

## Problem 1

**Answer:** Games with finite repetitions

This was explained in the lectures when the Street Lights example was discussed. The basic idea is that, in the last repetition, no threat is credible. As a result, players have an incentive not to cooperate. Then, by using backward induction, it's possible to conclude that players will never cooperate. This is the so-called endgame effect.

## Problem 2

**Answer:**

- ▷ Soft commitment

## Problem 3

**Answer:** Boeing launches the 747X, Airbus does not launch the A380

Boeing plays aggressive commitment. This means Boeing commits to producing the 747X airplane. At this point, Airbus has two options:

- ▷ Airbus will produce the A380 airplane:
  - Payoff for Boeing: -3;
  - Payoff for Airbus: -4.
- ▷ Airbus will NOT produce the A380 airplane:
  - Payoff for Boeing: 7;
  - Payoff for Airbus: 3.

In this case, using backward induction is trivial. After all, Boeing already committed to a particular strategy. Consequently, there is only one subgame that needs to be analyzed. Specifically, we only need to identify the best strategy for Airbus. In order to maximize its payoff, Airbus should not produce the A380. Therefore, the outcome of this game will be as follows:

- ▷ Boeing launches the 747X, and
- ▷ Airbus does not launch the A380.

## Problem 4

**Answer:** No change

We begin by analyzing a single repetition of this game. Consider the best reply by City Cuts for each strategy of Toby's Hairstyle:

- ▷ Toby's Hairstyle charges a high price: City Cuts charges a low price;
- ▷ Toby's Hairstyle charges a low price: City Cuts charges a high price.

Next, consider the best reply by Toby's Hairstyle for each strategy of City Cuts:

- ▷ City Cuts charges a high price: Toby's Hairstyle charges a high price;
- ▷ City Cuts charges a low price: Toby's Hairstyle charges a high price.

Therefore, for Toby's Hairstyle, charging a high price is always the best strategy. Moreover, for this company, it makes no difference if there's cooperation or not. In both cases, if this player selects its best strategy, then its payoff will be the same. This value corresponds to its maximum payoff. So Toby's Hairstyle is free to choose its best option every time, since there will be no repercussion. In other words, this player has no reason to deviate from what's best for itself. As a consequence, its opponent has no reason to respond differently. Hence the outcome of this game will not change.

## Problem 5

**Answer:** Between 0.25 and 1

This game is very similar to the Diamond Cartel game. However, in the present case, the payoff from cooperating is

$$P_c = \frac{120}{2} \frac{1}{1-p} = \frac{60}{1-p}, \quad (1)$$

where  $p$  denotes the probability that there will be a next season. Moreover, the payoff from deviating is  $P_d = 80$ . The airlines will cooperate when the payoff from cooperating is greater than the payoff from deviating:  $P_c > P_d$ . Hence:

$$\begin{aligned} P_c &> P_d \\ \frac{60}{1-p} &> 80 \\ \frac{3}{1-p} &> 4 \\ \frac{1-p}{3} &< \frac{1}{4} \\ 1-p &< \frac{3}{4} \\ p-1 &> -\frac{3}{4} \\ p &> 1 - \frac{3}{4} \\ p &> \frac{1}{4} \end{aligned} \quad (2)$$

Since  $p$  represents a probability, the inequality  $p \leq 1$  must also hold. Therefore, the correct answer is “Between 0.25 and 1”.

## Problem 6

**Answer:**

▷ High importance of future payoffs

## Problem 7

**Answer:**  $M = 120$  or greater

In this case, the probability that there will be a new game is  $p = 0.5$ . Hence:

$$\frac{1}{1-p} = \frac{1}{1-\frac{1}{2}} = 2. \quad (3)$$

This result allows us to write the payoff from cooperating as follows:

$$\frac{M}{2} \frac{1}{1-p} = \frac{M}{2} \cdot 2 = M. \quad (4)$$

The companies will cooperate when this payoff is larger than the payoff from deviating, which is 120. Therefore, the following inequality must be satisfied:  $M > 120$ .

## Problem 8

**Answer:** Situation with low interest rates

By analyzing the expression for the payoff from cooperating given in one of the lectures, we conclude that this payoff tends to infinity as the interest rate approaches zero. Equivalently, we can say that, when the interest rate is small, the payoff from cooperating is large. As a result, in this case players are more likely to cooperate.

## Problem 9

**Answer:**

- ▷ It lowers competition
- ▷ It makes future customers buy earlier

## Problem 10

**Answer:** No cooperation in first period - No cooperation in second period

By inspecting this game's payoff table, one can conclude that this is a prisoner's dilemma. In this case, High Price corresponds to cooperation, and Low Price corresponds to defection. So we're talking about a prisoner's dilemma with a finite number of repetitions. We know that, in a situation like this, the endgame effect will be observed. This means players will never cooperate. Therefore, both burger stalls will choose to charge a low price every time.