北京大学 PEKING UNIVERSITY

# 北京大学实验报告

课程名称：Game Theory 实验日期：____年____月____日

班　　级：HW4. 学生姓名：[redacted] 2200017812.

## Problem 1: Tit for tat.

| | |
|---|---|
| 2,2 | -1,3 |
| 3,-1 | 0,0 |

Consider 4 paths:

(1) C | C C C ...
C | C C C ...
payoff: $\frac{2+2\delta}{1-\delta^2}$.

C | D C D C ...
C | C D C D ...
payoff: $\frac{3-\delta}{1-\delta^2}$

$\Rightarrow \delta \geq \frac{1}{3}$

(2). C | D C D C ...
D | C D C D ...
payoff: $\frac{3-\delta}{1-\delta^2}$

C | C C ...
D | C C ...
payoff: $\frac{2+2\delta}{1-\delta^2}$

$\Rightarrow \delta \leq \frac{1}{3}$.

(3) D | C D ...
C | D C ...
payoff: $\frac{3\delta-1}{1-\delta^2}$

$\Rightarrow \delta \geq \frac{1}{3}$

D | D D ...
C | D D ...
payoff: 0.

(4). D | D D ...
D | D D ...
payoff: 0.

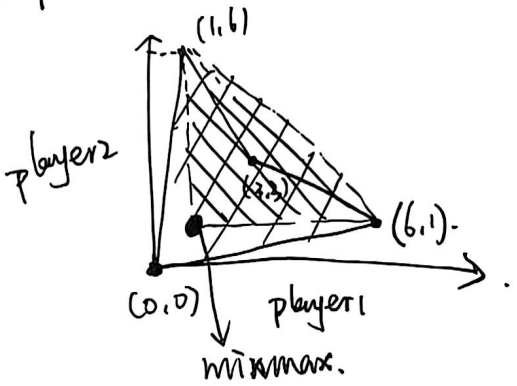
D | C D ...
D | D C ...
payoff: $\frac{3\delta-1}{1-\delta^2}$ $\Rightarrow \delta \leq \frac{1}{3}$

∴ 只有 $\delta = \frac{1}{3}$ 是 SPNE.

Problem 2.

| | H | D |
|---|---|---|
| H | 0,0 | 6,1 |
| D | 1,6 | 3,3 |

a. Feasible payoff. is the shade. (without (0,0)).




No.

b. ~~(0,1)~~ feasible payoffs.

can be an equilibrium,

~~this form~~.

but NE (6,1) & (1,6) can.

c. (1) D | D - - - / D | D - - - payoff: $\frac{3}{1-\delta}$.

D | H H - - - / D | D H - - payoff: 6.

$\Rightarrow$ not SPNE.

(2). any Hawk | H ... / H ... payoff: 0.

D ~~D~~ H ... / any Hawk | H H ... payoff: 1

d. minmax payoff = 1.

e. The area with double shade. can be an equilibrium payoff.

f. Consider: if someone use Hawk, enter T periods of punishment where the "bad" man uses Dove and "Good" man uses Hawk.

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If the bad man do not use Dove, refresh the punishment

So the payoff sequence is:

| | cooperation | | punishment | |
|---|---|---|---|---|
| A | D ··· D | H | D ·— — — D | D ·— — |
| B | D ··· D | D | H — — — H | D ·— — — |

1). payoff during punishment is $6+1+\delta+\delta^2+\cdots+\delta^{T-1}$

while cooperation payoff is $1+3(1+\delta+\cdots+\delta^{T-1})$.

2). A want to break punishment:

| | | | |
|---|---|---|---|
| D ··· D | H | D ·— — — D | |
| H ··· H | H | H — — — H | |
| old p. of time s. | 1 | new p. of time T. | |

not breaking: $1+\delta+\delta^2+\cdots+\delta^{T-1}+3(\delta^T+\cdots+\delta^{T+s-1})$.

breaking $1+\delta+\cdots+\delta^{s-1}+0+\delta^{s+1}+\cdots+\delta^{T+s-1}$.

3). For the punisher

change his action will decrease his payoff at that round and receive a punishment. So he'll never change.

$\Rightarrow$ Totally. we need:

$$6+1+\delta+\cdots+\delta^{T-1} \leq \text{(5)} \; 1+3(1+\delta+\cdots+\delta^{T-1})$$

$$\geq \frac{1-\delta^T}{1-\delta} \geq 5.$$

$$1-\delta^T \geq \frac{5}{2} - \frac{5}{2}\delta.$$

$$\boxed{\frac{5}{2}\delta - \delta^T \geq \frac{3}{2}.}$$