National Economics

Op vrijdag 16 december organiseerde studievereniging AEclipse de eerste *National Economics Olympiad*. Studenten (bedrijfs)economie en econometrie gingen drie uur lang de strijd met elkaar aan in teams van drie. Ze kregen tien Engelstalige opdrachten op verschillende deelgebieden van de economie voorgeschoteld. In *ESB* presenteren wij de leukste vier voor u. Weet u de vragen juist te beantwoorden?

Econometrics

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Suppose your interest is understanding peer effects in student performance. You decide to estimate:

$$s_{ij} = \sum_{j=1}^{G} \alpha_j I_j + u_{ij}$$

where i is the student, $j \in \{1, ...G\}$ is the school to which i belongs, G the number of schools, and n_j the number of individuals in a school. s_{ij} is the grade of the student. I_j is a binary (0/1) variable that indicates the school. u_{ij} is a random variable with mean 0. Assume that you are examining the very short run: the number of schools is fixed, and students are unable to move from school to school.

A. Derive the OLS estimator $\hat{\alpha}_1, \hat{\alpha}, ..., \hat{\alpha}_G$ for $\alpha_1, \alpha, ..., \alpha_G$.

B. Calculate the covariance between s_{ij} and the fitted value $\hat{s}_{ij}$.

C. Let $\bar{s}_j = \sum_j^{n_j} \frac{s_{ij}}{n_j}$. What does your calculation in Question B tell you about the OLS estimator the β_1 in $s_{ij} = \beta_0 + \beta_1 \bar{s}_j + \varepsilon_{ij}$? Derive the estimator and use it to answer this question formally.

D. What do your answers to questions A-C imply about your ability to interpret peer effects β_1 causally? Propose a solution to this problem.

De antwoorden vindt u op www.esb.nu/antwoorden2016

Macroeconomics

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Macroeconomists have long assumed agents to be identical. Hence their models include a representative household and a representative firm. An example of a typical setting for an individual agent and firm is given below:

$$c_t^j = E_t^j c_{t+1}^j - \frac{1}{\sigma}[r_t - E_t^j \pi_t]$$
$$q_t^j = (1-\beta w)\phi_t + \beta w E_t^j (q_{t+1}^j + \pi_{t+1})$$
$$\phi_t = -\alpha\zeta_t + \gamma y_t$$

Where c is consumption, y is output, r is the interest rate in the economy, π is economy wide inflation, q is the price set by the firm, φ is marginal cost and ξ is a technology process, used for production. The other parameters are fixed. The superscript j denotes an individual level quantity, so c^j is the consumption of the j'th household, whereas c would be the aggregate consumption of all households. There exists a continuum of households $j \in [0,1]$.

Given these individual functions, we impose the following equilibrium conditions binding the sum of individuals into an aggregate economy:

$$y_t = \int_0^1 c_t^j \, dj$$
$$\frac{w}{1-w}\pi_t = \int_0^1 q_t^j \, dj$$

A. Assume that all individuals are identical (hence all households and all firms are the same and have identical expectations). Aggregate the individual decision functions given above into a proper macroeconomic model.

Lately, a lot of attention has been paid to heterogeneous agents in macroeconomics. Incorporating heterogeneous agents in the model requires two substitutions. First, we assume that future expectations may differ, meaning $E_t^j c_{t+1} \neq E_t^i c_{t+1}$ if i and j are different. To deal with these differences, we introduce a new expectations operator $\bar{E}_t X_{t+1} = \int_0^1 E_t^j X_{t+1} dj$. Second, we assume that consumers may differ in their consumption and firms in their price setting behaviour. Including this into our model, we derive a new set of macroeconomic equations:

$$y_t = \bar{E}_t y_{t+1} + \Phi_t(c) - \frac{1}{\sigma}[r_t - \bar{E}_t \pi_t]$$
$$\pi_t = \beta \bar{E}_t \pi_{t+1} + \beta(1+w)\Phi_t(q) + \frac{1-w}{w}(1-\beta w)[-\alpha\zeta_t + \gamma y_t]$$

Opdracht gebaseerd op: Kurz, M., G. Piccillo and H. Wu (2013) Modeling diverse expectations in an aggregated New Keynesian Model. Journal of Economic Dynamics and Control, 37(8), 403-433.

B. Derive the analytical definition of $\Phi_t(c)$ and interpret its meaning in economic terms.

C. Explain how $\Phi_t(c)$ can give rise to bubbles, i.e. deviations from the steady state that are not caused by changes in fundamentals. Assume the system is at its steady state.

