Project Report

On

CONSUMER BEHAVIOUR IN ACCORDANCE WITH DECISION THEORY

Submitted

in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

in

MATHEMATICS

by

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(Register No. SM20MAT006)

(2020-2022)

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APRIL 2022

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CERTIFICATE

This is to certify that the dissertation entitled, **CONSUMER BEHAVIOUR IN ACCORDANCE WITH DECISION THEORY** is a bonafide record of the work done by Ms. **JITTY MOL XAVIER** under my guidance as partial fulfillment of the award of the degree of **Master of Science in Mathematics** at St. Teresa's College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam. No part of this work has been submitted for any other degree elsewhere.

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DECLARATION

I hereby declare that the work presented in this project is based on the original work done by me under the guidance of **NISHA OOMMEN**, Assistant Professor, Department of Mathematics, St. Teresa's College(Autonomous), Ernakulam and has not been included in any other project submitted previously for the award of any degree.

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ACKNOWLEDGEMENTS

I must mention several individuals who encouraged me to carry this work. Their continuous invaluable knowledgably guidance throughout the course of this study helped me to complete the work up to this stage

I am very grateful to my project guide (NISHA OOMMEN) for the immense help during the period of work

In addition, very energetic and competitive atmosphere of the Department had much to do with this work. I acknowledge with thanks to faculty, teaching and non-teaching staff of the department and Colleagues.

I also very thankful to HOD for their valuable suggestions, critical examination of work during the progress.

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Chapter 1

INTRODUCTION TO DECISION THEORY

In an uncertain context, decision theory is an interdisciplinary method to arriving at the most optimal decisions. To study the decision-making process, decision theory combines psychology, statistics, and mathematics. Decision theory is the study of an agent's choice and is based on the theory of rational decision making. In our daily lives, we are likely to come into a range of situations in which we must choose between a varieties of options. The use of mathematical procedures to arrive at alternative choices is made possible by decision theory. Indeed, selecting a finite number of feasible actions with a predictable outcome would be simple, and the best solution could be identified. All that is required is a decision maker's preference order to be consistent. Taking into account that real life processes hardly can be described in the mentioned way, but always are characterized by risk uncertainty and even information leads to the necessary inclusion of random processes and expectation formation. Personal experience and attitude play a crucial role in the assessment of outcomes of probabilities. This is somehow a contradiction to the main stream view, where the distribution of observed realization for the notion of probability. There are certain factors which influence decision making process .Different types of risks are involved in this process. Again expectation of gain and loss depending on the outcome of each decision alternative can be considered as another factor which influences the decision making process.

1.1 SIX STAGES OF DECISION MAKING

Though making of a decision from various alternative is complex to some extent, it can be minimized into the following six procedures.

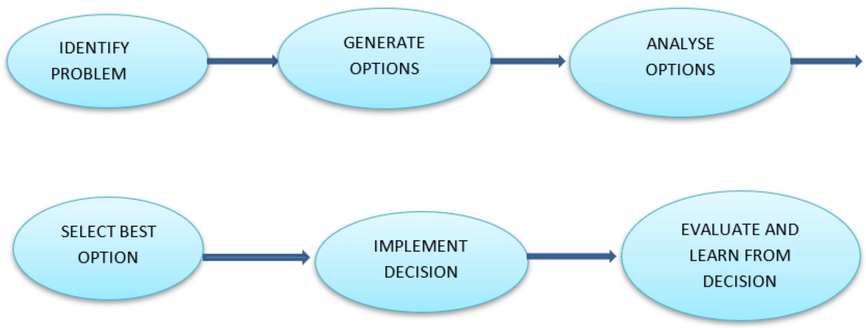

Figure 1.1: stages of decision making

* Identifying and deciding the problem that requires decision-making is the first step in the decision-making process. This allows the decision-maker to focus on the important questions involved in the decision-making process.

* Once the problem has been identified, the decision maker must specify the possibilities from which a decision must be taken. The elements or possibilities are frequently clearly measured, such as lowering the price, increasing profit through higher return on investment.

