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Rational Cooperation In One-Shot Simultaneous Pd-Situations

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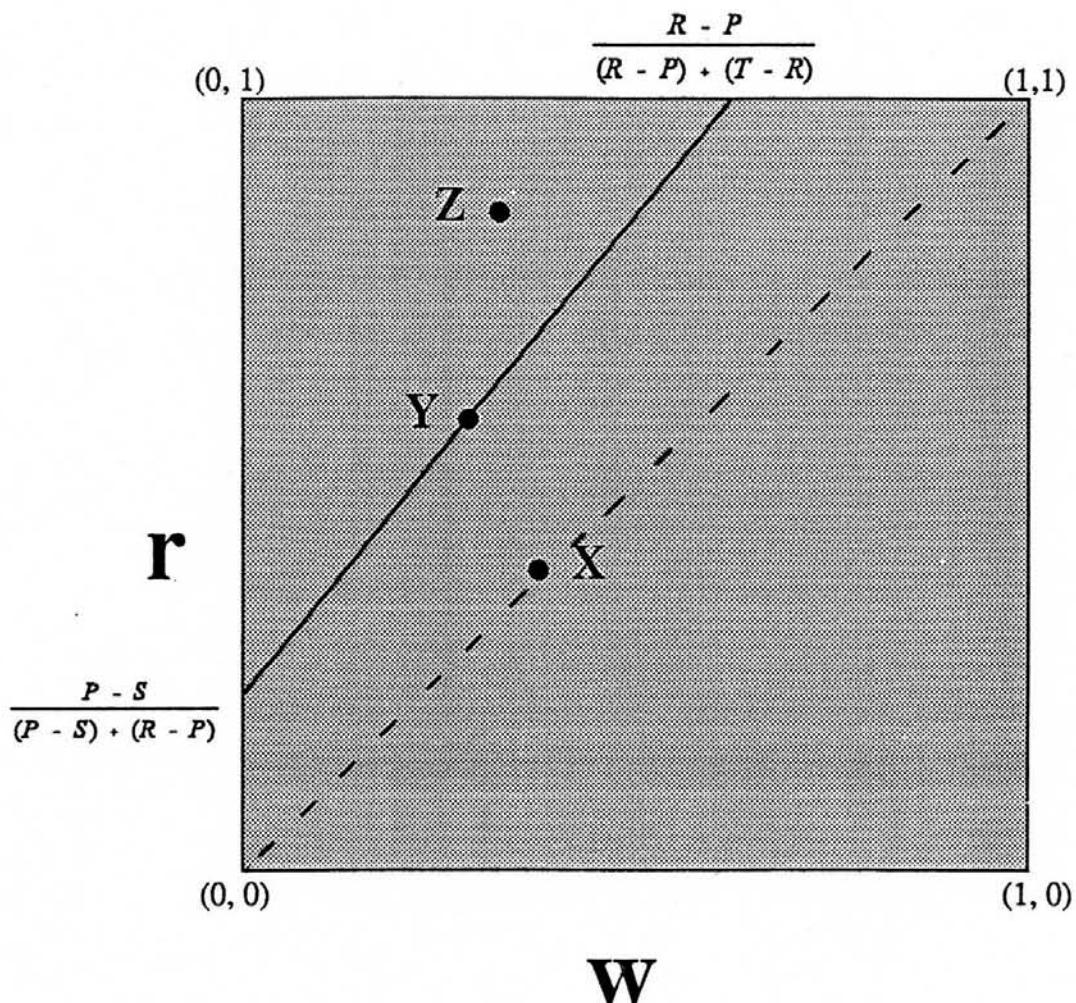
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FIGURE 1



1. The 45° dashed line represents the limit of zero forecasting ability, corresponding to $0 \leq r = w \leq 1$; such as point X. Such a point means that players cannot forecast each other's actual choice to cooperate or defect better than pure chance.
2. The straight line above the 45° dashed-line is a **cooperation line**; with formulas for its intercepts shown where the line intersects the top and left sides of the unit probability box. Inequality (1) is satisfied by points Y and Z, which lie on or above the cooperation line.
3. The intercept formulas imply that as $T - R$ and $P - S$ shrink relative to $R - P$, the cooperation line will shift arbitrarily close the 45° dashed-line; but never touch the dashed-line if the ordinal PD-payoff ranking ($T > R > P > S$) is preserved.