D. The new expectations operator $\bar{E}_t X_{t+1}$ does not satisfy the law of iterated expectations. This means that $\bar{E}_t[\bar{E}_{t+1}[X_{t+2}|I_{t+1}]|I_t] \neq \bar{E}_t[X_{t+2}]$ with I_t the information set at time t. Explain how the new expectations operator can give rise to bubbles. Assume the system is at its steady state.

De antwoorden vindt u op www.esb.nu/antwoorden2016

National Economics

Financial economics

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In 2015, the Dutch government listed ABN-AMRO on the Amsterdam Exchange indeX (AEX). In this problem we will simulate this IPO again, taking the role of an economics student in 2015 (before the IPO). An interested investor is not quite sure yet of the exact share price of ABN-AMRO, once it gets listed. However, he has managed to collect some data from published articles and newspapers.

- The most recent net profit of the bank was 1,55 billion euros (source: Annual Report 2014)
- The book value of equity is currently 15,58 billion euros (source: 1st Quarterly Report 2015)
- The average price-earnings ratio of listed competitors stands at 11,3 (source: FD)
- ABN-AMRO has 940 million total shares outstanding (source: Annual Report 2014) and the investor believes that no additional shares will be issued after the IPO.

The investor approaches you with the collected data and asks you a few questions in this regard.

A. "Based upon the collected data and your own believes, what do you think is a good estimation of the share price of ABN-AMRO after the IPO?"

In January 2015 ABN-AMRO fired six employees in Dubai, after having detected fraud. On June 22nd 2015, the Algemeen Dagblad (AD) headlined "Yet again trickery at ABN-AMRO Dubai" after an employee had not adhered to the internal rules of the bank.

B "What could be the effects of such incidents on the share price of ABN-AMRO?" Explain by using the formula of the constant growth Dividend Discount Model.

On May 22nd the following news item appeared in the media: "ABN-AMRO gets substantial protection against hostile takeovers" (source: Z24).

C. "Is there a difference in the value of ABN-AMRO between a scenario in which there are indeed protective measures taken and a scenario in which there are no such measures?"

The investor has collected some more data:

- Last year, ABN-AMRO paid out 400 million euros in dividends to the Dutch government (source: Annual Report 2014).
- The beta (β) of comparable companies listed on the stock market is on average 1,07 (source: FD).
- The interest rate on Dutch government bonds amounts to 1,12% (source: Bloomberg)
- The expected market return is 9,5%.

D. "Based on the constant growth Dividend Discount Model, what is the estimated market value of ABN-AMRO?" If necessary, you may also use the collected data at the beginning of this problem.

De antwoorden vindt u op www.esb.nu/antwoorden2016

Microeconomics

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Consider an economy populated by two agents: Agent 1 and agent 2. Agent's utility function is:

$$U_i = wh_i + \Upsilon(wh_i - wh_j) - \tfrac{1}{2}\theta h_i^2$$

where U_i is agent i's utility, w is the agent's hourly wage, h_i is the number of hours the agent decides to work, i and j are either 1 or 2, $i \neq j$, and $\Upsilon > 0$ and $\theta > 0$ are constants. The first term represents the utility an agent derives from private consumption. The second term represents agent's concern for relative income. Agents whose Υ is positive enjoy being ahead of others (i.e. having a higher income than others) and suffer from being behind (i.e. having a lower income than others). The last term represents the utility loss from spending time at work, rather than enjoying leisure.

A. Suppose agents take decisions on the number of work hours simultaneously and independently. How many hours does each agent decide to work? Interpret your result (that is, explain briefly why optimal hours of work depend on the exogenous variables in the way they do).

B. Since agents are identical and decide simultaneously, they choose the same number of work hours in equilibrium ($h_i = h_j$). Since their hourly wage is the same, the second term vanishes when calculating the level of utility reached in equilibrium by each worker. Explain why, despite this, relative income concerns have an impact on agents' utility in equilibrium, and also explain in which direction. If you can also show this formally, you get additional points!

C. Suppose now the agents decide jointly on work hours of each of them. For convenience, assume they do so, in such a way that they maximize the sum of their utilities. What level of hours do they choose?

D. In a large society, it would be difficult to decide on all agents' work hours jointly. Discuss a few other ways in which policy makers could try to reduce the welfare loss arising from relative income concerns. These need not necessarily fit perfectly in the context of this model. Original answers get additional points.

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