* As you gather knowledge, you may notice that you have numerous options or courses of action. You can also create new options by using your creativity and other information. In this phase, you'll make a list of all possible and optimal options.

* After you've examined all of the data, you can choose the option that best suits your needs. You can also select a mix of options.

* A decision maker gathers relevant information related with each viable choice in this step. The decision maker conducts an examination of relevant costs and benefits in this step of the decision-making process.

* In the fifth step, the management chooses and implements the optimal choice based on the appropriate cost and revenue analyses

1.2 ELEMENTS OF DECISION THEORY

- STATES OF NATURE

A state of nature is an occurrence that is beyond the decision maker's control. For example, the situation of the economy, weather conditions, and so on. The state of nature can be identified through scenario analysis, which involves interviewing a group of people to learn about natural conditions that could have a significant impact on a choice.

- PAYOFF

It is a numerical value calculated by combining all feasible combinations of decision alternatives and natural situations. The values of payoffs are always conditional. A tool for making decisions that outlines the probable values of several alternatives based on the various possible outcomes connected with each.

- DECISION ALTERNATIVES

It is a numerical value calculated by combining all feasible combinations of decision alternatives and natural situations. The values of payoffs are always conditional. A tool for making decisions that outlines the probable values of several alternatives based on the various possible outcomes connected with each.

- DECISION ANALYSIS

It is an analysis method that compares decision-making alternatives based on expected results.

Chapter 2

CLASSIFICATIONS OF DECISION THEORY

2.1 BRANCHES OF DECISION THEORY

Decision theory can be classified into two branches:

1. Normative/Prescriptive decision theory
2. Positive/Descriptive decision theory

2.1.1 NORMATIVE DECISION THEORY

Normative decision theory involves the determination of optimal decisions, where optimality is generally determined by considering ideal decision makers who is able to calculate with perfect precision and is completely rational in some sense. The practical application of this prescriptive method (how people should make decisions) is called decision analysis, and it aims to find tools, methods, and software (decision support systems) to help people make better decisions.

2.1.2 DESCRIPTIVE DECISION THEORY

In contrast, descriptive or positive decision theory focuses on describing observed behaviour, generally assuming that decision makers behave under certain consistent rules. For example, these rules may have a procedural framework. The behavioural prescriptions generated by positive decision theory allow further testing of the types of decisions that occur in practice.

2.2 DECISION MAKING ENVIRONMENTS

2.2.1 TYPE 1: DECISION MAKING UNDER CERTAINTY

Classical decision theory generally deals with a set of alternative behaviors that decision makers can use, a relationship that represents the expected state or outcome of each alternative behavior, and utility or objective functions, functions that are based on their desirability. When the results of each action can be accurately determined and classified, the decision is said to be made under certain conditions. In this case, choose the alternative that results in the highest performance.

2.2.2 TYPE 2: DECISION MAKING UNDER UNCERTAINTY

When probabilities of outcomes are not known approximately, the decision maker must arrive at a decision only on the basis of actual conditional payoff values keeping in the criterion of effectiveness. The following criteria under decision making under uncertainty has been discussed. They are,

a) Optimism criterion

b) Pessimism criterion

c) Equal probabilities(Laplace) criterion0

d) Coefficient of optimum criterion

e) Regret criterion

A: OPTIMISM CRITERION

In this standard, the decision maker makes sure not to miss the opportunity to achieve the maximum possible benefit (maximax) or the lowest possible cost (minimin).

WORKING PROCESS:

• Find the maximum benefit value (Pay off value) for each decision option.

• Choose the decision-making alternative with the best return value (best pay off value).

EXAMPLE: Suppose there is a situation where the decision maker has three possible choices A1, A2, and A3. The result (Outcome) of each of these options can be affected by the occurrence of any of the four possible events S1, S2, S3 and S4. The following table shows the monetary benefits of each combination.

