Questions

1. L10.s4 (Unobserved Heterogeneity) Why do you call the case where s is unobserved but $p(x, s)$ is known as 'infeasible'? Is it because in this case, estimation is infeasible (this does not seem to be the case since you suggested an estimator), or is it because it is extremely unlikely that we would come across such a case (where s is unobserved but $p(x, s)$ is known)?
2. L12.s30 (Ascending Auctions) I have a question on the expression $Pr(v_i > r_{t_j^b} | v_i > r_{t_{j-1}^b})$. Why do we take the probability conditional on $v_i > r_{t_{j-1}^b}$?
3. L12.s32 How do we get the last equation?
$$F_{V_1,V_2}(a_1, a_2) = F_V(a_1) - Pr(V_2 > a_2)Pr(V_1 < a_1 | V_2 > a_2)$$
4. L14.s19 (Pure Moral Hazard) How did you figure out the functional form for $g(x, \gamma)$?
5. L14.s27 Where does the expression $\sqrt{N} Q_0^{(N)}(\gamma)$ come from?
6. L17.s6 (Human Capital & Nonseparable Preferences) Why do we use the inverse of the marginal utility of wealth (η_n^{-1}) as pareto weight?

0.1 Formula used for conditioning on a rival bid

We want to prove:

$$F_{V_1,V_2}(a_1,a_2) = F_{V_1}(a_1) - \Pr\{V_2 > a_2\}\Pr\{V_1 \le a_1 | V_2 > a_2\}$$

Start out by noting that:

$$\begin{aligned} F_{V_1,V_2}(a_1,a_2) &\equiv \Pr\{V_1 \le a_1, V_2 \le a_2\} \\ &= \Pr\{V_2 \le a_2 | V_1 \le a_1\}\Pr\{V_1 \le a_1\} \\ &= [1 - \Pr\{V_2 > a_2 | V_1 \le a_1\}]\Pr\{V_1 \le a_1\} \\ &= \Pr\{V_1 \le a_1\} - \Pr\{V_2 > a_2 | V_1 \le a_1\}\Pr\{V_1 \le a_1\} \qquad (1) \end{aligned}$$

But:

$$\begin{aligned} \Pr\{V_2 > a_2 | V_1 \le a_1\}\Pr\{V_1 \le a_1\} &= \Pr\{V_2 > a_2, V_1 \le a_1\} \\ &= \Pr\{V_1 \le a_1 | V_2 > a_2\}\Pr\{V_2 > a_2\} \qquad (2) \end{aligned}$$

Substituting (2) into (1) gives:

$$\begin{aligned} F_{V_1,V_2}(a_1,a_2) &= \Pr\{V_1 \le a_1\} - \Pr\{V_2 > a_2 | V_1 \le a_1\}\Pr\{V_1 \le a_1\} \\ &= \Pr\{V_1 \le a_1\} - \Pr\{V_1 \le a_1 | V_2 > a_2\}\Pr\{V_2 > a_2\} \\ &\equiv F_{V_1}(a_1) - \Pr\{V_2 > a_2\}\Pr\{V_1 \le a_1 | V_2 > a_2\} \end{aligned}$$

which is what we set out to show.