

**A Two Warehouses Inventory Model for Decaying
Items with Stock and Time Dependent Demand rate
(Dissertation Code: BSMA852)**


**A
Report submitted in partial fulfillment of the
requirement for the degree of
Master of Science in Mathematics**



**Submitted to:
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**A Comparative Analysis View Point of Solution of Transportation
Model by Existing Methods & New Methods**

Project Report submitted

In partial fulfilment of the requirement for the degree

Of

Master of Science in Mathematics

By

Ms. Dipti Yadav

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Under the guidance of

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A Novel Approach for the Solution of the Assignment Model

*A Report submitted in partial fulfilment of the requirement for the
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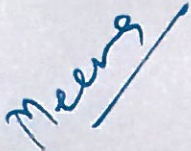
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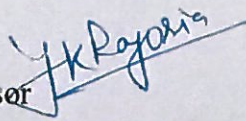
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SPECTRAL THEOREM FOR NORMAL MATRICES

*Project report submitted
In partial fulfillment of the requirements of the degree*

of

MASTER OF SCIENCE IN MATHEMATICS

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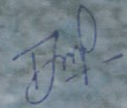


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JUNE 2020

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SPECTRAL THEOREM FOR NORMAL MATRICES

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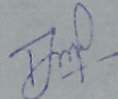
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DECLARATION

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ABSTRACT

Spectral Theory plays an important role in both pure and applied mathematics. In finite dimension, the simplest form of Spectral Theorem says that a quadratic form can be transformed by rotation of the plane into a normal form. The infinite-dimensional spectral theory was established by David Hilbert along with the Hilbert Space Theory. This theory has been extended to some general algebraic structures such as C^* -algebra, but we restrict ourselves here to the finite-dimensional case only.

We start with a historical perspective of spectral theorems and move forward with the motivation behind this work. We initially deal with the definition and some examples of a vector space and linear transformation. This establishes a foundation for the work on Spectral Theorems. Norm and inner product on a linear space are defined and we also present some properties such as continuity of inner product and norm. Some important definitions and preliminary results on Hilbert spaces along with concepts such as orthogonal direct sum, projections, adjoints etc. are discussed.

In the last stage, we essentially deal with spectral theorems. We look at spectral values in finite and infinite dimensions respectively. Spectrum and spectral radius formula are also elucidated. We present some preliminary results and spectral theorem for self-adjoint operators in finite dimension, or in simple terms for self-adjoint matrices. The last section of this work narrates the spectral theorem for normal matrices and ends with an example of a matrix decomposed using this theorem.

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ACKNOWLEDGEMENTS

My joy knows no bounds in expressing gratitude for the completion of this work. I hope, it is not the beginning of the end; but the end of the beginning of a learning experience, the values of which cannot be measured quantitatively.

First and foremost, I would like to pay thanks to almighty god for giving me power and the opportunity to do this work.

The efforts put up by me would not have been fruitful, if it were not the people around me, who encouraged me at all times. I express my sincere gratitude towards my supervisor Dr. Ajay Kumar, School of Basic & Applied Sciences, K. R. Mangalam University, Sohna road, Gurugram. His profound knowledge of subject, matured guidance and unceasing encouragement has been a great source of inspiration for my work. It was my fortune that I got a chance to gather a lot of learning under his guidance.

I am also highly obliged to Dr. Meena Bhandari, Dean, School of Basic and Applied Sciences, K.R. Mangalam University, Sohna road, Gurugram, for providing this opportunity to carry out the present Project/ work. I am heartily thankful to all staff members of Department of Mathematics, School of Basic and Applied sciences, K.R. Mangalam University, Sohna road, Gurugram for encouraging and giving me proper advice during my M.Sc. (H) Mathematics programme.

This acknowledgment will remain incomplete without expressing my indebtedness to my affectionate parents Sh. Hansraj Yadav and Smt. Sukesh Devi, who encouraged and inspired me in every possible way and also created an invisible homely atmosphere around me due to which I never felt myself alone even in my loneliness during my studies.