EVENTS ACTIONS	S1	S2	S3	S4	Minimum payoff	Maximum payoff
A1	27	12	14	26	12	27
A2	45	17	35	20	17	45
A3	52	36	29	15	15	52

SOLUTION: Since 52 is maximum payoffs the optimal solution is A3 [1]

B: PESSIMISM CRITERION

In this standard, the decision maker ensures that his income will not fall below the specified amount

WORKING PROCESS

- Position the maximum profit value in the event of data loss
- Select the decision alternative with the best value of benefit.

EXAMPLE: Suppose there is a situation where the decision maker has three possible choices A1, A2, and A3. The result (Outcome) of each of these options can be affected by the occurrence of any of the four possible events S1, S2, S3 and S4. The following table shows the monetary benefits of each combination

EVENTS Actions	S1	S2	S3	S4	Minimum payoff	Maximum Payoff
A1	27	12	14	26	12	27
A2	45	17	35	20	17	45
A3	52	36	29	15	15	52

SOLUTION: Since 17 is maximum payoffs the optimal solution is A2 [1]

C: EQUAL PROBABILITIES CRITERION

The Laplace criteria is another name for this. In the absence of any information on the likelihood of various natural states occurring, one option is to assume that all of these states have the same chance of occurrence = 1/n. As a result, if there are n natural stages, each stage can have a probability of occurrence attributed to it. We calculate the expected return for each course of action regarded to be the best using these probabilities.

D: COEFFIECIENT OF OPTIMISM CRITERION

This states that decision makers must not be completely optimistic or pessimistic, so they must show a combination of the two.

E: REGRET CRITERION

This criterion suggests that a decision maker should be neither completely optimistic nor pessimistic and therefore must display a mixture of both

2.2.3 TYPE 3: DECISION MAKING UNDER RISK

In the decision making environment decision maker has sufficient information to assign probability to the likely occurrence of each outcome. Knowing the probability distribution of outcomes the decision maker needs to select a course of action resulting to large risk is the expected monetary value (EMV). The decision making under risk process is as follows:

- Use the information you have to share your views on each situation, p(s)
- Each action has a payoff associated with each state of nature, X(a,s)
- We list the expected payoff, also called return(R) for each action R(a) = sum of [X(a,s),p(s)]
- We accept that it should be minimize or maximize expected payoff.

EXPECTED MONETARY VALUE (EMV)

The expected monetary value of a given stock is obtained by multiplying the return value by the probability associated with each state of nature.

I.e. EM $=\sum_{i=1}^{m} P_{ij}P_i$

m = Number of possible states of nature

P_{ij} = **Payoff associated with states of nature**

P_i = **Probability of occurrence of states of nature**

EXAMPLE:

ACTS State Of Nature	A1	A2	A3
S1	-20	-50	200
S2	200	-100	-50
S3	400	600	300

The payoffs of states of nature are 0.3, 0.4 and 0.3 respectively.

COMPUTATION OF EXPECTED MONETARY VALUE

	S1	S2	S3	
P(s)	0.3	O.4	0.3	EMV
A1	-20	200	400	-20×0.3+200×0.4+ 400×0.3 =194
A2	-50	-100	600	-50×0.3+- 100×0.4+600×0.3 =125
A3	200	-50	300	200×0.3+- 50×0.4+300×0.3 =130

[1]

EXPECTED OPPORTUNITY LOSS (EOL)

There are different choice criteria for risky decision-making. It is defined as the difference between the highest profit and the actual profit as a result of choosing a particular course of action in a particular state of nature. Thus, in a given natural state, this is the amount of payment earned by not choosing the path of action that leads to the least payout return. It is preferable to take a course of action that results in the shortest possible EOL. It is stated mathematically as follows:

EOL (state of nature,N_i**) = EOL =**$\sum_{i=1}^{n} l_{ij} P_i$

l_{ij}**= Opportunity loss due to state of nature,** N_i **and course of action**

P_i **= Probability of occurrence of state**

EXAMPLE: Consider the payoff matrix

Acts → State of nature↓	A1	A2	A3
S1	-20	200	400
S2	-50	-100	600
S3	200	-50	300

EXAMPLE:

