A PRELIMINARY REPORT ON

PORTFOLIO MANAGEMENT SYSTEM

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE
OF

BACHELOR OF ENGINEERING (COMPUTER ENGINEERING)

BY

MANAV PESHWANI	Roll No.**41140**
NIPUN KHIVANSARA	Roll No.**41144**
BHUSHAN PAGARE	Roll No.**41147**
PURVESH JAIN	Roll No.**41155**

Under The Guidance of
Prof. Yogesh Handge

DEPARTMENT OF COMPUTER ENGINEERING

PUNE INSTITUTE OF COMPUTER TECHNOLOGY

DHANKAWADI, PUNE-411043

SAVITRIBAI PHULE PUNE UNIVERSITY
2020-21

CERTIFICATE

This is to certify that the Project report entitled
PORTFOLIO MANAGEMENT SYSTEM
Submitted by

MANAV PESHWANI	Roll no. 41140
NIPUN KHIVANSARA	Roll no. 41144
BHUSHAN PAGARE	Roll no. 41147
PURVESH JAIN	Roll no. 41155

are bonafide students of this institute and the work has been carried out by them under the supervision of **Prof.Yogesh Hange** and it is approved for the partial fulfillment of the requirement of Savitribai Phule Pune University, for the award of the degree of **Bachelor of Engineering** (Computer Engineering).

(Prof.Yogesh Handge)
Internal Guide
Department. of Computer Engineering

(Prof. M. S. Takalikar)
Head
Department. of Computer Engineering

(Dr.R.Sreemathy)
Principal
Pune Institute of Computer Technology

Signature of Internal Examiner

Signature of External Examiner

Place: Pune

Date:

ACKNOWLEDGEMENT

It gives us great pleasure in presenting the preliminary project report on ***'Portfolio Management System'.***

We would like to take this opportunity to thank our internal guide **Prof. Yogesh Handge** for giving us all the help and guidance we needed. We are really grateful to him for his kind support. Her valuable suggestions were very helpful.

We are also grateful to ***Dr. M.S.Takalikar,*** Head of **Department of Computer Engineering, Pune Institute of Computer Technology** for his indispensable support and suggestions.

Manav Peshwani
Nipun Khivansara
Bhushan Pagare
Purvesh Jain
(B.E. Computer Engg.)

ABSTRACT

In a world of fluctuating interest rates, changing gold prices volatile financial markets, the aim of this project is to build an optimum portfolio for the users according to their risk appetite. The system's scope includes analysing client's preferable risk exposure, expected yearly returns and using this data to build a basket of securities and a variety of trading strategies based on technical analysis machine learning techniques. Algorithmic Trading is used to automate trading strategies based on study of past historical data, technical indicators, machine learning algorithms macroeconomic trends. This automation will help to eliminate human emotions from the investment process which will help in proper position sizing risk management with strict stop losses and targets. The project aims to use Modern Portfolio Theory to maximize the alpha while reducing the risk.

Contents

List of Figures

CHAPTER 1

INTRODUCTION

1.1 Motivation

In these unprecedented times many people have lost their wealth because of wrong investment decisions made, which are encouraged by human emotions. A strong system built on back-tested data would drive away human emotions and help people to make the right investment decision purely based on algorithms and statistics. Less than 1.5 % of people in India invest in the stock markets and the majority lack knowledge in terms of the right stocks to invest and how to manage their portfolios efficiently. Our aim is to build a strong portfolio management system which would encourage more people to invest in the markets and make the right investment decisions

1.2 Problem Definition

Design and create a portfolio management system which aims to Maximize the alpha (returns) and minimize the risk. Implement various trading investing strategies using technical fundamental analysis. Optimize strategies using machine learning algorithms. Use Algorithmic Trading to remove the psychological emotional bias faced during the investment process

CHAPTER 2

LITERATURE SURVEY

2.1 Stock Portfolio Selection using Data Mining Approach

1) Keywords : Portfolio Optimization,Machine Learning,Finance
2) Description :Logistic Regression Neural Networks are used to select a stock portfolio using fundamental technical parameters

2.2 Optimization of Investment Portfolio Management

1) Keywords : Risk Management,Asset Management,Algorithmic Trading,Quantitative Finance
2) Description : Pontryagin maximum principle and Markowitz portfolio theory is used to form a foundation of a portfolio as well as optimization of a given portfolio.

