SIMON FRASER UNIVERSITY
Department of Economics

Econ 305
Intermediate Macroeconomic Theory

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PROBLEM SET 1
(Solutions)

1. FALSE. *By definition, we have the following relationship,*

$$\text{Growth in Nominal GDP} = \text{Growth in Real GDP} + \text{Percentage Change in GDP deflator}$$

If inflation (defined by the percentage change in the GDP deflator) is negative, then real GDP growth will exceed nominal GDP growth. Such deflation is quite possible. For example, Japan has experienced several years of deflation in recent years.

2. FALSE. *By definition, we have the following relationship,*

$$\text{Current Account} = \text{Trade Balance} + \text{Net Factor Payments}$$

Clearly, a country could have both a trade surplus and a current account deficit if Net Factor Payments are sufficiently negative. Example? In the past, Canada has often had both a trade surplus and a current account deficit, since it tends to have negative net factor income.

3. FALSE. *Although this is often the case, it is possible for the unemployment rate to rise following an increase in total employment. By definition, the unemployment rate is defined as follows:*

$$u = \frac{\text{Unemployment}}{\text{Total Labor Force}} = \frac{U}{E+U}$$

But remember, the total (adult/noninstitutionalized) population is divided into three categories

$$N = E + U + NL$$

where NL denotes those people who are not in the labor force (e.g., full-time students). Therefore, it is possible for E to rise, and still see u rise, if U rises by more. This can happen, even with a fixed N, if NL falls enough. That is, if labor force participation rises fast enough. This actually happens quite frequently during the early phases of a business cycle recovery. Employment picks up as firms expand, and in response, previously discouraged workers begin to re-enter the labor force. As a result, you see employment rise and the unemployment rate rise at the same time!

4. *The labor supply curve just traces out the points of tangency between the budget constraint and the (C, ℓ) indifference curve as the wage changes. The tangency condition is*

$$\frac{U_\ell}{U_C} = w$$

Taking the derivatives, we get

$$\frac{1}{\alpha - C} = w$$

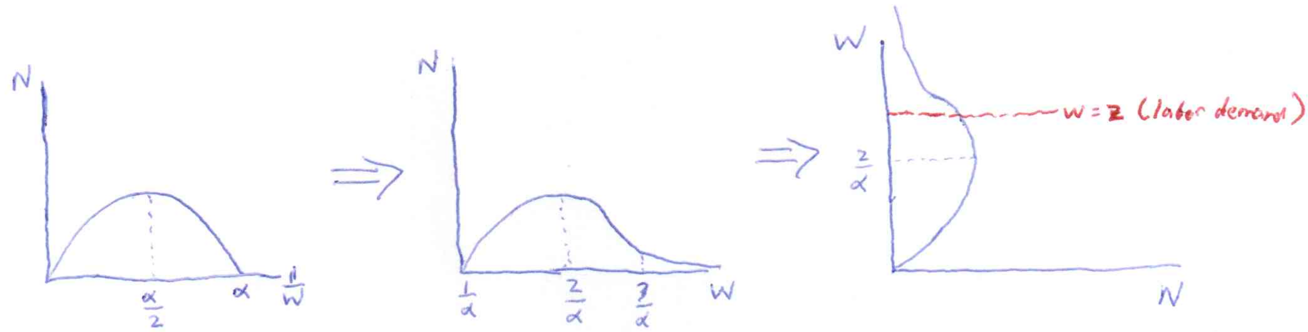
The budget constraint is

$$C + w \cdot \ell = 100 \cdot \ell \qquad \Rightarrow \qquad C = w \cdot N^s$$

where $N^s = 100 - \ell$ is the household's labor supply. Using this to substitute out for C in the optimality condition gives us the following labor supply curve

$$N^s = \frac{1}{w}\left(\alpha - \frac{1}{w}\right)$$

Labor supply increases with α because increases in α shift up the marginal utility of consumption. When the household values consumption more, it decides to work more. More interestingly, notice that total labor supply does not depend on the total time endowment (which is 100 here). Why not? The preferences here are rather special. They are an example of so-called 'quasi-linear' preferences. Notice that the MU of leisure is constant. It does not depend on the current amount of leisure. This household always values leisure by the same amount, no matter how much it already has. As a result, all additional income goes to leisure. Work/consumption stays the same. Sketching this curve is a little tricky. It's probably easiest to first plot N^s agains $\frac{1}{w}$, since this is just quadratic.



(The inflection pt. $w = 3/\alpha$ can be found by setting 2nd deriv. to zero.)

Notice that the income effect dominates for $w > \frac{2}{\alpha}$. Beyond this point, higher wages lead to lower labor supply. To calculate the equilibrium wage, we just need to subsitute $z = w$ into the above labor supply curve, since the marginal product of labor is constant here (because the production function is linear in z). Since $z_{us} = 1/3$, we find that equilibrium hours in the USA is $N^s = 3 \cdot (15 - 3) = 36$, while equilibrium hours in China are $N^s = 5 \cdot (15 - 5) = 50$. Hence, people in China work more, because they are poorer, and so value consumption/work more (at the margin) relative to Americans. However, China's productivity is catching up to American productivity. According to this model, labor supply will be the same in the two countries if productivity is the same. How long will this take? We can calculate it as follows

$$z_0^u(1+g_u)^t = z_0^c(1+g_c)^t \Rightarrow \frac{5}{3} = \left(\frac{1.08}{1.02}\right)^t \Rightarrow t = \frac{\ln(5/3)}{\ln\left(\frac{1.08}{1.02}\right)}$$

$$\simeq \boxed{8.9 \text{ years}}$$