Acts? → State of nature↓	A1	A2	A3
S1	(200-(-20)) 220	(200-200) O	(600-400) 200
S2	(200-(-50)) 250	(200-(-100)) 300	(600-600) 0
S3	(200-200) 0	(200-(-50)) 250	(600-300) 300

COMPUTATION OF EXPECTED OPPORTUNITY LOSS:

	S1	S2	S3	
P(S)	0.3	0.4	0.3	EOL
A1	220	0	200	220×0.3+0.4+200×0.3 = 126
A2	250	300	0	250×0.3+300×0.4+0×0.3 =195
A3	0	250	300	0×0.3+250×0.4+300×0.3 =190

Minimal EOL = 126

The optimal act is A1 [1]

EXPECTED VALUE OF PERFECT INFORMATION (EVPI)

The expected value of perfect information illustrates the importance of making the best option feasible during the decision-making process. Perfect information would eliminate all uncertainty from any problem by providing complete and accurate information about future demand. With this precise knowledge, it would be possible to estimate how much could be required ahead of time. Each state of nature is related with the chance of its occurrence when making risky decisions. However, if the decision maker can receive perfect (i.e. complete and exact) information about the occurrence of distinct states of nature, he or she will be able to choose a course of action that will result in the requisite reward for whichever state of nature occurs.

EVPI = EPPI − EMV*

EPPI = It represents the maximum obtainable monetary value with perfect information as to which state of nature will occur

EMV*= It represents the maximum obtainable expected monetary value given only the prior outcome probabilities without perfect information to which state of nature will actually occur.

EXAMPLE:

A wholesaler of sports goods has an opportunity to by 5000 pairs of skiis that have been declared surplus by the government. The wholesaler will pay Rs. 50 per pair and can obtain Rs. 100 a pair by selling skiis to retailers. The price is well established but the wholesaler is in doubt as to just how many pairs he will be able to sell. Any skiis leftover he can sell to discount outlet at Rs. 20 a pair .After a careful consideration of the historical data the wholesaler assigns probabilities to the demand as shown in the table.

RETAILERS DEMAND	PROBABILITY
1000 PAIRS	0.6
3000 PAIRS	0.6
5000 PAIRS	0.1

a) Compute the conditional monetary and expected monetary values

b) Compute the expected profit with a perfect predicting device

c) Compute the EVPI

SOLUTION:

Given that

Cost per pair = Rs. 50

Selling price per pair = Rs. 100

Profit per pair = Rs. 50(if sold)

Disposal selling price = Rs. 20(if unsold)

Loss on each unsold pair = (50-20) = Rs. 30

Conditional profit values are, therefore, computed by,

CP = 50S When D>S AND 50 D – 30(S-D) WHEN D<S

Where,

CP = Conditional profit

D = Pairs demand

S = Pairs stocked

(a) The resulting conditional payoffs and corresponding expected payoffs are computed in the table;

Retailers Demands	Probability	Conditional Payoffs (RS.)			Expected payoffs (Rs.)		
		1000 Pairs	3000 pairs	5000 pairs	1000 pairs	3000 pairs	5000 pairs
1000 pairs	0.6	50	-10	-70	30	-6	-42
3000 pairs	0.3	150	150	90	15	45	27
5000 pairs	0.1	150	150	250	5	15	25
				EMV	50	54	10

(b) The expected profit under perfect information (EPPI) is computed through the table:

Retailers Demands	Probability	Conditional Payoffs (RS.)			Under perfect information	
		1000 Pairs	3000 pairs	5000 pairs	Maximum payoffs	Expected payoffs
1000 pairs	0.6	50	-10	-70	50	30
3000 pairs	0.3	50	150	90	150	45
5000 pairs	0.1	50	150	250	250	25
					EPPI	100

(C) EVPI = EPPI-EMV*

= 100-54

= 46

Thus EVPI = Rs. 46000 [1]

Chapter 3

DECISION TREE

3.1 DECISION TREE

A decision tree is a graph that uses a branching method to illustrate every possible output for a specific input. Decision trees can be drawn by hand or created with a graphics program or specialized software. Informally, decision trees are useful for focusing discussion when a group must make a decision. In some cases, choice of optimal solution is not made in one stage and decision problem involves a sequence of acts, events etc. or in some situations, decision makers may need to reverse his decisions due to availability of additional information. Decision trees are excellent tools for decision making in such situations. They provide a highly effective structure within which we can lay down options and investigate possible outcomes of choosing these options. They also help you to form a balanced picture of risks and rewards associated with each possible course of action.