2.3 Algorithmic Trading for Trade Signal Generation

1) Keywords : Algorithmic Trading,Machine learning,Data Analysis,Finance
2) Description :Describes the algorithmic trading process components like alpha,beta and transaction models.Trade signal generation trade generation.

2.4 Data mining algorithm to analyse stock market data using lagged correlation

1) Keywords : Algorithmic Trading,Machine learning,Data Analysis,Finance

2) Description: Develops an algorithm for predicting the market direction more accurately when two stocks are strongly correlated to each other with a lag of K number of trading days.

CHAPTER 3

SOFTWARE REQUIREMENTS SPECIFICATION

3.1 Introduction

3.1.1 Project Scope

There are three basic users as

1) Director(admin)
2) Clients i.e short-term,mid-term and long term investors
3) Computer professionals

All users have their own profiles in the Portfolio-management system. Clients can create new account, log-in to their existing accounts which will give them the authority to use the services provided by the system. If a client wishes to create a new account then a questionnaire needs to be answered which will help the system understand the risk appetite of the customer. A new client might upload his/her existing portfolio for simple portfolio analysis like expected returns and red flags. Depending on the risk appetite, the system will create a list of stocks which are to be traded for a particular day/month/year. These strategies used are back-tested thoroughly and only then are they allowed to predict a list of stocks which will give positive returns. The long term investor gets stocks which are only based on fundamental analysis. The mid term and short term investors get stocks which are predicted using technical analysis and minimum fundamental checks. LSTM, GRU, Random Forest algorithms are used to predict the future trend of the market.

3.1.2 User Classes and Characteristics

1) User 1: Admin - Admin is a user which will have specific controls to the application which will allow them to control certain modules in the application. The admin can change the forum settings to make the users happy. Admin will administer the overall control of the website and can override any setting, constraints in any module as he/she wants and help the clients to maintain their portfolio efficiently and guarantee them good returns.

2) User 2: Client/investor - This user is the one who registers as a client in the application. He can post his requirement for which he wants to build the portfolio. He may define his risk appetite and other requirements like maximum drawdown

and expected returns.Also have a look at the average returns he/she has got over the past few years.

3.1.3 Assumptions and Dependencies

Assumption is that the user should have some basic knowledge of computers. We are assuming that the user should have some basic knowledge of using internet and online payment.

3.2 Functional requirements

3.2.1 Client Data

Client/investor has to post their requirements for which they want to build the portfolio. They may define their risk appetite and other requirements like maximum drawdown and expected returns.Also have a look at the average returns they have got over the past few years.

3.2.2 Analysis and forecasting

This module is responsible for the main functionality of the system which is to use the stock market data and perform computations on it that can generate the appropriate buy/sell signal for the investor..

3.3 Non-Functional requirements

3.3.1 Performance Requirement

1) User satisfaction:

   It is a measure of how application and services supplied meet or surpass customer expectation.

2) Average response time:

   Average Response Time. Response time refers to the amount of time Application Server takes to return the results of a request to the user.

3) Error rate:

   Error rates refer to the frequency of errors occurred, defined as "the ratio of total number of data units in error to the total number of data units transmitted." As the error rate increases, the data transmission reliability decreases.

4) Application Server CPU:

   If the CPU usage on your server is extremely high, you can guarantee you will have application performance problems. Monitoring the CPU usage of your server and applications is a basic and critical metric.

5) Application Availability:

   Application availability is the extent to which an application is operational, functional and usable for completing or fulfilling a user's or business's requirements.

3.3.2 Software Quality Attributes

1) Correctness

   The correctness of a software system refers to agreement of program code with specifications and independence of the actual application of the software system.

