# Normal form games

## Prisoner's dilemma

Consider the following (hopefully fictional) scenario. You and your partner in crime have been arrested for armed robbery. To avoid a lengthy trial, the police put you and your partner in crime in separate cells, *unable to communicate with each other*. The police offer each of you the following deal:

- If neither of you admit your guilt, you will be charged with carrying illegal weapons, and receive 1 year each in prison.
- If one of you admits both are guilty, while the other does not, the prisoner that admitted will get off free in exchange for the confession, while the other prisoner will receive 4 years in prison.
- If both of you admit you are guilty, you will each receive 2 years in prison — the length is reduced from 4 years in exchange for your confession.

Assuming that you care little for your partner (you are an armed robber, after all), what choice will you make? Will you cooperate with your partner in crime and deny your guilt, or will you betray your partner and admit your guilt? Remember, you have no idea which choice your partner will make, and you cannot communicate.

A: Admit
B: Deny

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Normal Form game

Nash equilibrium

Players
→ moves
→ utility / payoffs $u_i(a_j)$

Nash equilibrium

| A \ B | admit | deny |
|---|---|---|
| admit | -2, -2 | 0, -4 |
| deny | -4, 0 | -1, -1 |

① dominant strategy ] agents
② Nash equilibrium → best response ] games
(admit, admit)

## The Advertising Game

Firm 2 (best response)

| Firm 1 \ Firm 2 | Not | Adv |
|---|---|---|
| Not | 16, 12 | 7, 13 |
| ~~Adv~~ | ~~13, 7~~ | 6, 6 |

equil

~~Adv~~ dominated strategy

If Firm 2:

A: Advertise
B: Not Advertise

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## Split or Steal?

| Player 1 \ Player 2 | Split | Steal |
|---|---|---|
| Split | 0.5, 0.5 | 0, 1 |
| Steal | 1, 0 | 0, 0 |

Three equilibria

A: Split, Split
B: Split, Steal
C: Steal, Split
D: Steal, Steal

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golden balls. the weirdest split or steal ever!