Decision tree consists of:

1. Nodes
2. Branches
3. Probability estimates
4. Pay off

Now the node gets splits into DECISION node and CHANCE node

DECISION NODE :

It is represented by a square and it represents a point where a decision maker selects one alternative course of action among the availabilities

CHANCE NODE :

Each course of action may result in a chance node. The chance node is represented by a circle and indicates a point of time where decision maker will discover the response to his decisions.Branches emerge from and connect various nodes and represent either decisions or states of nature.

DECISION BRANCH:

It is the branch leading away from a decision node and represents a course of action that can be chosen at a decision point.

CHANCE BRANCH:

It is the branch leading away from a chance node and represents the state of nature of a set of chance events.

TERMINAL BRANCH:

Any branch that makes the end of the decision tee is called a terminal branch.

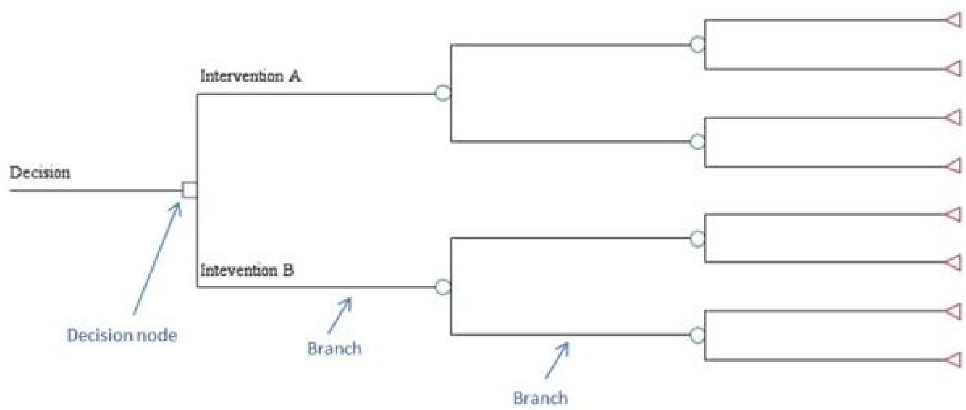

Figure 3.1: Diagramatic representation of a decision tree

EVALUATING DECISION TREE:

Optimal sequence of decision is a tree found by starting at right hand side and walk backwards.At each node, an expected return is calculated. If node is a chance node, the position value is calculated as the sum of probabilities of the branch originating from chance node, and their respective position values.If the node is a decision node, the expected return is calculated for each of its branches and highest return is selected. This process continuous until initial node is reached. Position value for this node corresponds to the outcomes expected return obtainable from the decision sequence.

EXAMPLE: Consider the payoff matrix,

Alternatives	Growth	Declining
Stocks	70	-13
Mutual funds	53	-5
Bonds	20	20
Probability	0.4	0.6

NB: The payoffs are profit and 0.4 and 0.6 are probabilities.

