Economics in the Real World for Pre-University Students

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Session #2: Intertemporal Cooperation and Coordination

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Repeated Interaction as an alternative to the State

- **Repeated Interaction. No State present, like in International context.**

- **Main aim: Explore when and if players (*countries*) can cooperate for mutually benefit *across time* - *intertemporal cooperation.***

- **Central Idea: *"Carrots and Sticks"* - Attempt to cooperate (the "carrot") with deviations (cheating) by others from that met with punishment (the "stick").**

- **Dealing with the problem of *short-run temptation to cheat.***

- **Key Trade-off: Benefit from cheating *today* versus costs from doing so, which come from the loss of the benefits from *future* cooperation.**

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Repeated PD Game

- **Key Feature**: Each time they play the PD game, they **know the history of past plays** (except the first time they play as there is no history).

- Objective for each player – UK and EU: To maximise the present discounted value of their payoffs.

- Let each player **discount future payoffs** at some rate, which we denote by **δ,** which is a number between 0 and 1. **So £1 secured tomorrow is worth £δ today – which is less than 1.**

- The more a player cares about ***future*** payoffs the ***higher*** is the value of **δ**.

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Repeated PD – Sustaining Cooperation
The Grim-Trigger Strategy

- India adopts the ***"grim-trigger"*** strategy:

First time they play the PD game, UK chooses ***C*** (to cooperate).

Thereafter, UK plays as follows: Play ***C*** ***if*** both players (UK and USA) played ***C*** throughout the past. Otherwise, play ***D***.

- USA also adopts the same grim-trigger strategy.

- **Note therefore that the outcome each time they play will be that both of them will cooperate, choose *C*, and thus each obtains a payoff of 5 each time they play.**

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Repeated PD – Sustaining Cooperation

Costs and Benefits of Cheating.

- Benefit from cheating "today" – the temptation: Getting an 8 rather than a 5. ***Hence the "short-run" benefit from cheating is: 8 - 5 = 3.***

- Cost from cheating "today" are the losses from "tomorrow" onwards of benefits from cooperation. ***Hence the "long-run" cost from cheating is: loss of 5 - 1 = 4 each period from tomorrow onwards.***

- The ***present discounted value*** of these losses are***:***

$$4\delta + 4\delta^2 + 4\delta^3 + 4\delta^4 + 4\delta^5 + \ldots\ldots = \frac{4\delta}{1-\delta}$$

- **Notice that when δ = 0, these losses are also zero. Indeed, when δ is small, these losses will be small and close to zero - and so well below 3, which is the temptation from cheating**.

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Repeated PD – Sustaining Cooperation

Incentive-Compatibility Condition for Not Cheating*:*

The Future needs to matter sufficiently

- Each player will ***not*** cheat provided the benefit from cheating is ***less than or equal to*** the cost from cheating. That is the following holds:

$$3 \leq \frac{4\delta}{1-\delta}$$

- This will not hold if the discount factor is sufficiently small. **This means that when a player does not care much about future payoffs then s/he will cheat and thus cooperation will not be sustained.**

- But if the discount factor is sufficiently large, them the above inequality will hold. **This means that when both players care sufficiently about their respective future payoffs, then neither of them has as an incentive to cheat and thus cooperation is sustained.**

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Coordination Problems with Conflict of Interest

The Battle of Sexes game

C **= Colosseum**

B **= Ballet**

Romeo:

Juliet:

	C	*B*
C	2, 3	0, 0
B	0, 0	3, 2

Nash Demand Game: coordination with conflict

- **Two Players: A and B.**
- **Strategies: Each player chooses – or *demands* - how much of the £100 she wants – so states a number between £0 and £100.**
- **Choices are made "simultaneously" - no communication**
- **Payoffs: If the sum of the two demands exceeds £100, each player gets nothing. But if the sum of the demands is less than or equal to £100, then each gets what they respectively demanded.**
- **What demand will you choose?**