



# INTERNATIONAL JOURNAL OF ADVANCE RESEARCH AND DEVELOPMENT

(Volume 4, Issue 9)

Available online at: [www.ijarnd.com](http://www.ijarnd.com)

## Operations Research in financial markets

Rushil Goyal<sup>1</sup>, Rahul Jain<sup>2</sup>, Rishab Dhariwal<sup>3</sup>, Sahil Dhanak<sup>4</sup>, Sakshi Prabhu<sup>5</sup>  
Student<sup>1, 2, 3, 4, 5</sup>, SVKM's Narsee Monjee Institute of Management Studies, Mumbai, Maharashtra

### ABSTRACT

*“OR utilizes the planned approach and an interdisciplinary team in order to represent complex functional relationships as mathematical models for the purpose of providing a quantitative analysis” -Thieraub and Klekamp In the research paper, the overview of the industry for two years has been provided along with the research objectives as to what our main task was, what areas are focused on and what all the issues are as well as the steps taken to avert those issues. Operation research (OR) plays a crucial role in evaluating certain financial issues such as foreign exchange market, securities development, market regulations, debt, etc. OR helps in solving these problems and provides a proper solution to it. The research done on the financial market has provided us with various inputs as to when an investment should be made and when the investment should be sold off so as to earn or reap the maximum benefits out of it. The financial market is very vulnerable to any changes and hence, people need to keep a very close and frequent watch of it. People need a deep understanding of the financial market to act in it and are not an area of a layman. Basics also work when it is related to small scale transactions but when it comes to large investments, it is always advisable to take the help of an expert. For efficient solving of problems, OR techniques that were used twenty years ago such as statistical analysis, Linear Programming Forecasting, and Simulation were followed. Apart from these, some other problems which could be solved through OR were funding decisions.*

**Keywords**— Operations Research, Financial Markets, Sensex, Nifty, Investments, Decision Making, Financial Problems, Profitability

### 1. INTRODUCTION

Sensex slumps 470 points, Nifty ends at 10,705 and companies like Reliance Industries (RIL), ICICI Bank, TCS, HDFC, and Infosys contributed the most to the Sensex's fall. The stock market further slumped and one of the companies that were the biggest laggard is Yes Bank, it was down by a staggering 16%. On the contrary, Tata Motors was one of the top gainers, up by 2%. Only 4 out of the 30 constituents ended in the green while the rest 26 declined. (Business Standard, 2019).

The financial industry is of major importance as it contributes to the creation of goods and services by the firms which further increase the consumption and hence the growth of the economy. In today's world billions of people are heavily invested in the financial market even with high uncertainty that surrounds the market. With the economic slowdown on a global scale, India is in a worse position than it has been in years. India's position is a concern that should be shared by everyone in the country. The investors need to be careful while investing to keep the return as high as possible in a time like this. And the returns ultimately come down to the person's ability to make decisions based on quantitative data and the analysis of that data. This is where Operations Research (OR) comes into play.

Operations Research plays a vital role in the analysis of certain financial problems such as foreign exchange markets, design securities, market regulations, risk evaluation and control, equity, etc. These are very complex problems and OR makes life easy for investor analysts by quantifying these problems into mathematical problems and in doing so, provide a viable solution. OR makes use of programming techniques like linear programming, Quadratic, Integer and also Goal and Dynamic programming to help a company to find better prospects of investment, minimise its cost, help others to grow through proper allocation of resources, etc. the techniques may help the companies to save themselves from investing in an area which may turn bad for them.

Through this research paper we would like to analyse the OR techniques that can be used to better understand and interpret the financial market. These techniques can be applied to the problems that are faced by investors in the financial market. These techniques should be made aware to everyone so that everyone takes informed decisions regarding their investments. The proper application can be very fruitful for an economy as the probability of bad investments will decrease.