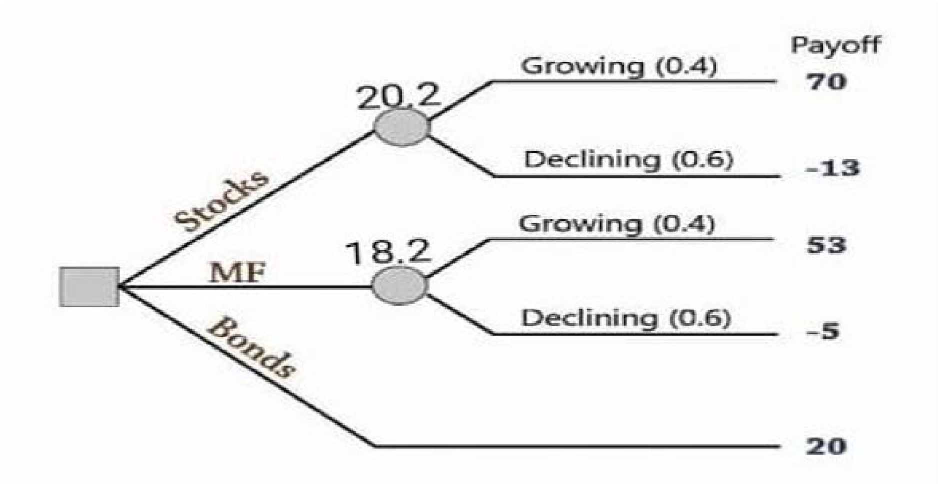

Figure 3.2: stocks-MF-Bonds

Expected value (Stocks) = 0.4 × 70 + 0.6 × (-13) = 20.2

Expected value (mutual funds) = 0.4 × 53 + 0.6 × -5 = 18.2

Decision made: Invest in stocks [8]

Chapter 4

FUZZY DECISION MAKING

Making decisions is without a doubt one of humanity's most fundamental occupations. In everyday life, we are all presented with a choice of options from which to pick. At least in some circumstances, we must choose between the many options. The study of decision-making extends back to the late 18th century in France, when various research on election systems and social choice were done. Decision making has evolved into a rich and renowned field of study since these early investigations. There is a substantial body of decision-making literature that is based mostly on theories and methodologies established in this century.

Fuzziness can be included into current decision models in a variety of ways. Bellman and Zadeh (1970), in their first publication on fuzzy decision making, provide a fuzzy model of decision making in which important goals and constraints are expressed in terms of fuzzy sets, and a decision is made by aggregating these fuzzy sets appropriately. The decision situation in this model has the following components:

1. A set of A of possible actions
2. A set of goals G_i(iϵN), each of which is expressed in terms of fuzzy sets defined on A
3. A set of constraints C_j(jϵN), each of which is expressed by a fuzzy set defined on A

Let G_i' and C_j' be the fuzzy sets defined on sets $X_i\ and\ Y_j$ respec-

tively.Assume that these fuzzy sets represent goals and constraints expressed by the decision maker.
Then for each (iϵN) and (jϵN), we describe the meaning s of actions in set A in terms of sets X_i *and* Y_j **by functions.**

g_i**:A**$\rightarrow X_i$

c_j**:A**$\rightarrow Y_j$

And expresses goals G_i **and** C_j **by**

G_i**(a)=** $G_i{}'$ $(g_i(\mathrm{a}))$

C_j**(a)=** $CG_i{}'$ $(c_j(\mathrm{a}))$

Then a decision situation is characterized by

D(a)=min($\boldsymbol{G_i}$(a), $\boldsymbol{C_j}$(a))

4.1 EXAMPLE OF FUZZY DECISION MAKING

Suppose that an individual needs to decide which of the four possible jobs a_1,a_2, a_3 , a_4 **to choose. His/her goal is to choose a job offers a high salary under the constraints that the job is interesting and within close driving distance. In this case A =**$\{a_{1,}a_{2,}a_{3,}a_4\}$ **and the fuzzy sets involved represents the concepts of high salary interesting jobs and close driving distance.**

Assume the following assignments:

