

Reasonableness, Monotonicity and Rationality

Kathryn Jane Grande

**1990 REU Final Report
Drew University
July 20, 1990**

Abstract: Reasonableness, Monotonicity, and Rationality

This paper ~~will~~ examines different cost allocation methods for superadditive cooperative games in regard to the properties reasonableness, monotonicity, and rationality. Because on 3-person games a special condition concerning reasonableness holds, the group of games with four or more players is examined more intensively, to better represent the general class of superadditive n -person games. My research covers the three properties with respect to the Shapley Value, Nucleolus, Tau Value, Banzhaf Value, and the Nucleolus of the Anticore Dual Game.

Introduction

Consider a game (N, v) , where $N = (1, 2, 3, \dots, n)$ is the set of players and v is a real-valued function defined on all coalitions $S \subseteq N$ satisfying $v(\emptyset) = 0$. The vector $x = \{x_1, x_2, \dots, x_n\}$ gives each player i an allocation x_i . *We assume throughout this paper that the games are superadditive.*

Player i 's marginal contribution to coalition S is defined as $v(S) - v(S - \{i\})$. John Milnor (1952) proposed that a reasonable payoff allocation x_i , for player i , should be no more than i 's maximum marginal contribution.

Rationality insures that each player, either individually or as part of a coalition, will receive at least their stated worth. To accept less than one started with would be "irrational."

Monotonicity insures that the allocation a player receives fluctuates accordingly if a coalition containing that player increases or decreases in value. Certainly a player whose payoff has decreased while their stated worth has increased would not be satisfied.

