

Infinitely Repeated Games

Dr. Vimal Kumar, Assistant Professor of
Economics

Indian Institute of Technology Kanpur,
vimalk@gmail.com

Infinitely Repeated Games

- Two kinds of models
 - Games that repeated for ever
 - Games that may end after each repetition with some positive probability.
- Why do we need the concept of infinitely repeated games?
- How should we write the payoffs?: Adding up doesn't make sense, as it would lead to comparing infinities.
- Technique: Add up the discounted sums.
- Cooperation can often be sustained as Nash equilibria in infinitely repeated games.

Infinitely Repeated Prisoners' Dilemma

P1\P2	Cooperate	Defect
Cooperate	2,2	0,3
Defect	3,0	1,1

- One equilibrium in this infinitely repeated game is that both players always play Defect.
- Are there any other equilibriums?
- The key element is that a player can adopt contingent strategies. If you “misbehave” on this round of the game, then I will respond on the next round.
- This option remains available if there is some chance there will be a next round.

- If someone doesn't cooperate or "misbehaves" in one round of the game, this player can be punished in next rounds.

- If the threat of punishment is sufficient to change the players strategies then we have found a new equilibrium termed a trigger strategy equilibrium.

- In a trigger strategy equilibrium:
 - Cooperate as long as the rivals do
 - Upon observing a defection:
 - immediately revert to a period of punishment of specified length in which everyone plays non-cooperatively

Trigger Strategy

Two Extreme Trigger Strategies

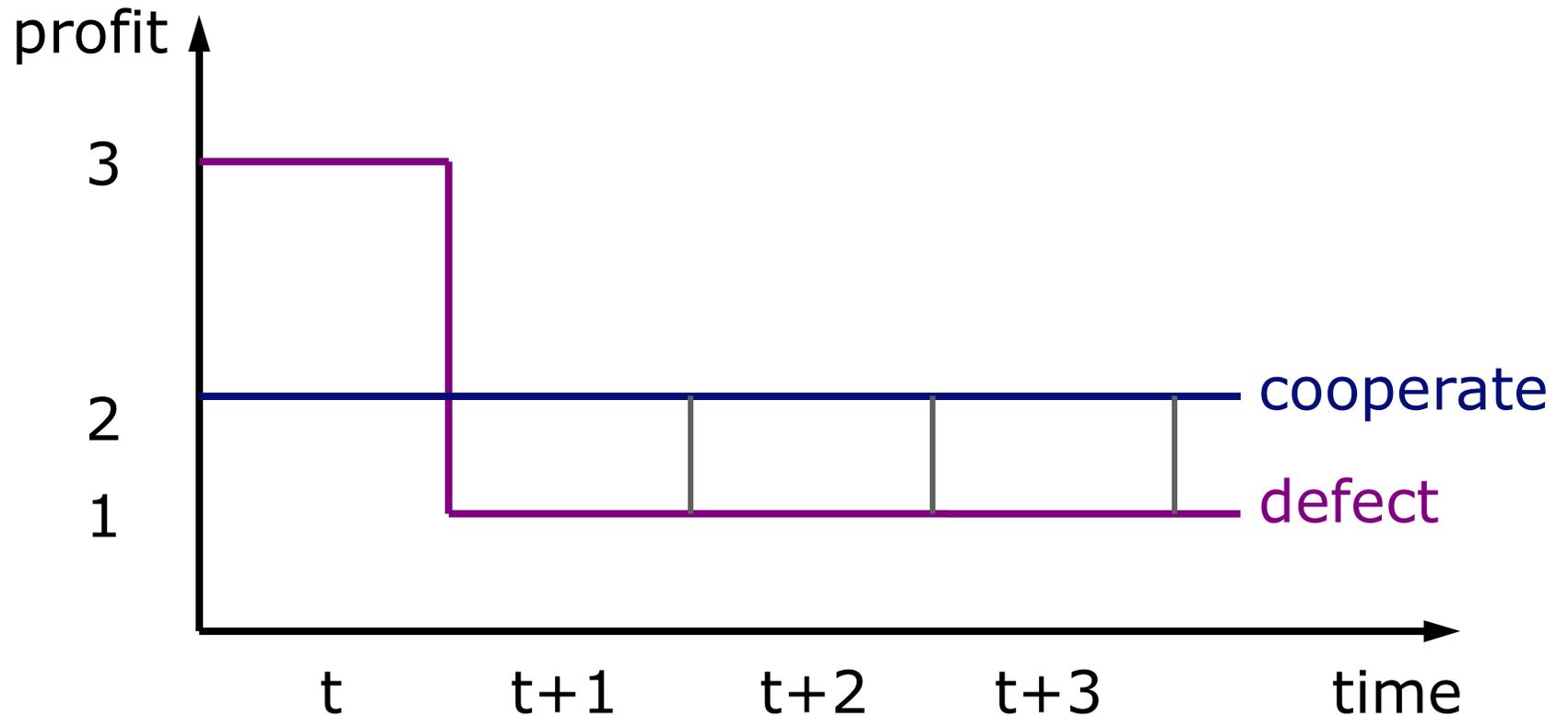
- Tit for Tat

- Whatever a player does in this round of the game, the other player will do the same in the next round.
- The simplest form of trigger strategy.
- Most forgiving/Shortest Memory.
- Proportional, credible but lack deterrence. [?]