### 2. OVERVIEW OF THE INDUSTRY

A financial market is a market in which people trade financial securities and derivatives at low transaction costs. Securities include stocks and bonds, and precious metals. The Indian financial market has two main sectors; money market- for short term financial instruments or capital market- for medium to long term financial instruments. We are going to be focusing mostly on the capital

markets. BSE Ltd, the first ever stock exchange in Asia established in 1875 and the first in the country to be granted permanent recognition under the Securities Contract Regulation Act, 1956, has had an interesting rise to prominence over the past 143 years. The journey of BSE Ltd. is as eventful and interesting as the history of India's securities market. There are some milestones achieved by BSE over the years. They are as follows:

### **2.1 In the year 2018,**

BSE launches its commodity derivatives section making it India's 1st Universal Exchange, BSE Investments Limited acquires 24 percent stake in CDSL Commodity Repository Limited (CCRL), launches 'chatbot' 'Ask Motabhai' for quicker, more convenient access to stock market data, BSE construction obtained a trademark. BSE signs MoU with Bombay Metal Exchange 27, BSE STAR MF passed 10000 Mutual Funds Distributors registration. It sign Memorandum of Understanding with Brink's India Pvt Ltd, BSE becomes India's first exchange to be acknowledged as a Designated Offshore Securities Market by the US, SE signs an MOU with Soybean Processors Association.

### **2.2 In the year 2017,**

India's leading BSE stock exchange and the biggest insurance exchange in the world, Ebix, Inc. Sign MOU to Launch Joint Venture Company, Setting up Pioneering Insurance Distribution Network in India, Asia Index Private Limited launches the S&P BSE Bharat, BSE gets "No Objection" from SEBI to act as a "facilitator" for non-competitive bidding in the Governor's auction.

## **3. OBJECTIVES OF RESEARCH**

- To understand how exactly the financial sector does operates.
- To find and analyze the various problems that are faced by investors in the financial sector.
- To elaborate on the various Operations Research techniques that exist and can be used to solve various problems in the financial sector.
- To identify and outline which method of Operations Research will be selected to solve which type of financial problem.
- To describe how the use of OR can reduce the probability of bad investments and improve the economy.
- To understand the connection between OR and Financial Markets.

## **4. RESEARCH METHODOLOGY**

For the purpose of our research we took various research papers and analysed them and we will be presenting the readers with our understanding of the topic. Secondary data has also been taken from these papers and this data will be further used in our own explanations. In order to convert these financial problems to quantitative, mathematical problems, certain OR techniques were used 20 years ago such as statistical analysis, linear programming forecasting, and simulation. We successfully understood these methods and gained a deeper insight in to Operation Research because we read some articles and a chapter of a book by Prof. (Dr.) Dalgobind Mahto. To understand the impact of the use of OR Techniques on the financial markets in India, we first needed a better understanding of the financial markets in India. To do this, we took some papers on financial markets and more specifically on the financial markets of India. We analysed these papers in conjunction with the papers on Operations Research and its application in Financial Markets. This helped us get a complete and overall understanding of the actual implication of OR Techniques in financial markets. Also, because those articles and papers were solely focused on the financial markets, we also got a better understanding of the problems that exist and can be solved through OR. Some of these problems are better equipped to be solved through OR as compared to others. For Example:

- **Funding Decisions:** It is imperative for an investor that he receives a good return on investment and also, a substantial profit margin from his investment in the financial markets. To increase the probability of gaining these benefits it is important that the investor uses certain specific OR techniques. These OR techniques will help firms decide the most suitable technique by which to raise capital. (Ahmed M. 2012)
- **Regulatory and Legal Problem:** A major worrying factor for financial regulators about the financial markets is their substantial and quick worldwide financial flows. This is one of the key administrative issues that is deciding the capital required by certain financial institutions to support their exercises in financial markets. Risk evaluation is one of the key ways to deal with this issue (VAR). For these types of financial problems, OR techniques have been helpful in managing the capital stores that these firms hold in banks and furthermore to guarantee a certain level of consistency with various lawful necessities by planning proper procedures and to take care of other lawful issues. (Ahmed M. 2012)

Some other financial problems where OR techniques have been made use of are; financial management, portfolio management, customer credit scoring, and check operations. (Kaur R., Singh R, 2014)

## **5. LITERATURE REVIEW**

The research papers that were studied for this topic held a blend of different financial problems and all these problems contained a different component of the financial sector. While going through and analysing these problems a pattern was observed which made it easier for us to select the OR technique necessary to solve the problem. One of the major findings from these papers is that there is a two-way relationship between OR and Finance. One, the techniques of OR have been applied to financial problems and OR has influenced financial markets to adopt new finance theories. Two, Finance theories have motivated the development and improvement of OR solution techniques. (Kaur R., Singh R, 2014). Although some of the OR Techniques like Linear programming and statistical analysis are almost 20 years old, they are still very efficient in solving the different types of problems found in the papers and in the financial markets. From the previous papers, it has been discovered that each and every financial problem has some basis that relates to a certain specific OR technique and this very technique can help investors either gain efficiency or profitability based on the type of problem. The majorly used OR techniques to tend to these financial problems are as follows in

correlation to the type of problem:

