

AAE101: Intro to Ag. & Applied Econ.

Discussion Section 9

Professor: Kevin Roth

TA: Erick F Molina

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Dept. of Agricultural & Applied Economics
Taylor Hall 520, 427 Lorch St, Madison, WI 53706

✉ molinaperez@wisc.edu

Today's goal

Introduce game theory and learn about payoffs, strategies, and Nash equilibria.

Game Theory

Game theory is the study of **strategic interactions** where the outcome for each participant (*player*) depends not only on their own actions but also on the actions of others.

Key Elements of a Game

- **Players:** The decision-makers.
- **Strategies:** The available actions each player can take.
- **Payoffs:** The outcomes or returns resulting from the combination of strategies.
- **Rules:** Structure of the game, including timing and information.

Types of Games

Game Type	Description
Simultaneous	Players choose strategies at the same time.
Sequential	Players move one after another.
Zero-Sum	One player's gain is another's loss.
Cooperative / Non-Cooperative	Depends on whether binding agreements are allowed.

The Prisoner's Dilemma

	B: Silent	B: Confess
A: Silent	A: -1 yr, B: -1 yr	A: -10 yrs, B: 0
A: Confess	A: 0, B: -10 yrs	A: -5 yrs, B: -5 yrs

Both players have an incentive to confess.

- **Dominant Strategy:** Best strategy regardless of what the other player does.
- **Nash Equilibrium:** No player can improve their outcome by changing strategy unilaterally.
- **Payoff Matrix:** Table that shows payoffs for each combination of strategies.
- **Best Response:** Strategy that yields the highest payoff given the other player's action.

Practice Exercises

1. Solve the following game. Is there a dominant strategy? Is there a Nash equilibrium?
If yes, which one?

Figure 1: Game 1

		Player 2					
		L		C		R	
Player 1	T	2	1	0	2	0	3
	M	1	1	1	1	1	0
	B	0	1	2	0	2	2

2. Solve the following game. Is there a dominant strategy? Is there a Nash equilibrium?
If yes, which one?

Figure 2: Game 2

		Player 2			
		L		R	
Player 1	T	1	2	0	0
	B	0	0	2	1