ECON 711 Midterm Cheatsheet

Nash Equilibria

1. Apply IDS$_\infty$.

2. Find all "best response cycles".

3. Look for a Nash equilibrium on support of each cycle.

Nash Equilibria in Continuous Games

- With a continuum of actions, if the payoff function is strictly quasi-concave in one's own action, then there are no mixed Nash equilibria.

- A **war of attrition** has a fundamental reason to stop $u(t)$ opposed by a strategic incentive $v(q)$ to outlast other players ($v(q)\uparrow$). e.g. costly war

- A **pre-emption game** has a fundamental reason to delay $u(t)$ opposed by a strategic incentive $v(q)$ to pre-empt other players ($v(q)\downarrow$). e.g. bank run

- A Nash equilibrium is a quantile function Q whose support contains only maximum payoffs, where quantile $q = Q(t)$ stops at time t.

- Let $\lambda = \arg\max u(t)$.

- In pre-emption game, solve $v(1)u(\lambda) = v(Q(t))u(t)$.

- In war of attribution, solve $v(0)u(\lambda) = v(Q(t))u(t)$.

- Initial rush (cdf jumps from 0 to some q):

$$\frac{1}{q}\int_0^q v(x)dx = v(q)$$

- Terminal rush (cdf jumps from some q to 1):

$$\frac{1}{1-q}\int_q^1 v(x)dx = v(q)$$

Supermodular Games

- A **supermodular game** is a game of strategic complements. It has payoffs $u_i(s_i, s_{-i})$ with increasing differences $\forall i$.

- $f(x,\theta)$ has **increasing differences** if for all $x' \geq x$ and $\theta' \geq \theta$:

$$f(x',\theta') - f(x,\theta') \geq f(x',\theta) - f(x,\theta)$$

- If f is continuously differentiable f has ID if $\frac{\partial f}{\partial x} \uparrow \theta$ or $\frac{\partial^2 f}{\partial x \partial \theta} \geq 0$.

- A **submodular game** is a game of strategic substitutes. It has payoffs $u_i(s_i, s_{-i})$ withh decreasing differences $\forall i$.

- $f(x,\theta)$ has **decreasing differences** if $f(x,-\theta)$ has increasing differences.

Bayesian Nash Equilibrium

- In **pooling equilibria**, different types take the same action.

- In **separating equilibria**, different types take the different action.

Correlated Equilibria

- Correlated Equilibria are supportable if obeying the signal is incentive compatible.