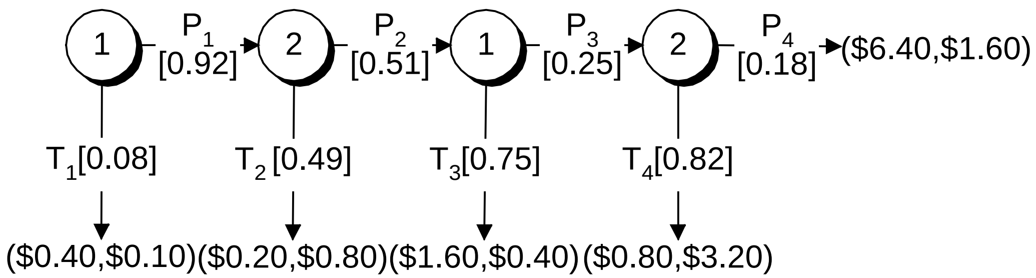
Experimental Economics

by David K. Levine

Last modified: September 1, 2005

Centipede Game: Palfrey and McKelvey



Numbers in square brackets correspond to the observed conditional probabilities of play corresponding to rounds 6-10, stakes 1x below.

This game has a unique self-confirming equilibrium; in it player 1 with probability 1 plays T_1

Summary of Experimental Results

Trials / Rnds	Rnds	Stake	Case	Expected Loss			Max Gain	Ratio
				Pl 1	Pl 2	Both		
29*	6-10	1x	H	$0.00	$0.03	$0.02	$4.00	0.4%
29*	6-10	1x	U	$0.26	$0.17	$0.22	$4.00	5.4%
	WC	1x	H			$0.80	$4.00	20.0%
29	1-10	1x	H	$0.00	$0.08	$0.04	$4.00	1.0%
10	1-10	4x	H	$0.00	$0.28	$0.14	$16.00	0.9%

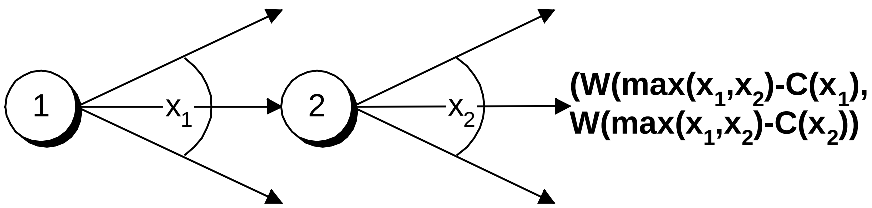
Rnds=Rounds, WC=Worst Case, H=Heterogeneous, U=Unitary

*The data on which from which this case is computed is reported above.

Comments on Experimental Results

- heterogeneous loss per player is small; because payoffs are doubling in each stage, equilibrium is very sensitive to a small number of player 2's giving money away at the end of the game.
- unknowing losses far greater than knowing losses
- quadrupling the stakes very nearly causes $\bar{\varepsilon}$ to quadruple
- theory has substantial predictive power: see WC
- losses conditional on reaching the final stage are quite large--inconsistent with subgame perfection. McKelvey and Palfrey estimated an incomplete information model where some "types" of player 2 liked to pass in the final stage. This cannot explain many players dropping out early so their estimated model fits poorly.

Best Shot Game: Prasnikar and Roth



x	*W(x)*	*C(x)*
0	$0.00	$0.00
1	$1.00	$0.82
2	$1.95	$1.64
3	$2.85	$2.46
4	$3.70	$3.28
5	$4.50	$4.10
6	$5.25	$4.92
7	$5.95	$5.74
8	$6.60	$6.50

Discussion of Best Shot

if the other player makes any contribution at all, it is optimal to contribute nothing

unique subgame perfect equilibrium player 1 contributes nothing

another Nash equilibrium player 2 to contributes nothing regardless of player 1's play

it is not consistent with Nash equilibrium for some player 1's to play 0 and others 4

any other probability distribution over the two Nash equilibria are heterogeneous self-confirming

Summary of Results from Best Shot

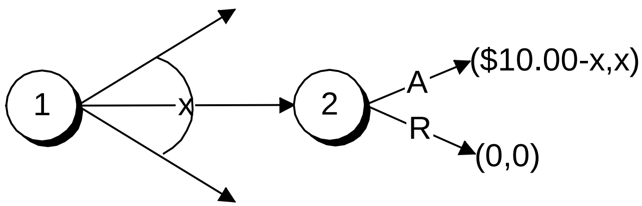
Trials	Rnds	Info	Case	Expected Loss			Max Gain	Ratio
				Pl 1	Pl 2	Both		
8	8-10	full	H	$0.00	$0.12	$0.06	$2.06	2.9%
8	8-10	full	U	$0.00	$0.12	$0.06	$2.06	2.9%
10	8-10	part	H	$0.01	$0.15	$0.08	$2.06	3.9%
10	8-10	part	U	$0.39	$0.15	$0.27	$2.06	13.%
	WC		H			$3.41	$2.06	165%

Rnds=Rounds, WC=Worst Case, H=Heterogeneous, U=Unitary

Comments on Best Shot

- In the full information case and partial information heterogeneous case player 2 occasionally contributes less than 4 when player 1 has contributed nothing; Note that the player who contributes nothing gets $3.70 against $0.42 for the opponent who contributes 4
- larger losses than centipede game with lower stakes
- full information case heterogeneous losses equal unitary losses--player 1 never contributed anything, and so never had a loss with either type of information; all losses by player 2 are necessarily knowing losses
- In the partial information case occasionally player 1 contributed 4 and player 2 contributed nothing: looks like public randomization between the two Nash equilibria. This is inconsistent with Nash equilibrium but consistent with self-confirming equilibrium.

Ultimatum Game:



Trials	Rnd	Cntry Stake	Case	Expected Loss			Max Gain	Ratio
				Pl 1	Pl 2	Both		
27	10	US	H	$0.00	$0.67	$0.34	$10.00	3.4%
27	10	US	U	$1.30	$0.67	$0.99	$10.00	9.9%
10	10	USx3	H	$0.00	$1.28	$0.64	$30.00	2.1%
10	10	USx3	U	$6.45	$1.28	$3.86	$30.00	12.9%
30	10	Yugo	H	$0.00	$0.99	$0.50	$10?	5.0%
30	10	Yugo	U	$1.57	$0.99	$1.28	$10?	12.8%
29	10	Jpn	H	$0.00	$0.53	$0.27	$10?	2.7%
29	10	Jpn	U	$1.85	$0.53	$1.19	$10?	11.9%
30	10	Isrl	H	$0.00	$0.38	$0.19	$10?	1.9%
30	10	Isrl	U	$3.16	$0.38	$1.77	$10?	17.7%
	WC		H			$5.00	$10.00	50.0%

Rnds=Rounds, WC=Worst Case, H=Heterogeneous, U=Unitary

Comments on Ultimatum

- every offer by player 1 is a best response to beliefs that all other offers will be rejected so player 1's heterogeneous losses are always zero.
- big player 1 losses in the unitary case
- player 2 losses all knowing losses from rejected offers; magnitudes indicate that subgame perfection does quite badly
- as in centipede, tripling the stakes increases the size of losses a bit less than proportionally (losses roughly double).

Raw US Data for Ultimatum

x	*Offers*	*Rejection Probability*
$2.00	1	100%
$3.25	2	50%
$4.00	7	14%
$4.25	1	0%
$4.50	2	100%
$4.75	1	0%
$5.00	13	0%
	27	

US $10.00 stake games, round 10