1. Chicken Game Continued

Last class we talked about Threats and Promises. Now what happens if we combine both of those at once. Consider the following game:

		Colin		
		C1		C2
Rose	R1	(2, 4)	⇦	(3, 3)
		⇧		⇩
	R2	(1, 2)	⇦	(4, 1)

As we can see based solely on the movement diagram, (2,4) is a Nash Equilibrium, where neither player can unilaterally leave and benefit themself. Furthermore since both of the horizonal arrows point left, C1 is a dominate strategy for Colin. Now lets see what happens with this game and order.

- Case 1, Rose goes first. Rose doesn't have a dominate strategy so Rose has 2 different options.
  - Rose chooses R1, Colin responds C1, game ends at (2,4).
  - Rose chooses R2, Colin responds C1, game ends at (1,2), which is worse for Rose.
- Case 2, Rose Threat. Rose wants Colin to play C2 not C1, to achieve this Rose simply tells Colin that if he plays C1 she will play R2. This choice is depending on Colin playing C1, hurts Rose (1,2) vs (2,4), and hurts Colin (1,2) vs (2,4), therefore this is a threat. This Threat eliminates the R1, C1 cell of (2,4). Now the question is does this threat do anything?

  - Colin chooses C1, Rose responds R2, game ends at (1,2).
  - Colin chooses C2, Rose responds R2, game ends at (4,1), which is worse for Colin.

  Therefore even with the Threat, Colin will still pick C1 so not only does the Threat not stop Colin from picking C1, they payout for Rose and Colin both decreased from the Nash Equilibrium.

- Case 3, Rose Promise. Rose still wants Colin to play C2, to achieve this Rose simply tells Colin that if he plays C2, she will not play R2 but will play R1. This Promise eliminates the R2, C2 cell of (4,1). Now the question is does this promise do anything?
  - Colin chooses C1, Rose responds R1, game ends at (2,4).
  - Colin chooses C2, Rose responds R1, game ends at (3,3), which is worse for Colin.

  Therefore even with the Promise, Colin will still pick C1 so the Promise does nothing.

- Case 4, Rose Promise and Threat. We have seen how a Threat removes (2,4), and a Promise removes (4,1), this leaves R1,C2 (3,3) and R2,C1 (1,2). With just these two points remaining we can clearly see that R1,C2 point of (3,3) dominates R2,C1 (1,2), and in this case Rose finally gets a payout of 3.

The biggest issue with all of this is credibility. In the Threat Rose says that she will play R2 if Colin plays C1. So lets assume Colin does pick C1 anyways, then Rose can either pick R1 for a payout of 2, or R2 for a payout of 1. Odds are she will go back on what she said and take the higher payout. Here are two ideas to get around this credibility issue:

- One method for Rose to gain credibility is to lower one or more of her payoffs, this way it is more obvious to Colin that she will execute the stated move.
- Another method is for Rose to bribe Colin. She can make a side payment to Colin to increase his selected payoffs to entice him to a strategy that is favorable to her and is now favorable to him because of the side payment. This is only possible in some scenarios. Looking at this previous case we have nothing done, (2,4), or Threat and Promise (3,3), therefore Rose could

offer a money amount between (0,3-2), to try to get Colin to take the (3,3) choice instead of the (2,4) choice.

2. Battle of the Sexes

The third classical two person partial conflict game is Battle of the Sexes. The scenario here is that we have a male and a female as the players, and the male wants to go watch a boxing match and the female wants to watch a ballet performance. However both participants would still rather be together than to go individual to the events that they want. Therefore the rankings from his perspective is both boxing (4), both ballet (3), him at boxing and her at ballet (2), him at ballet and her at boxing (1). Therefore the rankings from her perspective is both ballet (4), both boxing (3), her at ballet and him at boxing (2), her at boxing and him at boxing (1). So now how does this game work?

	Boxing	**She**	Ballet
	C1		C2
Boxing	(4, 3)	⇦	(2, 2)
He	⇧		⇩
Ballet	(1, 1)	⇨	(3, 4)

- Case 1, Conservative approach. This basically means go back to minimax approach. The minimum return from row 1 for him, is 2, the minimum return from row 2 for him, is 1, therefore he should pick row 1. The minimum return from column 1 for her, is 1, the minimum return from column 2 for her, is 2, therefore she will pick column 2.

- Case 2, repeated event. If this event is played more than once you can simply alternate between both ballet, and both boxing. If there are an even number of times this is done then the average payout of each person is 3.5, which is much higher than the (2,2) payout from being Conservative.

- Case 3, not repeated event. If this happens once, it is still more beneficial for them to both go to the same event than it is to take the conservative approach. Therefore simply take a coin,

each person picks a side, flip the coin, and whoever won go to that event. The payout is still (3,4) or (4,3) depending, which is more beneficial than the (2,2) solution.

- Case 4, Optimistic approach. This basically means go back to maximin approach. The maximum return from row 1 for him, is 4, the maximum return from row 2 for him, is 3, therefore he should pick row 2. The maximum return from column 1 for her, is 3, the maximum return from column 2 for her, is 4, therefore she will pick column 1. Therefore we end up at (1,1) each person going to the event they hate most.

- Case 5, Shoot for the moon, go for only the maximum possible outcome. He will go to boxing, She will go to the ballet, and hey back at (2,2) again.

As we can see Case 2, or 3 (depending if it is repeatable or not) is the vastly superior strategy for both participants.

2.

		Colin	
		C1	C2
Rose	R1	(1, 2)	(3, 1)
	R2	(2, 4)	(4, 3)

In this example, what is the Nash Equilibrium?
Can the person who is in the disadvantage in the Nash Equilibrium make any adjustments or strategy changes?

		Colin	
		C1	C2
Rose	R1	(4, 3)	(2, 2)
	R2	(1, 1)	(3, 4)

In this example is there a Nash Equilibrium(s)?
Is it better to go first or second?