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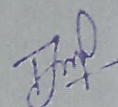
Chapter 1

Introduction

1.1 Background

The modern *Spectral Theory* that is still evolving has its roots in Algebra, Analysis and Analytical Geometry. The story began with the work of Fermat and Descartes in Analytical Geometry. The simplest form of Spectral Theorem says that a quadratic form can be transformed by rotation of the plane into a normal form. These kinds of problems were further investigated by many great mathematicians including L. Euler, J. L. Lagrange, Carl G. J. Jacobi and A. L. Cauchy. It was Cauchy who discovered that the coefficients in the normal form of a symmetric quadratic form are real. Later J. J. Sylvester and A. Cayley gave a matrix representation of this algebraic description in n -dimensional space.

The infinite dimensional spectral theory was established by David Hilbert along with the *Hilbert Space Theory*. It was Erhard Schmidt, a doctoral student of David Hilbert, who simplified and presented this theory for the Hilbert space l^2 . Later on, Friedrich Riesz developed this theory on the Lebesgue space L^2 . Werner Heisenberg and his coworkers Max Born and Pascual Jordan used linear transformations to represent a physical quantity. At that time, no mathematician or physicist, including Hilbert, had any presentiments that this theory will become a mathe-



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mathematical tool in quantum mechanics. A much more revolutionary work to extend this theory was done by John von Neumann. He axiomatically introduced the concept of an abstract Hilbert space and extended this theory from bounded to unbounded operators. This theory has since been extended to even more general algebraic structures such as C^* -algebra. For more details related to the historical perspective of Spectral Theorem we refer to [10].


1.2 Overview

This project work is divided into four chapters in which the first chapter is introductory and the next three account the main body of the project. The organization of the four chapters is as follows.

Chapter 1 is introductory in nature. It starts with a historical perspective of spectral theorems and ends with an overview of the project.

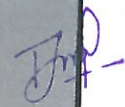
Chapter 2 begins with the motivation behind this work. Section 2.2 deals with definition and some examples of a vector space. In section 2.3, we define a linear transformation and a linear operator. Further, we give some examples and see how a matrix represents a linear operator.

Chapter 3 works as a foundation for the current work. In section 3.1, normed linear spaces are defined and illustrated with some examples. Section 3.2 presents a description of the continuity and boundedness of linear transformations. In addition, the concept of operator norm is elaborated, and the section ends with some results, inequalities and examples of bounded and unbounded operators. In section 3.3, we define an inner product on a linear space and also present some properties such as continuity of inner product. Hilbert space and its properties are explained in section 3.4. This section presents some important definitions and preliminary results on Hilbert spaces. The concepts such as orthogonal direct


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sum, projections, adjoints etc. are discussed in this section.

Chapter 4 essentially deals with spectral theorems. In sections 4.1 and 4.2 we look at spectral values in finite and infinite dimensions respectively. This enables us to differentiate between spectral value and eigenvalue. Spectrum and spectral radius formula are elucidated in section 4.3. In section 4.4, we present some preliminary results and spectral theorem for self-adjoint operators in finite dimension, or in simple terms for self-adjoint matrices. Section 4.5 is the last section of this chapter. This section narrates the spectral theorem for normal matrices and ends with an example of a matrix decomposed using spectral theorem.



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**A STUDY ON THE IMPACT OF COVID-19 ON
INVESTORS RISK TAKING BEHAVIOUR IN THE
GURUGRAM REGION**

Submitted in the partial fulfilment of the requirements
for the award of the degree of

**MASTER OF SCIENCE
IN
MATHEMATICS**

by

MEENAKSHI YADAV
1903600001

Under the supervision of

VENUKA SANDHIR



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CANDIDATE'S DECLARATION

I hereby declare that the work which is being presented here entitled, "A STUDY ON THE IMPACT OF COVID- 19 ON INVESTORS RISK TAKING BEHAVIOUR IN THE GURUGRAM REGION" by Meenakshi Yadav in partial fulfillment of requirements for the award of the degree of Master of Science in Mathematics submitted in the Department of Mathematics, School of Basic and Applied Science at K. R. Mangalam University, Gurugram, is an authentic record of my own work under the supervision of Ms. Venuka Sandhir. The matter presented in this report has not been submitted by me (in any form) to any other University / Institute for the award of M.Sc. degree.

I hereby further declare that in case of any legal dispute in my M.Sc. dissertation, I will be solely responsible for the same.