- Grim Trigger Strategy:

- punish the player forever for his “misbehavior”
- Least Forgiving/ Longest Memory
- Adequate deterrence but lack credibility [?]

Payoff Stream (Grimm Trigger Strategies)



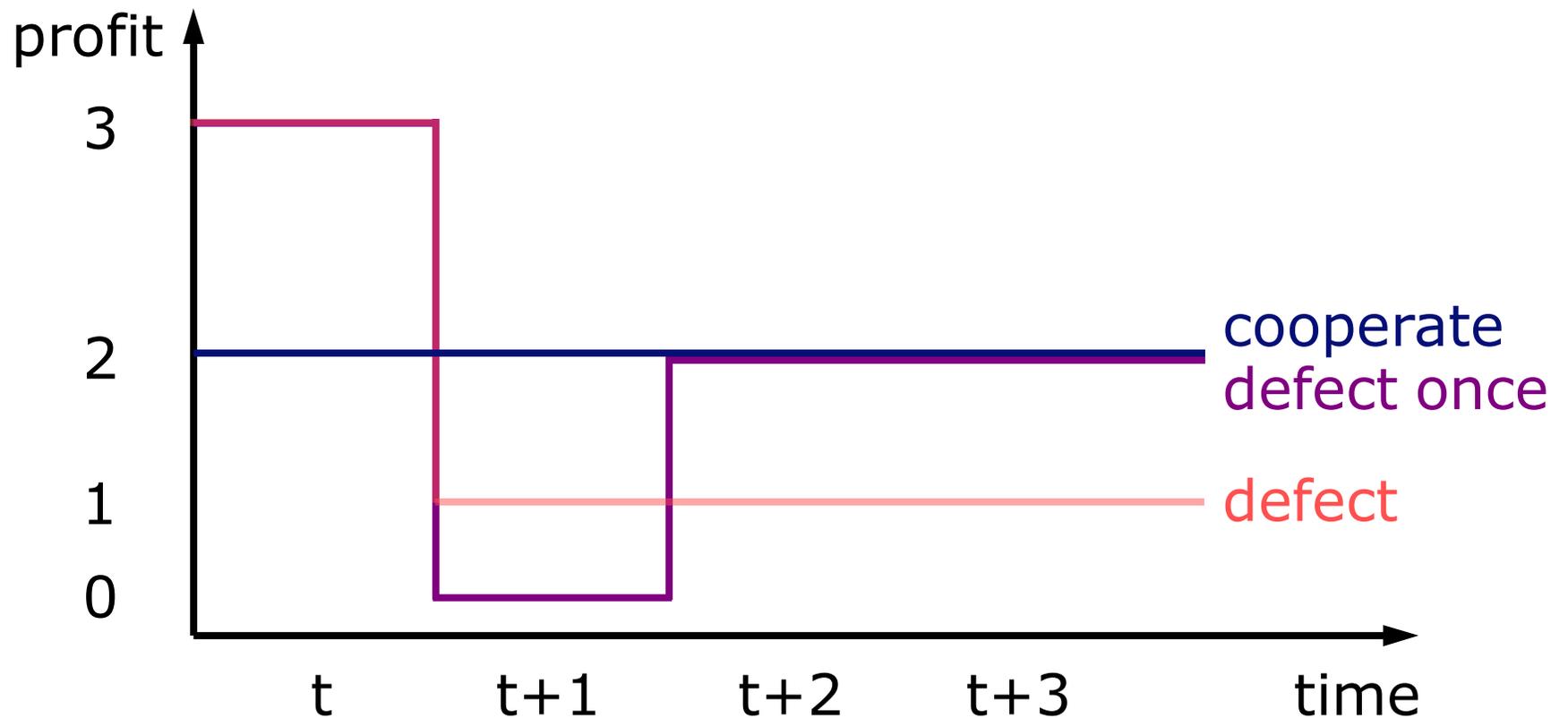
Discount Factor and Summation

Calculus of Grimm Trigger Strategy

Sustainability

- The minimum discount rate required to sustain the collusive outcome depends on the payoff structure
- Greater relative profits from cheating: Need larger discount rate
- Smaller relative profits after cheating: Need smaller discount rate

Payoff Stream (TFT)



Calculus of TFT

Trigger Strategies

- Grim Trigger and Tit-for-Tat are extremes

- Balance two goals:

Deterrence

- GTS is adequate punishment
- Tit-for-tat might be too little

Credibility

- GTS hurts the punisher too much
- Tit-for-tat is credible