$g(a_1)$ = **Rs.40000**

$g(a_2)$ = **Rs.45000**

$g(a_3)$ = **Rs.50000**

$g(a_4)$ = **Rs.60000**

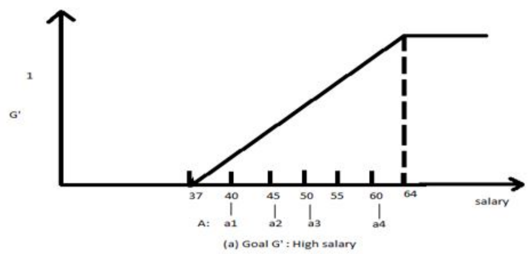

Figure 4.1: Goal G': High Salary

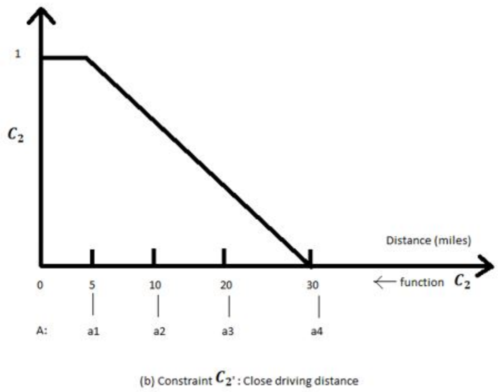

Figure 4.2: Constraint C2': close driving distance

Composing now the functions g and G' , we obtain the fuzzy set,

G= $\frac{.11}{a_1} + \frac{.3}{a_2} + \frac{.48}{a_3} + \frac{.8}{a_4}$

Which expresses the goal terms of the available jobs in set A.?

The first constraints, requiring that the job interesting is expressed directly in terms of set A.

Assume that the individual assigns to four jobs in A, the following membership grades in the fuzzy set of interesting jobs:

$$C_1 = \frac{.4}{a_1} + \frac{.6}{a_2} + \frac{.2}{a_3} + \frac{.2}{a_4}$$

The second constraint, requiring the driving distance be close, is expressed in terms of the driving distance from home to work.

$C_1(a_1)$ = **27 miles**

$C_2(a_2)$ = **7.5 miles**

$C_3(a_3)$ = **12 miles**

$C_4(a_4)$ = **2.5 miles**

By corresponding functions C_2 **and** C_2**', we obtain the fuzzy set**

$$C_1 = \frac{.1}{a_1} + \frac{.9}{a_2} + \frac{.7}{a_3} + \frac{1}{a_4}$$

Which expresses the constraints in terms of set A.

D= $\frac{.1}{a_1} + \frac{.3}{a_2} + \frac{.2}{a_3} + \frac{.2}{a_4}$

Which represents a fuzzy characterisation of the concept of desirable job.

Among the available four jobs $\widehat{a} = a_2$ is the most desirable job under the given goal G and constraint C_1 and C_2 [7]

4.2 FUZZY DECISION MAKING

In real life problems, the class of objects do not have well defined criteria of membership that is confusion about inclusion or exclusion of objects in the class. This is reason of uncertainty in decision making problems. This uncertainty arises due to lack of knowledge about inclusion and exclusion of objects in a particular class or due to inherent vagueness. These types of problems can be solved by existing mathematical theories such as theory of probability, theory of fuzzy sets. Applications of fuzzy sets within the field of decision making have, for the most part consisted of fuzzification of the classical theories of decision making. While decision making under conditions of risk have been modelled by probabilistic decision theories and game theories, fuzzy decision theories attempt to deal with the vagueness and nonspecificity inherent in human formulation of preferences constraints and goals.

4.3 CASE STUDY ON FUZZY DECISION MAKING

Here we going to see a decision making problem as an application of fuzzy sets. I have conducted a survey to evaluate the consumer's preference towards various online shopping websites. The consumer's preference is calculated by adding the membership values given by the respondents to each criteria [1 –highest membership value and 5- least membership value]. The data collected is given below:

4.3.1 CRITERIA 1 – BETTER PRICES

Amazon	72
Flipkart	86
Myntra	103
Ajio	134
Snapdeal	110

4.3.2 CRITERIA 2 – FAST DELIVERY

Amazon	65
Flipkart	82
Myntra	79
Ajio	98
Snapdeal	111

4.3.3 CRITERIA 3 – QUALITY AND ASSURANCE

Amazon	82
Flipkart	93
Myntra	82
Ajio	75
Snapdeal	115

4.3.4 CRITERIA 4 – DISCOUNTS AND OFFERS

Amazon	83
Flipkart	77
Myntra	104
Ajio	74
Snapdeal	112

4.3.5 CRITERIA 5 – PRODUCT VARIETIES

Amazon	81
Flipkart	97
Myntra	85
Ajio	76
Snapdeal	111

Let U be the set of online shopping websites.