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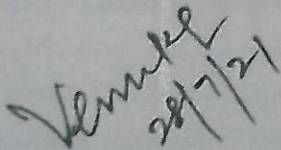
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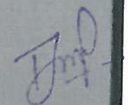
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All the investigations and the observations regarding this work have been done heartily by me under and under the scholarly appreciably and encouraging guidance of my respected supervisor Miss Venuka Sandhir, department of mathematics, school of basic and applied science, K. R. Mangalam University, Sohna Road, Gurugram. Her profound knowledge of subject, matured guidance, parental advices and unceasing encouragement has been a great source of inspiration for my work. It was my fortune that I got a chance to gather a lot of learning under his guidance. She is my ideal as a teacher and as a person.

I am also heartily obliged to Dr. Meena Bhandari, Dean, School of basic and applied sciences, institutes of basic science, K. R. Mangalam University, Sohna road, Gurugram, for providing this opportunity to carry out the present project/work.

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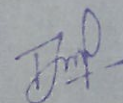


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Scope for Further Research

References

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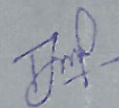
CHAPTER 1

INTRODUCTION

1.1 Impact of COVID-19 on Investment

Novel Corona virus has affected millions of people worldwide. Not only has it caused a huge health crisis, it has also let the global economy in a wounded state. Nationwide lockdown although a welcome step to reduce the spread of Covid19, has left the general population in a grim state where almost all businesses and jobs have suffered a great deal. In the present situation therefore, saving and investment has once again emerged as two pillars of our economy by whose support our country can survive this global pandemic. Saving as a habit is deep rooted in India and has many times in the past also helped us face global economic crises. This study aims to analyse the effect of Covid-19 on saving habits of individuals in Gurugram region. The aim is to understand to what extent did savings help a normal citizen ride out the storm of Covid-19 and what changes if any have happened in the saving and investment patterns in general.

Over the recent years, financial landscape has changed considerably becoming complex with the introduction of many new financial products. At present there are lot of investment avenues available in the financial market for an investor. One can invest in Bank Deposits, Post Office, Corporate Debentures, PPF and Bonds where there is low risk but low return. Investor may invest in Stock of companies through stock market where the risk is high and the returns are also proportionately high. All investment modes have its own advantage & disadvantage and the investors try to balance these pros and cons of different investment modes while investing in them. But yet the different investors have different views of investing. Some invest for Return, some for Tax Planning and some for Safety, etc. In past research, the various studies on Non risky investment avenues were conducted and in some



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studies the risky investment avenues were also examined. In this study, investor's perception on risky and non risky investment avenues has been examined when the return is declining on continuous basis due to pandemic.

1.2 investment avenues

From past few years the Mutual Fund industry come up with many changes in terms of convenience to the investors making it easy to select and invest with the advantage of providing higher returns. Not only Indian many multinational companies come up with various schemes to meet out the investment objective of the investors bringing in their professional expertise in managing funds worldwide. Because of this investors have a broad range of schemes available of mutual funds to select depending on their individual profiles.

Investment Options Available In current competitive environment there are large number of investment options are available in the market to invest in. Some of them are more riskier than others. Some of them are providing better returns as compared to others. These can also be differentiated by many parameters like liquidity, return, professional management and others. The investor has to choose right investment choice based on their specific need, risk preference, return expectation and various other liabilities.

The various preferred investment options available in the market are:

- a) Banks
- b) Post Office Schemes
- c) PPF
- d) Insurance Products
- e) Shares/ Debentures/ Bonds
- f) Mutual Funds

Indians have been traditionally savers and invested money in traditional saving instruments. Investor's traditionally putting money in safe, risk free investments like Banks, Post office and Insurance has started to invest in Stocks, Bonds and shares thanks to the Mutual fund Industry. But going by the reports, not more than 5% of households savings are channelized into the markets either directly or through the mutual fund route. Not all parts of country are contributing equally into the mutual fund corpus. 8 cities account for over 60% of the total assets under management in mutual funds. These are issues which need to be addressed jointly by all concerned with the mutual fund industry so to get investment from all parts.

1.3 Statement of the Research Problem

The present study aims to understand the impact of COVID- 19 on investors risk taking behaviour towards different investment avenues.

