OPNS 523 Part IV

Bindan Zhang, Simrita Singh

June 2020

1 Study Question

$q_{n0}^{m+1} = 0.71123459424$

2 Reduced form estimation of the Choice Probabilities

We know that

$$log(P(\text{replacement time=X}|s)) = log(P_1(X,s)) + \sum_{x=0}^{X-1} log(1 - P_1(x,s))$$

Using this equation recursively, gives us:

$$log(P_1(X,s)) = log(P(\text{replacement time=X}|s)) - log(1 - \sum_{x=0}^{X-1} P(\text{replacement time=X}|s))$$

We estimate $P(\text{replacement time=X}|s) = \frac{n(X,s)}{n(s)}$

3 Estimating the Value Functions

$$v_j(x,s) = \begin{cases} 0 & \text{if } j = 1 \\ \theta_1 s - \theta_2 x + \beta V(x+1,s) & \text{if } j = 2 \end{cases} \tag{1}$$

Substituting 1 in (2.7), we get that

$$v_2(x,s) = \theta_1 s - \theta_2 x - \beta log(P_1(x+1,s)) + \beta log(P_1(0,s)) \implies \tag{2}$$

$$V(x+1,s) = log(P_1(0,s)) - log(P_1(x+1,s)) \tag{3}$$