To Know the Efficient Training, Through an Application of Game Theory

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Abstract

This study mainly focused to know the effective training, through an application of game theory.Across, the training had been conducted efficiently by the Government of Telangana. The Youth Training Centres (YTC's) are meant for conducting Skill Development training for Adilabad, Ichoda, Utnoor and around 19 Training Centres in Telangana. Considered for only three Training centres of Adilabad District for Scheduled Tribe, Non-Scheduled Tribe and Total, who were trained and placed. An application of game theory, the result has revealed that the training had been conducted well and benefitted for both ST's and Non-ST's. Through the game theory application, found best strategies by the saddle point and also applied the arithmetic procedure.

Keywords

Game Theory, YTC's Training and Saddle point.

INTRODUCTION

The game theory has more emphasis on the historical background of the theory. It has Nash equilibrium, dominance and saddle point are the important concepts of theory. The main objective is given on mixed strategies, extensive games with imperfect information and with perfect information, bidding in auctions and finally the game theory applications in the field of economics [Sihlobo, 2012][1]. The interest of the case in many agents, when any single agent's behaviour does not affect other agent's possibilities. The outcomes to agents, conditional on their investment decisions [Harold, 2001][2].

Game theory is rampant in economics. Having long ago invaded industrial organization, game theoretic modelling is now common place in international, public finance, macro, labour and is gathering steam in development and economic history. Many of the modelers use game theory applications because it allows them to think like an economist when price theory does not apply. The game theory models allow economists to study the implications of self-interest, rationality and equilibrium, both in market interactions that are modelled as games [Robert Gibson's, 1996][3]. A motivation comes from strong arguments that the human mind with its decision and actions constitutes a physical quantum system should be modelled based on the laws of quantum mechanics [Ulrich Faigle, 2017][4].Simple games, the value is more often called a power index; a value of game is a real function

[Michel & Marc, 1999][5].

GAME THEORY METHODOLOGY

Game theory is a type of decision theory in which one's choice of action is determined after taking into account all possible alternatives available to an opponent playing the same game, rather than just by the possibilities of several outcomes.Minimax and maximin criterion of J. Von Neumann is the mathematical analysis of competitive situations.A game is defined by the set of rules. In a game, activities are determined by skill, it is said to be a game of strategy. If they are determined by chance, it is a game of chance.

Payoff: A quantitative measure of satisfaction a person gets at the end of each play is called a payoff (outcome).

Strategy: A strategy of a player has been loosely defined as a rule for decision-making in advance of all the plays by which he decided the activities he should adopt. In other words, a strategy for a given player is a set of rules that specifies which of the available course of action he should make at each play. If a player knows what the other player is going to do, a deterministic situation is obtained and objective function is to maximize the gain. Therefore, the pure strategy is a decision rule always to select a particular course of action. A probabilistic situation is known as mixed strategy.

Minimax (Maximin) criterion of optimality: It states that if a player lists the worst possible outcomes of all his/her potential strategies. He will choose that strategy to be most suitable for him which corresponds to the best of these worst outcomes. Such a strategy is called an optimal strategy.A payoff matrix is the position of such an element in the payoff matrix which is minimum in its row and maximum in its column is called as saddle point exist. If the payoff matrix has the saddle point then the players A and B are said to have optimal strategies.

The payoff at the saddle point is called the value of game and it is shown maximin () and minimax value () of the game. A fair game is said to be if $\bar{v} = \underline{v} = 0$. Strictly determinable if $\bar{v} = v = \underline{v}$.

A, 2 X 2 game is said to rectangular game may have saddle point exist. If saddle point exists then it is said to be it has pure strategy; otherwise it is called as mixed strategy. The mixed strategy problem for 2 X 2 rectangular game can be solved by using arithmetic method. Suppose that the given matrix is not in 2 X 2 matrix and saddle point does not exist. Then we can apply dominance property. In the dominance property we may go for reducing rows or columns to bring it as 2 X 2 matrix. Finally, after reducing the matrix 2 X 2, we check saddle point exist or not; otherwise we calculate probabilities with the help of arithmetic method [S.D. Sharma, 2008][6].