1.4 Significance of the study

It is very important to assess the risk bearing capacity and its relationship with investment behaviour. It is hoped that results of this study would improve policy makers', planners' and researchers' to understand investment behaviour of individual. It may serve as an important tool as it contributes to the efforts of the country in improving financial crisis due to pandemic. The present study would provide significant contribution in the area of behavioural finance and investment decisions.

1.5 Objective of the Study

The general objective of the study is to examine the investment behaviour of the investor in Gurugram region during pandemic. To examine the above general objective, the study has pursued the following specific objectives:

1. To know the investors preference towards various investment alternatives (risky and non risky).
2. To study the relationship between the demographical factors (like gender, age, income, marital status, occupation and academic qualification) of the investors and their risk attitude towards various investment avenues.
3. To analyse the frequency of investment of the investors depending upon their income.



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A Comparative Analysis View Point of Solution of Transportation
Model by Existing Methods & New Methods

Project Report submitted

In partial fulfilment of the requirement for the degree

Of

Master of Science in Mathematics

By

Ms. Dipri Yadav

(Roll No.:1803600001)

Under the guidance of

Dr. Yogendra Kumar Rajoria



School of Basic and Applied Sciences

K. R. MANGALAM UNIVERSITY

SOHNA ROAD, GURUGRAM

June, 2020

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**K.R. Mangalam University
Sohna Road, Gurugram, (Haryana)**

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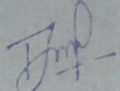
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June, 2020

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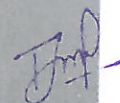

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DEDICATION

My work is dedicated to my parents, Shri Rakesh Kumar and Smt. Savitri Devi who encouraged and inspired me in every possible way and also created an invisible homely atmosphere around me due to which I never felt myself alone even in my loneliness during my studies. I am also a heartiest thankful to my brother & sister, Kartik and Kirti who played a great role in my studies.



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DECLARATION

I hereby declare that the work which is being presented here in entitled "A Comparative Analysis View Point of Solution of Transportation Model by Existing Methods & New Methods" in partial fulfilment of requirements for the award of the degree of M.Sc Mathematics submitted in the School of Basic and Applied Science at K. R. Mangalam University, Gurugram, is an authentic record of my own work carried out during a period from Jan 2020 to June 2020 under the supervision of Dr.Yogendra Kumar Rajoria. The matter presented in this report has not been submitted by me (in any form) in any other University / Institute.

Dipti Yadav

Ms. Dipti Yadav

Roll No. 1803600001

M.Sc. Mathematics

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Date: 11 June 2020

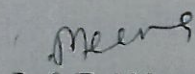
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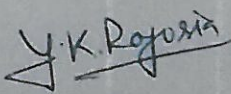
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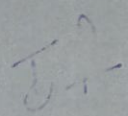
CERTIFICATE

This is to certify that the project titled "A Comparative Analysis View Point of Solution of Transportation Model by Existing Methods & New Methods" is an academic work done by "DIPTI YADAV" submitted in the partial fulfilment of the requirement for the award of the degree of "Master in Science (Mathematics)" from K.R. Mangalam University, Sohna Road, Gurugram under my guidance and direction. To the best of my knowledge and belief the data and information presented by her in the project has not been submitted earlier elsewhere.

Date: 11 June 2020


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Dean, SBAS
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Dr. Yogendra Kumar Rajoria
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ABSTRACT

In Operations Research, an important application that has a special case of linear programming is known as the transport problem. Transportation problems regarded as a significant characteristic that has been investigated in a variety of operations as well as research provinces.

In this study, various newly alternate methods such as; mean proposed method (AMM, GMM, HMM, QMM), ATN method, and second minimum value method in recent years are applied to solve real-world problems of the transportation problems. In the present study, an attempt has made to comparative investigation and graphical representation of IBF solution obtained by various methods.



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ACKNOWLEDGEMENT


My joy knows no bounds in expressing gratitude for the completion of this work. I hope, it is not the beginning of the end; but the end of the beginning of a learning experience, the values of which cannot be measured quantitatively. First and foremost, I would like to pay thanks to almighty god for giving me power and the opportunity to do this work. The efforts put up by me would not have been fruitful, if it were not the people around me, who encouraged me at all times.

