

Non Constant Sum and R+S Player Extensions of the Linear Programming Representation of Two Person Constant Sum Games

Michael J Ryan

e-mail: M.J.Ryan@hull.ac.uk
University of Hull
Hull University Business School
U.K.

KeyWords: Nonconstant sum Noncooperative Duality N person Games

ABSTRACT

This paper has two purposes. The first is to present theorems and results which show how the linear programming formulation of a two person noncooperative game can usefully be extended to include: i) resource constraints; ii) prior information concerning an opponent's potential choice of strategies; iii) explicit modelling of the play:don't play decision and; iv) ideas of strategic equivalence and of intervening duality which extend the linear programming approach to nonconstant sum and explicitly bargaining related cases. The second purpose of the paper is to extend all of these results further to include cases in which there are $R > 1$ cooperating players on the primal side and $S > 1$ cooperating opponents on the dual side. Throughout the paper ideas and results will be illustrated by using farmer and landowner and weather related examples.

Some relevant references

- Charnes, A., 1953, "Constrained Games and Linear Programming", Proceedings of the National Academy of Sciences, July, 294-320.
- Charnes, A., and Littlechild, S.C., 1975, "On the Formation of Coalitions in n Person Games", Journal of Economic Theory, 10, 3, 386-402.
- Owen, G., 1982, Game Theory, Academic Press.
- Ryan, M.J., 2002a, "Constrained Game Approaches to the Systematic Regulation of Land Use Availability", forthcoming, The Annals of Regional Science.
- Ryan, M.J., 2002b, "Intervening Duality, Strategic Equivalence and Nonconstant Sum Bimatrix Games", Proceedings Tenth International Symposium on Dynamic Games and Applications, 739-748, St Petersburg State University.
- Ryan, M.J., 2001, Regulatory Uncertainty, Strategic Inequivalence and Win:Win Regulation Games. Fourteenth Italian Conference On Game Theory and Applications, Ischia.
- Ryan, M.J., 2000a, "Economies of Scale and Scope, Contestability, Windfall Profits and Regulatory Risk", Manchester School, 68, 6, 701-722.
- Ryan, M.J., 2000b, "Regulatory Risk, Regulatory Uncertainty and a Teaching Role for Regulators." Proceedings of the ESREL 2000 Conference on Foresight and Precaution, Edinburgh, 1649-1657, Balkema, Rotterdam.
- Ryan, M.J., 1999, "Intervening Duality and Bargaining with a Farmer-Landowner Example" European Journal of Operational Research, 113, 3, 688-699.
- Ryan, M.J., 1998a, "Multiple Criteria and the Framing of Decisions", Journal of Information and Optimization Sciences, 19, 1, 25-42.
- Ryan, M.J., 1998b, "Intervening Duality Based Analyses of Nonconstant Sum Bimatrix Games" Journal of Interdisciplinary Mathematics, 1, 2, 175-196.
- Ryan, M.J., 1998c, "Constrained Games, Intervening Duality and Experimenter-Experiment Interactions", European Journal of Operational Research, 110, 2, 326-341.
- Ryan, M.J., 1995, "Constrained Games, Intervening Duality and the Nature of Probability", European Journal of Operational Research, 86, 2, 366-373.
- Ryan, M.J., 1994, "Constrained Gaming Approaches to Production Decisionmaking Under Uncertainty", European Journal of Operational Research, 77, 70-81.