Joint Probability and Expected Payoff Calculations

For $(r, w) = (.5, .5)$ and $(T, R, P, S) = (10, 8, 6, 4)$

STRATEGY PAIR	$p(C_A, C_E)$	$p(D_A, C_E)$	$p(C_A, D_E)$	$p(D_A, D_E)$	U_A	U_E
(DD_A, DD_E)	0	0	0	1	6	6
(CD_A, DD_E)	0	0	0.5	0.5	5	8
(DD_A, CD_E)	0	0.5	0	0.5	8	5
(CD_A, CD_E)	0.25	0.25	0.25	0.25	7	7

TABLE 1

STRATEGY MATRIX IMPLIED FROM TABLE 1

		CD_E	DD_E
CD_A	7	8	
	7	5	
DD_A	5	6	
	8	6	

Joint Probability and Expected Payoff Calculations

For $(r, w) = (.9, .3)$ and $(T, R, P, S) = (10, 8, 6, 4)$

STRATEGY PAIR	$p(C_A, C_E)$	$p(D_A, C_E)$	$p(C_A, D_E)$	$p(D_A, D_E)$	U_A	U_E
(DD_A, DD_E)	0	0	0	1	6	6
(CD_A, DD_E)	0	0	0.3	0.7	5.4	7.2
(DD_A, CD_E)	0	0.3	0	0.7	7.2	5.4
(CD_A, CD_E)	0.675	0.075	0.075	0.175	7.5	7.5

