ECON 210C PROBLEM SET # 4

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1. Labor supply problem

(a) individuals with time-separable utility solve the following maximization problem:

$$\mathcal{L} = \sum_{t=0}^{\infty} \beta^t \Big(\log C_t + \log(1 - L_t) \Big) + \lambda \sum_{t=0}^{\infty} \beta^t \left(C_t - w_t L_t \right)$$

Since the future wage schedule is known in advance, the problem is translated into the following form:

(b)

2. Demand shock

(a)

(b)

(c)

(d)

(e)

3. Business cycle and external returns to scale

(a)

(b)

(c)

(d)

(e)

4. Problems from Romer

4.1. **Problem 6.10.**

(a) Using the given three equations, it is easy to get the closed form solution for p, p^*, and y.

$$p = \frac{f\phi m'}{1 - f + f\phi}$$
$$p^* = \frac{\phi m'}{1 - f + f\phi}$$
$$y = \frac{m'(1-f)}{1 - f + f\phi}$$

(b) The following figure summarizes the results

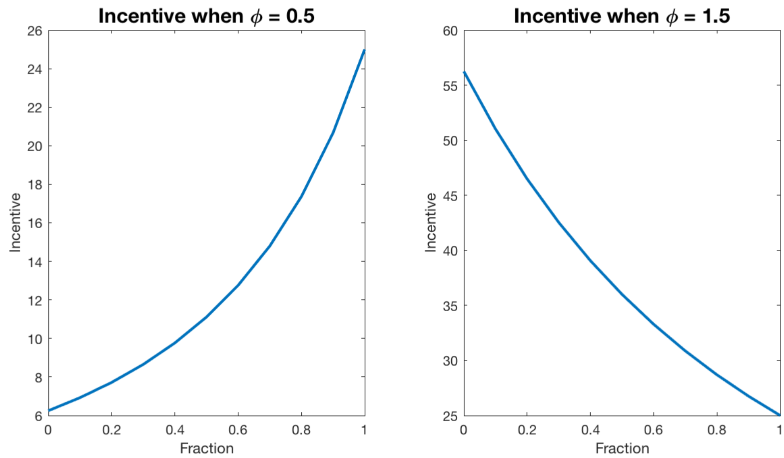

FIGURE 1. A firm's incentive to adjust its price

(c) Whether a firm adjusts its price or not depends on the size of the menu cost, Z. Assume that $\phi < 1$. Now suppose the menu cost is very low, lower than the incentive of a firm when no other firm is adjusting their prices. In this case, all firms adjusting their prices can be a Nash equilibrium.

Suppose, on the other hand, the case when the menu cost is really high, higher than the incentive of a firm when all the other firms are adjusting their prices. In this case, no price adjustment is the only Nash equilibrium.

Now suppose that the size of the menu cost lies somewhere between the above two extremes. Specifically, say that $Z = Kp^*(f)$ for some f. Then, a fraction f of the firms adjusting their prices is the only Nash equilibrium, because for $f' \neq f$ some firms have incentives to deviate from adjusting (not adjusting) prices.

4.2. **Problem 6.11.**

(a) If the firm does not adjust its price and stays at $r^*(y_0)$ level, its profit is $\pi\left(y_1, r^*(y_0)\right)$. On the other hand, if the firm choose to adjust its price to the optimal level for y_1, its profit is $\pi\left(y_1, r^*(y_1)\right)$ The difference between these two is a potential gain from adjusting the price, so can be interpreted as the incentive to adjust its price.

(b) Second-order Taylor approximation of $G = \pi\left(y_1, r^*(y_1)\right) - \pi\left(y_1, r^*(y_0)\right)$ is:

$$
\begin{aligned}
G &= \pi\left(y_1, r^*(y_1)\right) - \pi\left(y_1, r^*(y_0)\right) \\
&\simeq
\end{aligned}
$$

(c)

4.3. **Problem 6.12.**