RESULTS AND DISCUSION

YTC	ST	Non - ST		
Adilabad	178	532	178	
Ichoda	182	54	54	
Utnoor	161	146	146	179
Mulugu	174	189	179	
Kataram	104	266	104	
Khammam	110	116	110	
	182	532		
	182			

Min (Max) $\neq$ Max (min) , no saddle point.

Clearly the game has no saddle point .From player A's point of view it is seen that each payoff in Adilabad dominates utnoor (i.e., 3rd row).i.e., choice of 3rd strategy by the player A will always result in the lesser gains as compared to that of selecting first strategy (Adilabad).

Row 1 (Adilabad) is superior to 3rd

Hence, deleting 3rd row, the reduced size payoff matrix is

Adilabad	178	532
Ichoda	182	54
Mulugu	179	189
Kataram	104	266
Khammam	110	116

Again Adilabad dominates kataram i.e., row1 (Adilabad) is superior to Kataram. Hence, delete Kataram ,the reduced pay off matrix is

Adilabad	178	532
Ichoda	182	54
Mulugu	179	189
Khammam	110	116

Now Mulugu is superior to Khammam, hence delete khammam

Adilabad	178	532
Ichoda	182	54
Mulugu	179	189

Since none of the rows are in the domination. So we take the average of the combinations to hold the dominance. The average of Adilabad & Ichoda dominates the Mulugu, so from player A's point of view deleting the row 3rd

YTC	ST	Non - ST		
Adilabad	178	532	178	178
Ichoda	182	541	54	
	182	532		

182

The payoff matrix has no saddle point then the optimal strategies will be the mixed strategies.

step 1: Taking the difference of two numbers in column 1, we get 178 - 532 = -354 by neglecting negative sign. We put it under the column 2.

Step 2: Taking the difference of two numbers in column 2 , we get 182-54= 128, we put it under first column.

178	532	128
182	54	354
478	4	

Step 3: Repeat the above two steps for the rows, we get under the row1 is 478 and under the row2 is 4. Thus, for the optimum gains, the player A must use. Stratergy Adilabad with ST probability 128/482 = 0.2655 and stratergy 354/482 = 0.734 (Non -ST) while player.

Optimum strategy for the player A (128/482, 354/482) and B (478/482, 4/482).

Value of game = 178 X 128/482 + 182 X 354 /482

= 47.2697 + 133.66805

= 180.93

CONCLUSION

The training of YCT's for Adilabad and Illandu districts of places in Telangana have been traced by the method of game theory application,and result shown withsignificantprobability of strategies(mixed strategy)for ST and Non-ST.

REFERENCES

[1] Sihlobo, Wandile Mr. "A review of game theory", University of Stellenbosch, 2012.
[2] Harold L. Cole. "Efficient Non-Contractible investments in large economics", Department of Economics, Journal of Economic Theory, Vol. 101, pp: 333-373, 2001. DOI: 10.1006/jeth.2001.2797.
[3] Robert Gibsons. "An introduction to applicable game theory", National Bureau of Economic Research, Cambridge, 1996.
[4] Ulrich Faigle and Michel Grabisch. "Game Theretic interaction and decision", A quantum analysis, Mathematics institute, Germany, pp: 106-122, 6th Nov. 2017.
[5] Michel Grabisch and Marc Roubens. "An axiomatic approach to the concept of interaction among players in cooperative games", International Journal of game theory, Vol. 28(4), pp: 547-565, 1999.
[6] S.D. Sharma, "Operations Research, Quantitative Analysis for Business Decisions", Kedarnath Ram nath, Meerut, Delhi, 2008.
[7] Hamdy A. Taha."Operation Research &Introduction", 7th edition, prentice hall, New Delhi and India.
[8] Steven E. Land burg. "Qantumgame theory, notices of the AMS, Vol.51(4), Bobly 2004.
[9] SamuelsonLarry. "Stochastic Stability in games with Alternative best replies," Journal of Economic Theory, Vol. 64. Pp: 35-65, 1994.
[10] Schefing, Thomas C. "The Strategy of Conflict. Cambridge, Mass", Harvard University Press, 1960.
[11] Schelling and Thomas C. "Dynamic Models of Segregation," Journal of Mathematical Sociology, Vol.1,pp: 143-86, 1971.