2) Reliability

   Reliability of a software system is defined as the probability that this system fulfills a function (determined by the specifications) for a specified number of input trials under specified input conditions in a specified time interval (assuming that hardware and input are free of errors).

3) Learnability

   Learnability of a software system depends on the design of user interfaces and the clarity and the simplicity of the user instructions (tutorial or user manual).

4) Robustness

   Robustness reduces the impact of operational mistakes, erroneous input data, and hardware errors.

3.4 System Requirements

3.4.1 Software Requirements

1) Platform as a Service (Cloud): Heroku, PostgreSQL

2) Web-based :

   Client side: HTML , CSS ,JS

   Server side : Django (python based web deployment technology)

3.4.2 Hardware Requirements

1) Processor (i3 or higher): Fast and efficient systems are needed to handle intensive loads and provide efficient throughput.

2) RAM (8GB minimum): Helps in performing fast computations and optimizes execution process.

3.6 System Implementation Plan

SR NO.	TASK	DUE DATE
1.	Literature survey	2nd week of August
2.	Defining problem statement	3rd week of August
3.	Designing class diagrams, E-R diagrams and related models	3rd week of October
4.	Synopsis Review	2nd week of Novemeber

CHAPTER 4

SYSTEM DESIGN

4.1 System Architecture

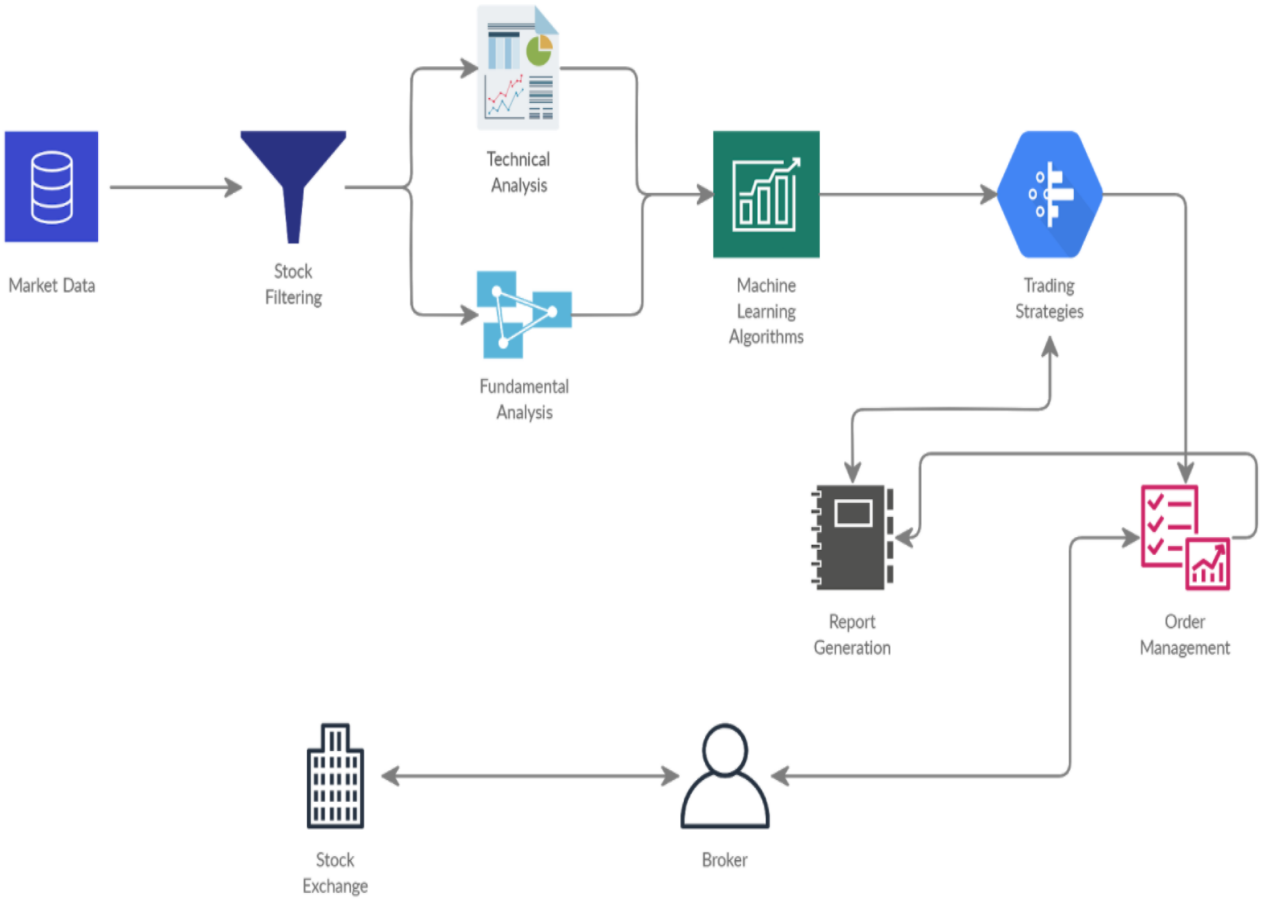

Figure 4.1: Architecture Diagram

4.2 Activity Diagrams

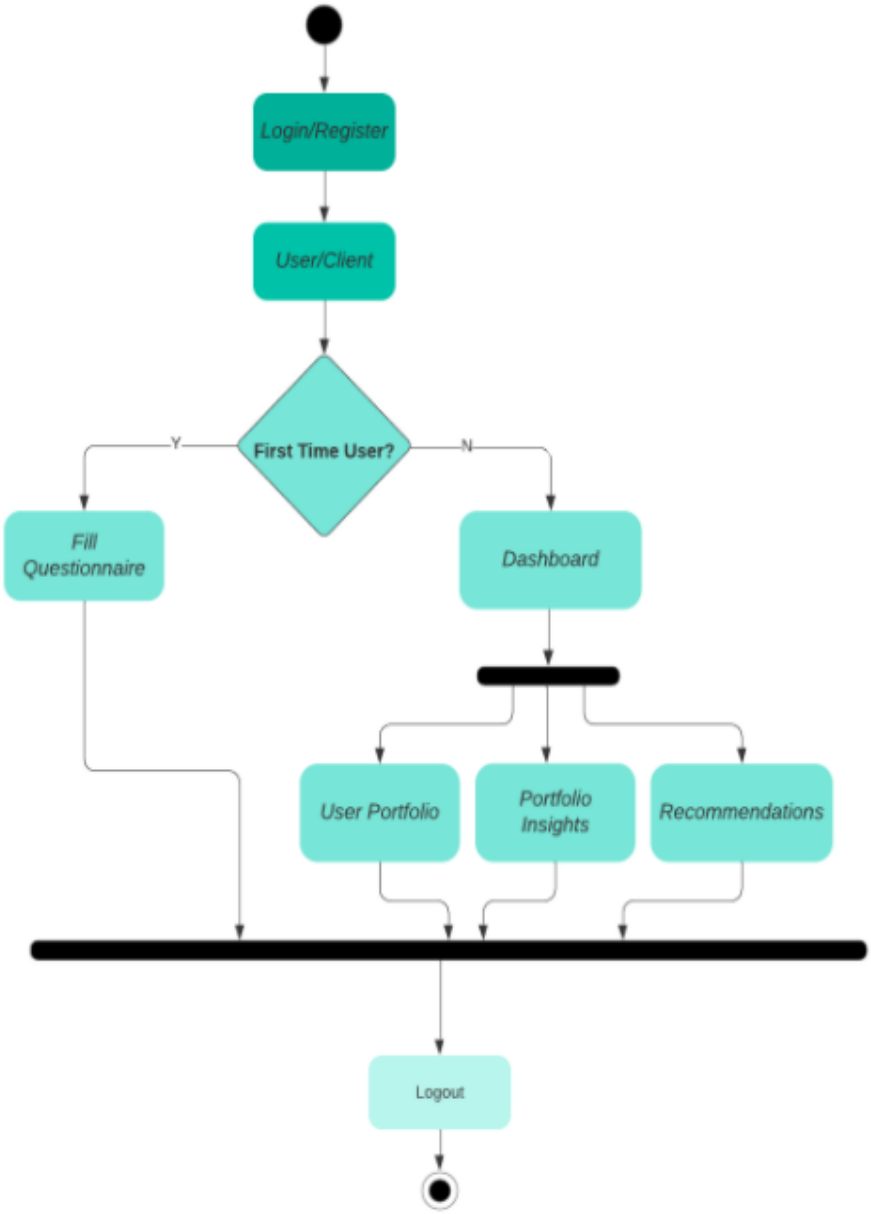

Figure 4.2: Activity Diagram

4.3 Class Diagram

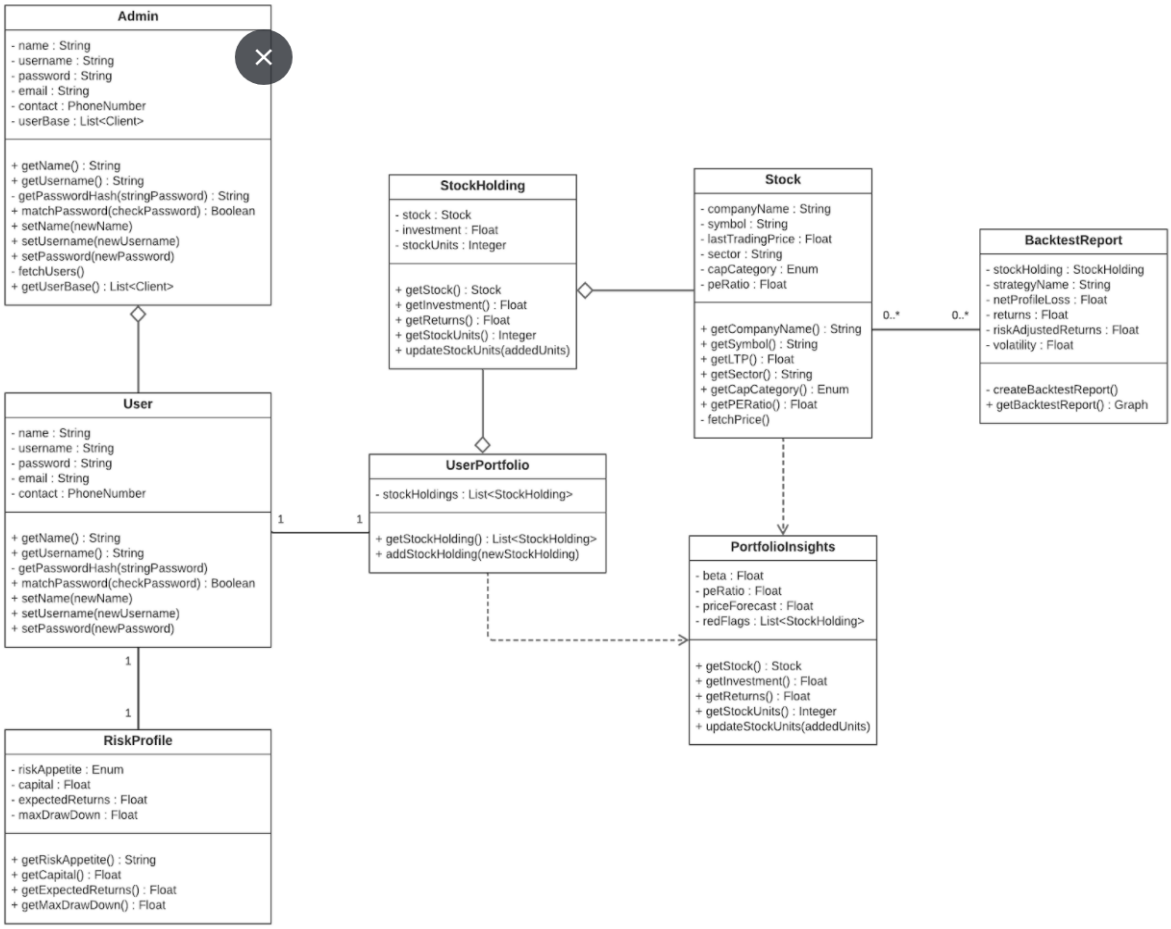

Figure 4.3: Class Diagram

4.4 Use Case Diagrams

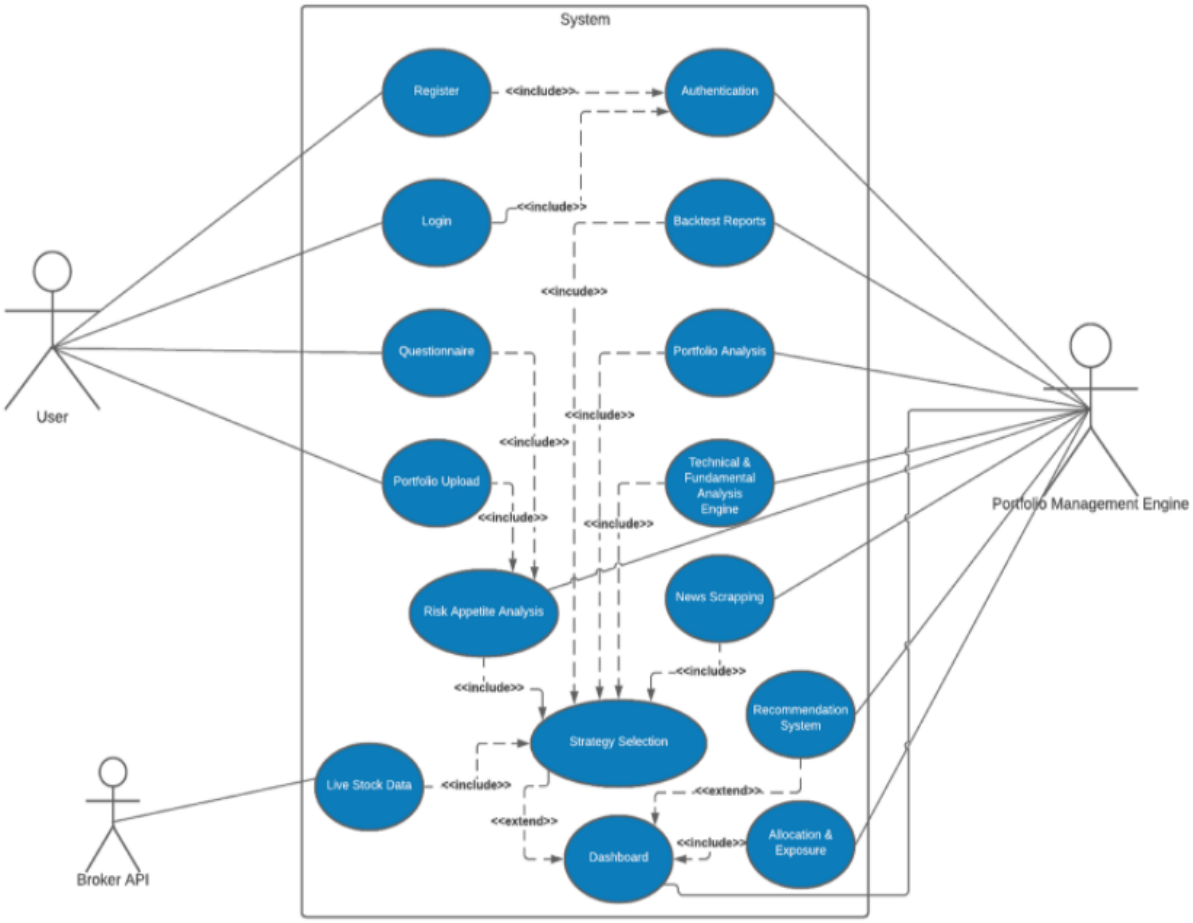

Figure 4.4: Use Case Diagram

CHAPTER 5

OTHER SPECIFICATIONS

5.1 Advantages

1) Quality Portfolio : People who manage their own portfolios on an average buy less of quality and focus more on price, rather than value Data shows that while there are thousands of listed companies; individual investors (Non Promoter Non Institutional [NPNI]) have a lower share of holding in the larger indices like Nifty, BSE 200 or even Nifty 500. Retail or NPNI holding is higher in non-index smaller companies. There is a skew to lesser quality stocks in their portfolios. It is equally remarkable that Nifty accounts for almost 60% of total market cap, BSE 200 accounts of nearly 85% of market cap and Nifty 500 accounts for nearly 94% of market cap (Source: Capitaline). This means that while the bulk of the market value resides with the top 500 companies, retail direct investors' holding is with the 'long tail' which doesn't hold much value. Retail investors consistently seem to ignore the adage, "Price is what you pay; Value is what you get". They seem to chase stocks