Then U= {A_1, A_2, A_3, A_4, A_5, A_6, A_7, where A_1=Amazon; A_2 = Flipkart; A_3 = Myntra; A_4= Ajio; A_5= Snapdeal

Let E = $\{X_1, X_2, X_3, X_4, X_5\}$ be the set of parameters i.e; the criteria for evaluating the online shopping websites

X1= Better prices

X2= Fast delivery

X3=Quality and assurance

X4=Discounts and offers

X5=Product varieties

The responses of the consumers are recorded using Google forms and their preferences are converted into membership values according to the table given below;

	MEMBERSHIP VALUES
Strongly disagree	0.1
Disagree	0.3
Indifferent	0.5
Agree	0.8
Strongly agree	1

On the basis of their preferences we construct the following fuzzy sets,

$\mathbf{A}_1 = (X_1, 1), (X_2, 1), (X_3, 0.5), (X_4, 0.5), (X_5, 0.8)$

$\mathbf{A}_2 = ((X_1, 0.8), (X_2, 0.5), (X_3, 0.3), (X_4, 0.8), (X_5, 0.3)$

$\mathbf{A}_3 = (X_1, 0.5), (X_2, 0.8), (X_3, 0.8), (X_4, 0.3), (X_5, 0.5)$

$\mathbf{A}_4 = (X_1, 0.1), (X_2, 0.3), (X_3, 1), (X_4, 1), (X_5, 1)$

$\mathbf{A}_5 = (X_1, 0.3), (X_2, 0.1), (X_3, 0.1), (X_4, 0.1), (X_5, 0.1)$

The above fuzzy sets in terms of membership value can be written in the tabular form as follows:

The choice value of a website is also calculated:-

U	$\mathbf{X_1}$	$\mathbf{X_2}$	$\mathbf{X_3}$	$\mathbf{X_4}$	$\mathbf{X_5}$	$\sum \mathbf{A_{ij}}$
$\mathbf{A_1}$	1	1	0.5	0.5	0.8	3.8
$\mathbf{A_2}$	0.8	0.5	0.3	0.8	0.3	2.7
$\mathbf{A_3}$	0.5	0.8	0.8	0.3	0.5	2.9
$\mathbf{A_4}$	0.1	0.8	1	1	1	3.4
$\mathbf{A_5}$	0.3	0.1	0.1	0.1	0.1	0.7

From the table the maximum choice value are for the websites A1 and A4, i.e, for Amazon and Ajio.

In order to find the weighted choice value of the websites we have the following equation,

$c_{ij} = \sum d_{ij}$, where

$d_{ij} = w_j \times \mathbf{A}_{ij}$

For that we have to assign weights for the parameters

PARAMETERS	WEIGHTED VALUE(W)
$\mathbf{X_1}$	0.5
$\mathbf{X_2}$	0.4
$\mathbf{X_3}$	0.9
$\mathbf{X_4}$	0.7
$\mathbf{X_5}$	0.3

Now we calculate the weighted choice value,

U	X_1	X_2	X_3	X_4	X_5	WEIGHTED CHOICE VALUE
A_1	1	1	0.5	O.5	0.8	1.94
A_2	0.8	0.5	0.3	0.8	0.3	1.52
A_3	0.5	0.8	0.8	0.3	0.5	1.65
A_4	0.1	0.3	1	1	1	2.07
A_5	0.3	0.1	0.1	0.1	0.1	0.38

From the weighted choice value the maximum is for A4

i.e, Ajio is the most preferred website by consumers.

Chapter 5

CONCLUSION

When it comes to making decisions, one should always weigh the positive outcomes as well as the negative outcomes. Decision theory offers a platform to achieve this goal. Making solid decisions is a necessary management skill. Having a strategy that guides management's decision making improve confidence and results. We have come across the application of fuzzy decision making, but there are so many any other applications to decision theory. Some of the most exciting developments in this field occurred in the expansion of the economic approach to include the functioning of political structure. The work has been extended to include a theory of political decision making.

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