- **Daily Banking operations and decision making:** The use of MS tools such as Data Envelope Analysis (DEA) to enjoy greater productivity and performance. This is a form of Linear Programming made easy due to the development of technology.
- **Portfolio Management:** The use of Index-tracking fund, which can be done in 2 ways full replication or partial replication. It is used often by fund managers when they do not feel confident about market performance.
- **Optimal Allocation of Resources:** To overcome this dilemma, portfolio selection is used where one selects the investment options by an individual or an investment company.

Above are some of the examples of financial problems that are very generic and nature and are faced by a majority of the population that is affiliated with the stock market. Apart from the aforementioned OR techniques, some of the other OR techniques that are also observed to be used widely across various market scenarios are a few different types of mathematical programming techniques such as linear, non-linear, goal, etc. Also, another widely used OR technique is Monte Carlo simulation. A constant pattern observed through the research papers is that OR techniques help investors and investment firms on a common basis to make much better decisions in a relatively smaller time frame, giving them less stress and the ability to further better their ability to handle financial problems that may or may not arise in the future.

In today's day and age where technology is so easily accessible these OR techniques can be used by anyone who is interested in investing in the stock market. There used to be a lot of errors before in case of big calculation but in the current phase, it is very easy to make these calculations. By analysing the literature papers, we understood the deep and longstanding relationship between OR and Financial Markets.

## 6. CONCLUSION

From our research on the financial markets we got to know that though there are many techniques that could be used to find various things like where to invest, when to sell, when to purchase, stock market highs and lows, how worthy a company is and what is its liquidity status, etc. but still there is a lot of scopes for people to discover more variables to study upon and get more precise data. We used the past research papers for our better understanding and got to know how the variation has come over the years and how new variables have been found to use the operations research techniques on and get more specific calculations out of it so as to give a brief idea to the user as to what the current situation of the company is and what all scope it has in its near future and where it is going to lead itself to. The use of tools and techniques such as data envelope analysis, index tracking fund, portfolio selection, etc. helps to make life simple and get the data and interpretations very fast saving people a lot of time and since people use a lot of computers and applications nowadays, the calculations become even faster. Linear and non-linear programming also helps in getting interpretations very fast along with the graphs that help people to interpret through visual analytics.

## 7. REFERENCES

- [1] Reshampal Kaur, Ranjit Singh, "Role of OR Techniques in Financial Decision Making", IJMBS Vol. 4, Issue 1, Jan - March 2014
- [2] Mobin Ahmad, "Operations Research Applied to Financial Market", ISSN, Volume 6, Issue 4, April. 2017, PP.17-22
- [3] Mobin Ahmad, "Impact and Implications of Operations Research in Stock Market", IJMSI, Volume 5 Issue 6, June. 2017, PP-01-05.
- [4] Board J., Sutcliffe C., Ziemba W, "Applying Operations Research Techniques to Financial Markets", Informs, Vol. 33, No. 2, 2003, pp. 12-24.
- [5] Ivan Busharov, Tyler Diller, Haris Krijestorac, "Operations Research Techniques in the Formulation of an Investment Strategy", 21-292, Carnegie Mellon University, Fall 2008.
- [6] Chaithanya Bandi, Dimitris Bertsimas, "Robust option pricing", European Journal of Operational Research 239 (2014) 842–853.
- [7] Jayant Rajgopal, "Principles and Application of Operations Research", Department of Industrial Engineering, University of Pittsburgh, Pittsburgh, Pennsylvania.
- [8] Wei Huang, Yoshiteru Nakamura, Shou-Yang Wang, "Forecasting stock market movement direction with support vector machine", Computers & Operations Research 32 (2005) 2513 – 2522.
- [9] Mohammed Rubani, "A study of Structure and Functions of Capital Markets in India", International Journal of Business Administration and Management. ISSN 2278-3660 Volume 7, Number 1 (2017).
- [10] Prof.(Dr.) Dalgobind Mahto, "Essentials of Operation Research", Chapter 1, PP 1-19. [11] Najeb M.H. Masoud, "The Impact of Stock Market Performance upon Economic Growth", International Journal of Economics and Financial Issues, Vol. 3, No. 4, 2013, pp.788-798.