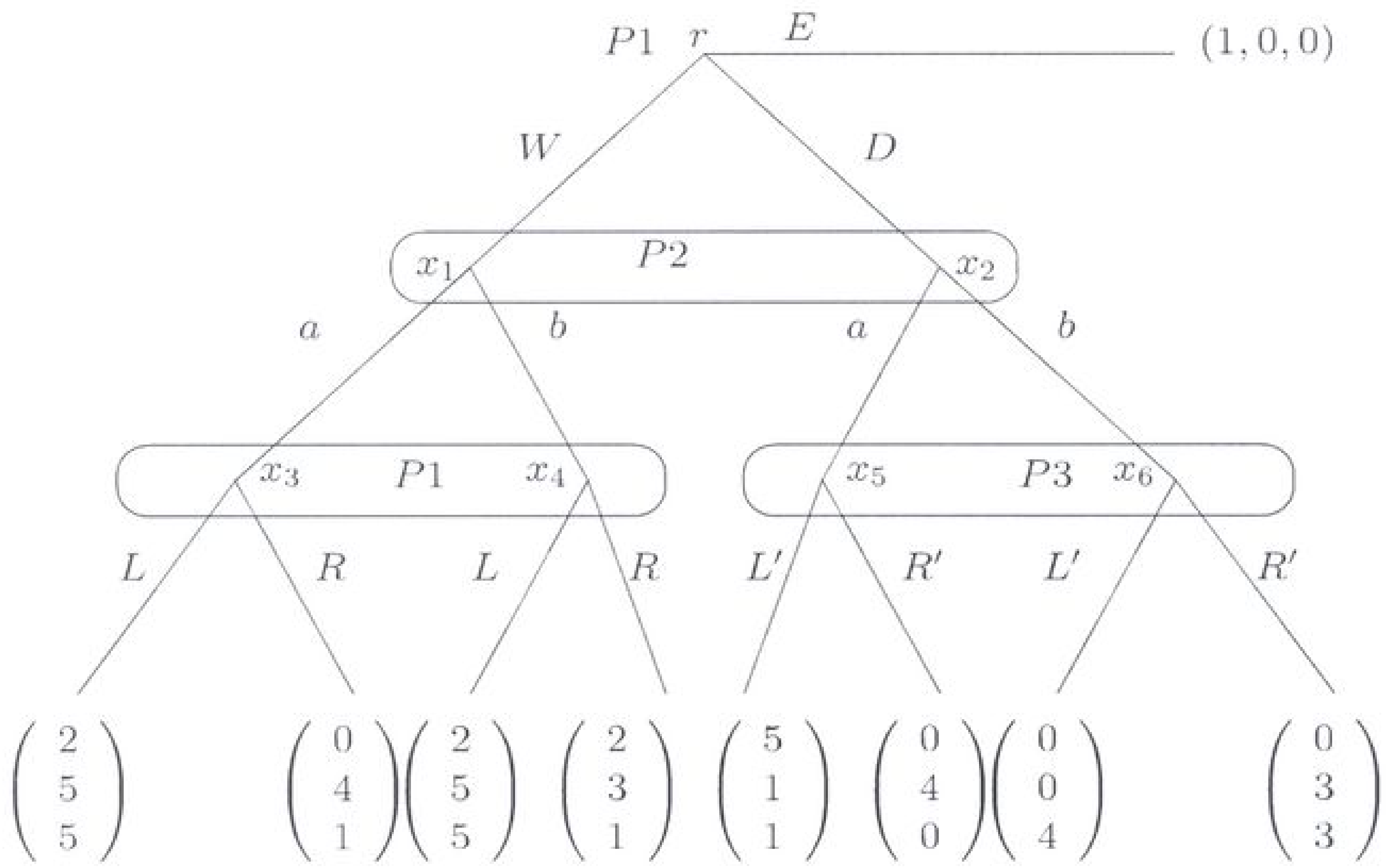
$$\begin{array}{c} \\ T \\ M \\ B \end{array} \begin{array}{c} \begin{array}{ccc} l & m & r \end{array} \\ \begin{pmatrix} (1,1) & (1,0) & (8,0) \\ (1,0) & (1,1) & (0,0) \\ (0,8) & (1,0) & (6,6) \end{pmatrix} \end{array}$$

III-a') Compute the pure Nash equilibria of G'

III-b') Compute the mixed Nash equilibria of G'.

III-c') Apply "the" Folk theorem and compute the set of uniform equilibrium payoffs of the repeated game G'_∞.

Exercise IV We consider the following extensive-form game Γ.



Notice that Player 1 has several information sets.

IV. a) Compute the Nash equilibria, resp. the subgame-perfect equilibria, resp. the Bayesian-perfect equilibria, resp. the sequential equilibria, in pure strategies.

IV.b) Compute the sequential equilibria in behavior strategies.