All the investigations and the observations regarding this work have been done heartily by me under the scholarly, appreciable and encouraging guidance of my respected supervisor Dr.Yogendra Kumar Rajoria, Department of mathematics, School of basic and applied sciences, K. R. Mangalam University, Sohna road, Gurugram. His profound knowledge of subject, matured guidance, parental advices and unceasing encouragement has been a great source of inspiration for my work. It was my fortune that I got a chance to gather a lot of learning under his guidance. He is my ideal as a teacher and as a person.

I am also highly obliged to Dr Meena Bhandari, Dean, School of basic and applied sciences, institutes of basic science, K.R. Mangalam University, Sohna road, Gurugram, for providing this opportunity to carry out the present Project/ work.

I am heartily thankful to all staff members of Department of mathematics, School of basic and applied sciences, K. R. Mangalam University, Sohna road, Gurugram for encouraging and giving me proper advice during my M.Sc. Mathematics programme.

This acknowledgment will remain incomplete without expressing my indebtedness to my affectionate parents *Sh. Rakesh Kumar and Smt. Savitri Devi*, who encouraged and inspired



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It will be unfair if I do not give my heartiest thanks to my friend Monika Yadav & Savita Pandey for her co-operation

Dipti Yadav

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ABBREVIATIONS

Serial number	Methods	Abbreviations
1	Operations Research	OR
2	Initial Basic Feasible Solution	IBFS
3	North-West Corner Method	NWC
4	Least Cost Method	LCM
5	Vogel's Approximation Method	VAM
6	Advanced Vogel's Approximation Method	AVAM
7	Row Minima Method	RMM
8	Column Minima Method	CMM
9	Arithmetic Mean Method	AMM
10	Harmonic Mean Method	HMM
11	Geometric Mean Method	GMM
12	Quadratic Mean Method	QMM
13	Second Minimum Value Method	SMVM
14	Allocation Table Method	ATM
15	Minimum Odd Cost	MOC
16	Allocation Cost Value	ACV
17	Cement Company of Northern Nigeria	CCNN



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1. Introduction:

The Transportation Problem in OR is a special type of linear programming problem where the objective is to minimize the cost of distributing a product from a number of sources or origins to a number of destinations. The transportation problems require a special method of solution. The origin of a transportation problem is the location from which shipments (products) are dispatched. The destination of a transportation problem is the location to which shipments (products) are transported. The unit transportation cost is the cost of transporting one unit of the consignment from an origin to a destination. The transportation problems are concerned with the best possible (optimal) way in which a product produced at different factories or plants (origins) can be transported to a number of warehouses or customers (destinations). The objective in a transportation problem is to fully satisfy the destination requirements within the operating production capacity constraints at the possible minimum cost. The transportation problem has an application in industry, communication network, planning, scheduling transportation and allotment etc.

Transportation problem deals with the problem of how to plan production and transportation such as in an industry where there are several plants at different location and have larger number of customers of their products. The transportation problem received this name because of its applications in determining how to optimally transport products. Transportation problem is a logistical problem for organizations especially for manufacturing and transport companies. This method is a useful tool in decision-making and process of allocating problem in these organizations. The transportation problem deals with the distribution of products from several points, such as factories i.e. sources, to a number of points of demand, such as warehouses i.e. destinations. Each source is able to supply a fixed number of units of products, usually known as availability, and each destination has a fixed demand, usually known as requirement. Because of its major application in solving problems involving several products sources and destinations of products, this type of problem is called "The Transportation Problem".

Transportation problem is associated with our day-to-day activities in real life and mainly deals with logistics. It helps in solving problems on distribution and transportation of products or resources from one place to another. The two common objectives of transportation problems are:

- a) Minimize the cost of shipping m units to n destinations


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b) Maximize the profit of shipping m units to n destinations

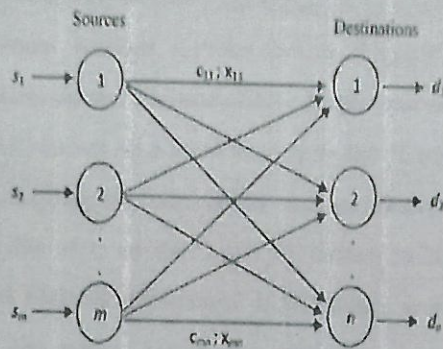


Figure (a): Network flow model of the transportation problem

2. Historical Background of Operations Research

No science has been born in a single day. OR is as old as science & society. The roots of or extend to early 1800s, it was in 1885 when Frederick W. Taylor emphasised the application of scientific analysis to methods of production, that the real start took place. In 1917, A.K. Erlang, a Danish mathematician, published his work on the problem of congestion of telephone traffic. Beginning in the 20th century, study of inventory management could be considered the origin of modern operations research with economic order quantity developed by Ford W. Harris in 1913. OR may have originated in the efforts of military planners during World War I. Percy Bridgman brought operational research to bear on problems in physics in the 1920s and would later attempt to extend these to the social sciences.

