Population Games and Normal Form Games

Game Theory

Vincent Knight

Pairwise Contest Games

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$$u(\sigma, \chi) = \sum_{s,s' \in S} \sigma(s)\chi(s')u(s, s')$$

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Prob of σ playing s

Prob of meeting s'

$$\begin{pmatrix} u(s,s), u(s,s) & u(s,s'), u(s,s') \\ u(s',s), u(s',s) & u(s',s'), u(s',s') \end{pmatrix}$$

Theorem.
If σ^* is an ESS in a pairwise contest population game then for all $\sigma \neq \sigma^*$:

1. $u(\sigma^*, \sigma^*) > u(\sigma, \sigma^*)$ OR
2. $u(\sigma^*, \sigma^*) = u(\sigma, \sigma^*)$ and $u(\sigma^*, \sigma) > u(\sigma, \sigma)$

Conversely, if either (1) or (2) holds for all $\sigma \neq \sigma^*$ in a two player normal form game then σ is an ESS.