TABLE 2

STRATEGY MATRIX IMPLIED FROM TABLE 2

	CD_E		DD_E	
CD_A	7.5		7.2	
	7.5		5.4	
DD_A	5.4		6	
	7.2		6	

Joint Probability and Expected Payoff Calculations

For $(r, w) = (.53, .50)$ and $(T, R, P, S) = (25.2, 25, 5, 4.8)$

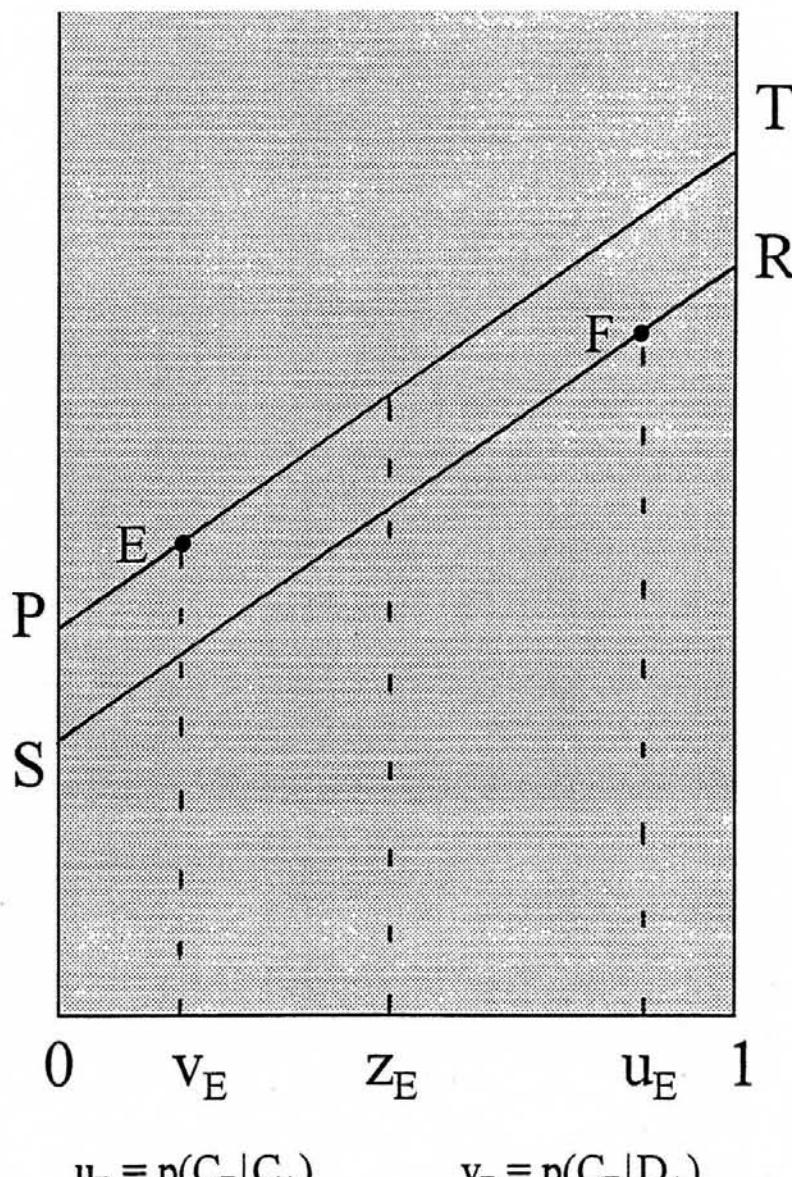
STRATEGY PAIR	$p(C_A, C_E)$	$p(D_A, C_E)$	$p(C_A, D_E)$	$p(D_A, D_E)$	U_A	U_E
(DD_A, DD_E)	0	0	0	1	5	5
(CD_A, DD_E)	0	0	0.5	0.5	4.9	15.1
(DD_A, CD_E)	0	0.5	0	0.5	15.1	4.9
(CD_A, CD_E)	0.273	0.242	0.242	0.242	15.3	15.3

TABLE 3

STRATEGY MATRIX IMPLIED FROM TABLE 3

	CD_E	DD_E
CD_A	15.3	15.1
	15.3	4.9
DD_A	4.9	5
	15.1	5

FIGURE 2



1. The upper and lower lines represent Adam's expected payoff from defecting and cooperating respectively; depending on whether Eve's unconditional or conditional probabilities of cooperating, z_E or (u_E , v_E), are used to calculate his expected payoffs.
2. Using a single z_E probability implies vertical expected payoff comparisons. Otherwise, horizontally displaced comparisons result from using u_E and v_E ; as illustrated by points E and F.

TABLE 4

	$p(C_A^f)$	$p(C_E^f)$
(CD _A , CD _E)	$\frac{r_A w_E + w_A(1 - w_E)}{1 - (r_A - w_A)(r_E - w_E)}$	$\frac{r_E w_A + w_E(1 - w_A)}{1 - (r_A - w_A)(r_E - w_E)}$
(DD _A , CD _E)	$r_A w_E + w_A(1 - w_E)$	w_E
(CD _A , DD _E)	w_A	$r_E w_A + w_E(1 - w_A)$
(DD _A , DD _E)	w_A	w_E

TABLE 5

Unconditional Forecast Probabilities

For (r, w) = (.9, .3)

Unconditional Forecast Probabilities

For (r, w) = (.51, .50)

	$p(C_A^f)$	$p(C_E^f)$
(CD _A , CD _E)	0.75	0.75
(DD _A , CD _E)	0.48	0.3
(CD _A , DD _E)	0.3	0.48
(DD _A , DD _E)	0.3	0.3

	$p(C_A^f)$	$p(C_E^f)$
	0.50505	0.50505
	0.505	0.5
	0.5	0.505
	0.5	0.5