When the term "operational research" was first used in the late 1930s, nobody could have predicted the radical turns its history would take in the next 20 years. These turns were guided by the individual experiences and agendas of many different people and institutions. Similarly, nobody can now predict what will come of the present alliance of OR/MS and analytics. But, if a history that attends carefully to individual experiences and agendas can decode the past, a thorough history of the people and institutions of our own time can make it easier to talk concretely about the opportunities and challenges of the present.

In 1937 Modern OR originated at the Bawdsey Research Station in the UK as the result of an initiative of the station's superintendent, A. P. Rowe. Initially, Rowe analysed the operating of the radar equipment and its communication network. This revealed unappreciated limitations of the CH network and allowed remedial action to be taken. The

**APPLICATION OF APPLIED MATHEMATICS IN BETTING
MARKET**

Project Report submitted

In partial fulfilment of the requirement for the degree

Of

Master of Science in Mathematics

By

Ms. Savita Pandey

(Roll No.:1803600002)

Under the guidance of

Mrs. Pooja Vats



SCHOOL OF BASIC AND APPLIED SCIENCES

K. R. MANGALAM UNIVERSITY

SOHNA ROAD, GURUGRAM

June, 2020

A handwritten signature in blue ink, likely belonging to the Registrar, is positioned above the printed name.

Registrar

K. R. Mangalam University
Sohna Road, Gurugram, (Haryana)

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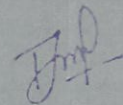
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June, 2020

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CONTENT

Declaration
Certificate
Abstract
Acknowledgement
Introduction
Prediction Markets And Sports Betting
Conceptual Framework
Data
Emperical Results
Table Representation
Mechanism of Inefficiency
Conclusion
Reference



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DECLARATION

I hereby declare that the work which is being presented here in entitled "Application of applied mathematics in betting market" in partial fulfilment of requirements for the award of the degree of M.Sc. Mathematics submitted in the School of Basic and Applied Science at K. R. Mangalam University, Gurugram, is an authentic record of my own work carried out during a period from Jan 2020 to June 2020 under the supervision of Mrs. Pooja Vats. The matter presented in this report has not been submitted by me (in any form) in any other University / Institute.

Place: Sohna

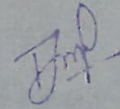


Mrs. Savita Pandey

Roll No: 1803600002

M.Sc. Mathematics

Date: 11/06/2020



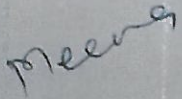
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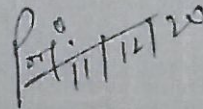
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Abstract

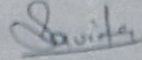
In recent years, there has been a substantial global increase in gambling and prediction markets, including casino, sports betting, lotteries, elections and wagering on financial instruments. This trend has heightened interest in numerous economic and financial issues related to this sector. These include questions relating to the efficiency of these markets, heterogeneity in risk attitudes among economic agents, and the use of prediction markets in policy analysis. The papers in this special issue provide a mix of theoretical and empirical evidence on these issues.



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(Savita Pandey)

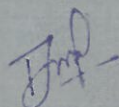
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Introduction: In betting markets individuals price the likelihood of future events. If the prediction market price accurately represents all of the information available in the market, there is no room for arbitrage. This "no arbitrage" condition has a natural analog to the efficient markets hypothesis, where traders predict the present value of an asset, which features prominently in the economics and finance literatures. Sports betting markets are particularly unique prediction markets since the predicted event will be realized with certainty. For this reason, researchers have focused on sports betting markets as fertile ground for tests of market efficiency (Sauer et al. 1988, Woodland and Woodland 1994, Gil and Levitt 2007).

