One-stage deviation principle

- Suppose we have a strategy that involves a sequence of moves "play a1 at stage 1, a2 at stage 2,...,aT at stage T" and we want to verify whether it is a NE or not

One-stage deviation principle: We only need to verify deviation at each stage individually

Example:

- Suppose we have a joint strategy that involves both players choosing actions a1,a2,carrot on three consecutive stages
- If sequence a1',a2',stick improves (by unilateral deviation) one player's payoff, then either a1',a2,stick improves the payoff or a1,a2',stick improves the payoff

Intuition: since stages are independent, either a1' must improve the payoff of stage 1 or a2' must improve the payoff of stage 2

If
$$u(a_1', a_1) + \delta u(a_2', a_2) + \delta^2 u(\text{carrot})$$
$$> u(a_1, a_1) + \delta u(a_2, a_2) + \delta u(\text{stick})$$

$>?$ $>?$ $>$ (known)

We can't have both

$$u(a_1', a_1) < u(a_1, a_1)$$

and

$$u(a_2', a_2) < u(a_2, a_2)$$

otherwise

$$u(a_1', a_1) + \delta u(a_2', a_2) < u(a_1, a_1) + \delta u(a_2, a_2)$$