Cournot Model in a Normal-Form Game

EE311
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Assumptions

- 2 firms in the market
- (Inverse) demand function is

  $P = 100 - Q$, where $Q = Q_1 + Q_2$
- Constant marginal cost

  $MC_1 = MC_2 = 10$

Profit functions

- Profit functions are

$\Pi_1 = (100 - Q_1 - Q_2)Q_1 - 10Q_1$

$\Pi_2 = (100 - Q_1 - Q_2)Q_2 - 10Q_2$

- Now, suppose $Q_1 = Q_2 = 10$, the profit values are

$\Pi_1 = (100 - 10 - 10)(10) - 10(10) = 700$

$\Pi_2 = (100 - 10 - 10)(10) - 10(10) = 700$

- Actually, there are so many other alternatives!

Some other choices

- Previously, we know that the optimal level of production for each firm in Cournot Model is

  $Q^C_1 = Q^C_2 = 30$ and

  $\Pi^C_1 = \Pi^C_2 = 900$

- We also know that if both firms collude, the result is

  $Q^M_1 = Q^M_2 = 22.5$ and

  $\Pi^M_1 = \Pi^M_2 = (100 - 45)(22.5) - 10(22.5) = 1{,}012.5$

Cross choices

- Suppose firm 1 deviates from the collusion and produces at $Q^C_1 = 30$,

  $\Pi_1 = (100 - 30 - 22.5)(30) - 10(30) = 1{,}125$

  $\Pi_2 = (100 - 30 - 22.5)(22.5) - 10(22.5) = 843.75$

- Suppose firm 1 deviates from the collusion and produces at $Q_1 = 10$,

  $\Pi_1 = (100 - 10 - 22.5)(10) - 10(10) = 575$

  $\Pi_2 = (100 - 10 - 22.5)(22.5) - 10(22.5) = 1{,}293.75$

  …

Normal-Form Game

		Firm 2		
		10	22.5	30
	10	700, 700	575, 1293.75	500, 1500
Firm 1	22.5	1293.75, 575	1012.5, 1012.5	843.75, 1125
	30	1500, 500	1125, 843.75	900, 900

Try figuring out Nash equilibrium of this game yourselves!