ECO316
U of Toronto
Winter 2012
Ettore Damiano

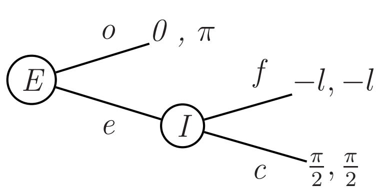
Midterm: February 13, 2012

You have 1 hour to complete this test. There are three questions for a total of 60 points. **You must explain every answer**.

Question 1. [25 points]
A firm is considering whether to enter a new market which is currently served by a monopolist firm. If the potential entrant (E) chooses not to enter the market it makes no profit while the incumbent firm (I) continues to enjoy strictly positive monopoly profits. If otherwise E decides to enter the market, I can choose one of two responses: it can cooperate, in which case the two firm share the monopoly profits; or it can start a price war that drives the profits of both firms below zero. Both firms want to maximize their profits.

a) Model the strategic situation described above with a game tree.

In the game tree below: o corresponds to the potential entrant staying out; e is the action of entering the market; f corresponds to starting a price war; and c stands for cooperating. The strictly positive monopolist profit is denoted by π and the loss from a price war by $-l$.



b) Find the Backward Induction equilibrium of the game.

At the decision node where I chooses it strictly prefers cooperating, which gives a positive payoff of $\pi/2$ to starting a price war which gives a negative payoff of $-l$. Thus in a backward induction equilibrium I's strategy must be c. Anticipating that I will cooperate after observing entry, E strictly prefer entering the market, which gives a positive payoff $\pi/2$ to staying out which gives a payoff of 0. Thus the Backward induction equilibrium is the strategy profile (e, c).

c) Is the equilibrium you found in part b) a Nash equilibrium?

Yes. For E, entering the market, e, is a best response to the c. Simultaneously, cooperating is a best response for I to the strategy e of the potential entrant.

d) Are there Nash equilibria different from the Backward induction equilibrium of part b)?

Yes. The strategy profile where E stays out and I starts a price war is a Nash equilibrium. When the entrant stays out of the market, the payoff of the incumbent is π regardless of *the strategy it chooses. Thus f is a best response to o for the incumbent. Given that the incumbent chooses f, the payoff to the entrant from e is $-l$ which is strictly lower than the payoff from staying out. Thus, o is a best response to f for the potential entrant.*

e) Is any strategy in the game strictly dominated? weakly dominated?

For the entrant no strategy is dominated. Staying out does strictly better when the incumbent chooses f, entering does strictly better when the incumbent chooses c. The strategy f for the incumbent is weakly dominated by c. Both f and c yield the same payoff π when the entrant chooses o and c yields a strictly larger payoff when the entrant chooses e.

Question 2. [20 points]
Either give an example of a strategic game with all of the following properties, or argue that no such game exists.

- The game has two Nash equilibria.
- All players strictly prefer the same Nash equilibrium outcome.
- In the preferred Nash equilibrium, the action of one of the players is weakly dominated.

Consider the following two player game where the row player choosing between T and B and the column player choosing between l and r.

	l	r
T	$0, 0$	$x, -y$
B	$-y, x$	x, x

When both x and y are strictly positive numbers, the game satisfies all listed requirements. The game has two Nash equilibria: the strategy profile (T, l) and the strategy profile (B, r). This is because T is a best response to l and B is a best response to r for the row player, while l is a best response to T and r is a best response to B for the column player. Both player receive a larger payoff (x) in the Nash equilibrium (B, r) than they receive in the Nash equilibrium (T, r). Finally, the action B (r), which is played by the row (column) player in the preferred Nash equilibrium, is weakly dominated by the action T (l) for the column (row) player. The action T gives to the column player the same payoff (x) as B when the row player chooses l and does strictly better ($0 > -y$) when the column player chooses r.

Question 3. [15 points] John and Nelly are meeting at 8pm for dinner. They could not decide where to go so they made reservations at two separate restaurants, Tistura and Merroni. They agreed they would call each other to make a final decision before dinner, but a failure in the cell phone network prevents them to get in touch with each other. Each of them now has to decide independently whether to go to Tistura or Merroni. John prefers Tistura over Merroni and the opposite is true for Nelly. They both prefer going for dinner together, regardless of the location, to eating on their own.

a) [5 points] Model this situation as a strategic form game.

In the strategic game below John is the row player and Nelly is the column player, T stands for going to Tistura and M for going to Merroni.

	T	M
T	x, w	y, y
M	z, z	w, x

The game satisfy the assumptions in the text whenever $x > w > y > z$. This is because the most preferred outcome for John is (T, T) when he eats at his preferred restaurant together with Nelly, the second best is (M, M) when he eats together with Nelly at Merroni, the third best is (T, M) where he eats at Tistura on his own, and the worst outcome is (M, T) where he eats at his least favourite restaurant by himself. Nelly's preferences can be described similarly.

b) [5 points] Find the Nash equilibria of the game in part a).

The game has two Nash equilibria. The strategy profiles (T, T) and (M, M) where both players chooses the same restaurant are Nash equilibrium. For both John and Nelly it is a best response to choose the same restaurant the other player chose.

c) [5 points] Find the outcomes that survive iterated deletion of dominated strategies in the game in part a).

No strategy is dominated in the game, thus no strategy is eliminated and all outcomes survive iterated deletion of dominated strategy.