Labor Prelim Exam, May 2011

Answer only one of the two Blocks.
1. Consider the following static problem of a married couple:

\[
\max_{\lambda_f} \left[ \mu \log(c^1_f) + \nu \log(c^2_f) + (1 - \mu - \nu) \log(l_f) \right] \\
+ \lambda_m \left[ \mu \log(c^1_m) + \nu \log(c^2_m) + (1 - \mu - \nu) \log(l_m) \right]
\]

\[\text{st} \quad c^1_j + c^1_m + qk \leq (1 - \tau_f)w^1_f + (1 - \tau_m)w^1_m, \]
\[c^2_j + c^2_m = A\theta (l^2_f)^{1-\theta}, \]
\[l_f + l^1_f + l^2_f = 1, \]
\[l_m + l^1_m + l^2_m = 1, \]
\[l^2_m \geq 0, \quad l^2_m \geq 0, \quad l^1_f \geq 0, \quad l^1_m \geq 0. \]

where \(c^1_j\) and \(c^1_m\) are the consumption of the market good by the women and the man, \(c^2_j\) and \(c^2_m\) are the consumption levels of home good, \(l^1_f\) and \(l^1_m\) are the hours they work in the market and \(l^2_f\) and \(l^2_m\) are the hours they work in the home.

- Derive under which conditions on the parameters the solution implies \(l^2_m = 0\).
- Given these conditions, show that hours worked by women in both market and home are independent of \(A\) (technological progress in the household).
- How would you answer change if the utility functions were not logarithmic?
- What assumptions in Greenwood, Seshadri and Yorukoglu guarantee that female work hours increase in response to an improvement in home technology?

2. Given a spatial dataset:

- Define spatial dependence and spatial heterogeneity.
- Given the general model:

\[
y = \rho W_1 y + X\beta + u \\
u = \lambda W_2 u + \varepsilon \\
\varepsilon \sim N(0, \sigma^2 I_n)
\]

- Define the matrix \(W_1\) and discuss different ways to construct it.
- What special models are derived by imposing the following restrictions: (a) \(X = 0\) and \(W_2 = 0\), (b) \(W_2 = 0\), (c) \(W_1 = 0\)?
- Consider the case in which \(X = 0\) and \(W_2 = 0\). Show that the OLS estimator is biased and explain why.
3. Given $N$ spatial units indexed by $i$ and an economic variable $X$:

- Define the Moran I and discuss its relationship with $\sigma_x$ (dispersion of $X$).
- What economic phenomena do you expect to display high spatial correlation in the data and why?
- What is the behavior over the last century of the Moran I and of the dispersion of female labor force participation rates across US counties?
- Write down the spatial model estimated in Fogli Veldkamp (2011) and interpret the coefficient on the spatial lag in light of the proposed theory.

4. What are two theories about the evolution of female LFP that you know? Briefly describe their main ingredients and how their implications compare with the empirical evidence.

5. In the model of preference transmission of Bisin and Verdier (QJE), there are two possible types of cultural traits in the population $\{a,b\}$ and the fraction of individuals with trait $i \in \{a,b\}$ is denoted $q^i$. All children are born without defined preferences or cultural traits, and are first exposed to their parent’s trait. Direct "vertical" socialization to the parent’s trait, say $i$, occurs with probability $d^i(q^i)$. If a child from a family with trait $i$ is not directly socialized, which occurs with probability $1 - d^i(q^i)$, he/she picks the trait of a role model chosen randomly in the population (i.e., he/she picks trait $i$ with probability $q^i$ and trait $j \neq i$ with probability $q^j = 1 - q^i$).

- Write the transition probabilities $P_{ii}$ and $P_{ij}$ for all $i, j \in \{a,b\}$ and the equation that describes the evolution of the fraction of the population with trait $i$ in the continuous time limit.
- What are the conditions on the transmission mechanisms which induce heterogeneity in the long run stationary distribution of preferences in the population?
- For which cultural traits do you think these conditions are likely to be satisfied?
- And for which ones do you think these conditions are not likely to be satisfied?
Block B

In the following there are 10 questions for 100 points. Answer all questions. Be as precise as you can and good luck.

Health

Imagine a household with finite life where utility has a term that depends on health (which has discrete support) that multiplies a standard CRRA function of consumption. Health levels also affect labor income and survival probability. The evolution of health is affected by shocks and by investments in terms of effort (the investment is a disutility) and in terms of resources.

1. (15 points) Pose a household problem that implements this environment where the household has access only to savings at interest rate $r$. State necessary conditions for optimality of the decision.

2. (10 points) Write down the Euler equation for consumption.

3. (10 points) If you had data on consumption, health, education, the evolution of health by education level, as well as the survival probabilities by age and education, could you estimate jointly discount rates and the multiplicative terms that depend on health. How would you do it?

Human Capital Accumulation

4. (10 points) Pose a Ben-Porath type model (learning by not doing or watching) with leisure for an agent that lives $I$ periods.

5. (15 points) Write down the first order conditions and briefly describe how would you solve it.

Imagine a couple.

She has two units of endowment while he has one. She is in love with him and if together she gets .1 utils. utils. She is indifferent to him. Both agents have CRRA with $\sigma=2$ and there are no public goods.

6. (5 points) Pose and indicate how to solve a planner problem with equal (Pareto) weights to determine the allocation.

7. (5 points) Pose and indicate how to solve a bargaining problem with equal weights to determine what to do.

8. (5 points) If she were to give a take it or leave it offer, how much would she ask for?
Credit without commitment

A household that lives for two periods, has an endowment of zero in the first period and a random with uniform distribution and support in the interval $[0, 2]$ in the second period. Preferences are expected utility with CRRA with parameter $\sigma = 2$ in each period with no discounting. There is a world interest rate of $r > 0$. The household would like to borrow but it cannot commit to pay back. There is a punishing technology that takes away .1 utils in case of default.

9. (15 points) Compute the (inverse of the) interest rate that competitive lenders would charge the household for each long size.

10. (10 points) What would the household choose, and what is the probability of default?