The existing literature has focused on professional sports in testing for market efficiency (Sauer et al. 1988, Woodland and Woodland 1994, Brown and Sauer 1993, Scheibehenne and Broder, 2007). Few studies have focused on amateur sports. Despite their amateur status, there are a number with large betting markets. For example, it is estimated that as much as \$12 billion is bet on the NCAA Final Four Basketball tournament each spring (Matuszewski 2009). Although the basic structure of the markets is similar to that in professional sports, the information environment can vary considerably. For example, college teams have different characteristics from professional teams. When moving from professional sports to their college counterparts, the number of teams increases by four fold, there is greater variation in team quality, player turnover is inherently greater, and, unlike professional sports, injuries and suspensions are not always released publicly. There may also be fewer sources of public information in college sports; while every professional sports team receives substantial newspaper and television coverage, relatively few college programs are subject to such intense scrutiny. Indeed, many major college sports powers are outside of major media markets, which can act to limit the availability of information about teams. More

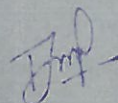


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line should not be predictive of future performance if the market is efficient (Fama 1991, among others). We find, however, that betting lines are not independent from game to game. In particular, current betting lines have memory; they are functions of previous betting market results. Because of this serial correlation, we test to see whether or not teams that exceed the betting line are likely to do so in the following week. We find that teams who exceed the betting line in one week are no more likely to do so in the following week because betting lines are systematically greater for teams who beat the betting line the previous week.

This bias suggests that betting houses are particularly sensitive to potential "hot hand" bias among bettors. As a rule, betting houses are particularly sensitive to any bias among bettors- their profit motive is to have an equal amount of money on either side of the bet. If bettors believe in the hot hand, the profit motive of betting houses will cause them to overstate the betting lines of "hot" teams in order to avoid risk. We support our conclusion with both qualitative and statistical evidence. Qualitatively, we use narrative evidence to show this sensitivity drives the overpricing performance against the betting line is commonly used to predict current performance. Statistically, we show how mispricing of games varies by whether or not they contain "hot" teams. One consequence of this adjustment is that it makes other conditional strategies, such as betting on favorites that beat the betting line in the week before, consistently profitable. Both of these sources of evidence are consistent with our finding that counteracting the "hot hand" bias of bettors creates profitable strategies that cause the college football betting market to be inefficient.


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What is Statistics:-

The word statistics is very popularly used in practice. In addition to many numerical facts, 'statistics' also refers to a subject, just as 'mathematics' refers to a subject, as well as symbols, formulae and theorems and accounting refers to principles and methods as well as to accounts, balance sheets and income statements. In this sense statistics is a body of method of obtaining and analysing data in order to Base decisions on them. It is a branch of scientific method in dealing with phenomena that can be described numerically either by account or by measurement.

Thus the word statistics refers either to quantitative information or to a method of dealing with quantitative information. "statistics in the use of data to help the decision maker reach better decision."

Statistical Methods:-

The methods by which statistical data are analyzed are called statistical methods. The mathematical theory which is the basis of these methods is called the theory of statistics or mathematical statistics.

Statistics: Science or Art :-

Whether statistics is a science or an art is often a subject of debate. Science refers to a systematized body of knowledge. It studies cause and effect relationship and attempts to make generalization in the form of scientific principles or laws. It describes facts objectively and avoid vague judgements as good or bad. Science in short, is like a light house that gives light to the ships to find out their own way but does not indicate the direction in which they should go, art on the other hand refers



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to the skill of handlings so as to achieve a given objectives. "if science is knowledge, then art is action". Looking from this angle statistics may also be regarded as an art.

Limitations of statistics:-

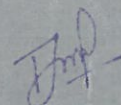
1. Statistics does not deal with isolate measurements.
2. Statics deal only with quantitative characteristics.
3. Statistical results are true only on an average.
4. Statistics can be misused.

Collection of data:-

Data:- Data constitute the foundation of statistical analysis and interpretation. Hence, the first step in statistical work is to obtain data.

Data can be obtained from three important sources:-

Secondary data:- when an investigator uses the data which has already, been collected by others, such data are called secondary data. Secondary data can be obtained from journals and reports, government publications, publications of research organizations, trade and professional bodies, etc.



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