Problem set 3

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1 Question 1

The switching costs from low to high are: $A < B < C$.

When p_B changes from 15 to 10 in period 4, case C has less people switch from A to B compared to case B, therefore C has higher switching costs. In case A even when prices don't change there are switchers, while in case B and C there are no switchers when prices do not change. Therefore, case A has the lowest switching costs.

2 Question 2

1 In period 1, the consumer's expected payment of searching is:

$$\begin{aligned}
P_1 &= c + Pr(p_1 + s < p_0)E[p_1 + s | p_1 + s < p_0] + Pr(p_1 + s >= p_0)p_0 \\
&= c - \frac{p_0^2}{20} + \frac{s^2}{20} + p_0
\end{aligned}$$

The consumer would search in period 1 if

$$P_1 < p_0 \quad \Rightarrow \quad c - \frac{p_0^2}{20} + \frac{s^2}{20} < 0$$

Denote $p_j^m = min p_0, p_1, p_2, ..., p_j$. In period 2, the consumer knows about p_1, and the expected payment of searching is:

$$\begin{aligned} P_2 &= c + Pr(p_2 + s < p_1^m)E[p_2 + s|p_2 + s < p_1^m] + Pr(p_2 + s >= p_1^m)p_1^m \\ &= c - \frac{(p_1^m)^2}{20} + \frac{s^2}{20} + p_1^m \end{aligned}$$

The consumer would search in period 2 if

$$P_2 < p_1^m \quad \Rightarrow \quad c - \frac{(p_1^m)^2}{20} + \frac{s^2}{20} < 0$$

Similarly, in period t, the consumer would search if

$$c - \frac{(p_{t-1}^m)^2}{20} + \frac{s^2}{20} < 0$$

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$$\begin{aligned} Pr(no\ switch) &= Pr(no\ search) + Pr(p_0 = p_N^m) \\ &= Pr(p_0^2 < 20c + s^2) + (\frac{10 - p_0 + s}{10})^N \\ &= \frac{\sqrt{20c + s^2}}{10} + (\frac{10 - p_0 + s}{10})^N \\ Pr(switch) &= 1 - Pr(no\ switch) \\ &= 1 - \frac{\sqrt{20c + s^2}}{10} - (\frac{10 - p_0 + s}{10})^N \end{aligned}$$

3 Increasing c by ε reduces the probability of switching more, since the consumer needs to pay the search cost c for every search and only need to pay the switch cost s once if the consumer chose to switch.

4 A \$1 search cost with no switing cost would decrease the probability of switching more, so would have a higher equilibrium price.