MACS 30150 - Problem Set 1

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1 Question 1: Classify a model from a journal

1.1 Part a

I picked up "Partner choice, investment in children, and the marital college premium" research paper by Chiappori et al. The authors have developed a decision making model for households in which agents consume two commodities: a private and a public good, here, children's welfare. And the public good, interpreted as children's welfare depends on parental time and human capital.

1.2 Part b

"Chiappori, Pierre-André, Bernard Salanié, and Yoram Weiss. "Partner choice, investment in children, and the marital college premium." American Economic Review 107, no. 8 (2017): 2109-67." is the citation of the article.

1.3 Part c

Assumptions:
1. The populations differ only by their human capital and each couple has one child
2. Time inputs of child's mother and father are complements in the production of the child's human capital
3. Domestic chores require some fixed amount of time τ' , for which male and female time are prefect substitutes
4. Domestic chores involve no human capital, and thus are performed by the parent whose market wage is lower, here, denoted as spouse 2

The mathematical model developed in the paper is as follows:
A child's future well being is given by U_C :

$$U_C = Q^{\alpha} \tag{1}$$

where Q represents child's human capital and α captures the impact of human capital on the child's future wages, income dynamics, etc.

The child's human capital is produced using parental time:

$$Q = (H_1 t_1)^{\beta}(H_2 t_2)^{(1-\beta)} \tag{2}$$

where H_i, t_i, respectively, denote parent i's human capital and time spent with the child

Agent's wage on the labour market is given by:

$$w_i = WH_i \tag{3}$$

The spouse's respective time constraints are:

$$t_1 + l_1 = 1 \; and \; t_2 + l_2 = \tau = 1 - \tau' \tag{4}$$

where l_i denotes i's market work and τ is the total time available for spouse 2

The economic component of an individual's utility is given by:

$$u_i(q_i, U_C) = q_i U_C = q_i Q^{\alpha} \tag{5}$$

The couple's budget constraint is

$$q_1 + q_2 = WH_1(1 - t_1) + WH_2(\tau - t_2) \tag{6}$$

The economic surplus generated by marriage is:

$$S(H_1, H_2) = G(H_1, H_2) - G^1(H_1)G^2(H_2) \tag{7}$$

where $G(H_1, H_2) = max(q_1 + q_2)Q^{\alpha}$ and $G^i(H_i)$ $i = 1, 2$ denotes the utility of person i when she or he is single.

1.4 Part d

Exogenous variables: Individual's human capital H_i is given exogenously and is proxied using her/his education class.
W represents some aggregate shock (see equation 3) and is an exogenous variable.
$\alpha \; and \; \beta$ are parameters which are given from outside the model.
τ' is an exogenous variable which represents the time required to accomplish domestic chores.

Endogenous variables: child's future well being, U_C and child's human capital, Q are endogenous variables.
Agent's wage, w_i is an endogenous variable and is calculated using equation (3).
$t_i \; and \; l_i$ are endogenous variables in agents time-constraint equation.
Agent's private and public consumption, respectively, $q_i \; and \; Q$ are endogenous variables.
$S(H_1, H_2)$ is an endogenous variable representing the economi.

1.5 Part e

It is a non-linear deterministic model where agent's utility function takes a Cobb-Douglas form. It's a static model which is solved for one period of a time.

1.6 Part f

One of the important variable missing in modelling the child's human capital is the role of immediate neighborhood/society. The model could have contained a parameter θ with range between -1 and 1, as a scaling factor of $(H_i t_i)$, the efforts of an individual agent towards the development of her/his child's human capital.

2 Question 2: Make your own model

2.1 Part a

A model of whether someone decides to get married wherein the probability to marry is 0 if individual's age is less than 21 (considered as legal age to marry). Linear Probability Model:

$$marriage\ decision = \begin{cases} don't\ get\ married\ (0),\ if\ marriage < 0.5 \\ get\ married\ (1),\ if\ marriage >= 0.5 \end{cases}$$

$$marriage = \begin{cases} 0, \ \ if\ age < 21 \\ \alpha + \beta_1 * wage + \beta_2 * educ + \beta_3 * sp + \beta_4 * gender + \epsilon, \quad \text{otherwise} \end{cases}$$

where wage represents individual's annual salary

$$education\ level,\ educ = \begin{cases} 0,\ not\ completed\ school \\ 1,\ completed\ school \end{cases}$$

$$societal\ pressure,\ sp = \begin{cases} 0,\ no\ pressure\ from\ society \\ 1,\ pressure\ from\ society \end{cases}$$

$$gender = \begin{cases} 0,\ female \\ 1,\ male \end{cases}$$

ϵ *represents error term.*

2.2 Part b

marriage is an endogenous variable in the linear probability model.

2.3 Part c

Given the exogenous variables, wage, education level, gender and societal pressure, one can find the probability if an individual should get married or not.

2.4 Part d

Annual income and age are the most important factors to decide if an individual should get married or not. Individuals in mid 20s with a well paying job are generally ready to get married. Society in the form of gender discrimination and peer-pressure also plays a major role. Other factors which could influence marriage decision are job satisfaction and education level.

2.5 Part e

Annual income and individual's education play an important role in one's decision to get married or not. With ever-increasing connectivity, one faces pressure from all spheres of society such as peer pressure, pressure from family, etc. To keep the model parsimonious, other factors like satisfaction in job, etc. haven't been taken into account.

2.6 Part f

To determine the significance of factors incorporated in the model, one could do an interview based survey. The participants of the study will answer questions about their salary, education level, gender, etc. After obtaining the values of exogenous variables we could predict the value of marriage variable using our linear probability model and compare the results with the actual marriage status of an individual. We could also run statistical tests to check the significance of the variables using the data collected from the survey.