that are attractive on price and may or may not be so on value. It's not that retail investors never buy good quality stocks; it's just that they have a tendency to sell when they make a profit and hold on to stocks that have depreciated in value. It's a well- known fact that profits are booked easily and mostly prematurely, but losses are allowed to run.

2) Independent Portfolio : PMS Holdings are isolated and hence not impacted by other investors behavior Mutual Funds being managed and held as a pool may be at times exposed to vagaries of the sum total behavior of hundreds of thousands of investors. In general, investors tend to invest in rising markets or improving fund performance and there could be times of panic in rapidly falling markets and times of poor fund performance. It may happen that mutual funds at times are forced to buy in rising markets and sell in falling markets because fund managers have discretion on stock picks but not on fund flows. Apart from managing the portfolio, managing fund flows is a significant activity on a daily basis. As far as PMS is concerned, every investor influences his own buying or selling time and price, there is no impact on other investors' holding or experiences. PMS has isolated individual holdings so one investor's behavior doesn't impact other investors investments. At the same time, it is worth noting that Mutual Funds get benefited by regular inflows by way of Systematic Investment Plan, which helps them buy stocks in all kinds of market conditions. On the other hand, PMS would get inflows depending upon client discretion and their preferences.

3) Transparent Holdings : PMS is transparent If we were to use cricket parlance, one can say that in PMS an investor can get a ball by ball update on the portfolio.

Every trade is intimated to the investor and a live portfolio view is available on the managers' website. Specifically for our PMS portfolios, there is a focused portfolio of curated stocks which the client can view in his holdings. Mutual Funds typically tend to have large diffused portfolios ranging from 25, 30 to even a 100 stocks, (which restrict the transparency) and the holdings are made available only once in a month or a quarter. And for investors holding 5/6/7 different funds in their portfolios, they end up holding over 250-300 stocks. Even if they de-duplicate the holdings through proper analysis, they would realize they pretty much own whatever of the market there is to own, resulting in dilution of returns. You can't beat the market if you buy the market.

4) Possibility of Superior Returns : PMS can be more aggressive (hence more risky) and has the potential to generate higher returns Mutual Funds being structured for a wide mass of retail investors tend to be regulated strictly; for instance there are regulatory norms for benchmarking, scrip level exposure, investment patterns etc. More specifically in Mutual Funds, no stock can be over 10 percent of portfolio exposure. In PMS for instance; if a stock has 8 percent exposure and all things being static, this stock appreciates to become 12 percent of the portfolio, there is no compulsion to sell. There are times when a stock classified as mid cap appreciates over time and comes within the large cap basket. In a Mutual Fund scheme depending on investment universe defined the portfolio manager might be forced to sell.In a PMS, a portfolio manager may choose to have higher exposure as well as hold on to concentrated positions as long as they are delivering growth. While this can cut both ways, the ability to run concentrated positions combined with no inflows and outflows or compulsions of fund flow management, does afford the potential to generate higher returns.

5) Transparent Expense Ratio : PMS is flexible in terms of expense ratios being transparent and customized Expense ratio disclosures of PMS are transparent as each client signs a specific fee structure and receives a monthly detail of charge levied on the portfolio. Further, expense structures can be customized based on ticket size and profit sharing based fee structures are possible too.

5.2 Limitations

1) Tax Implications : While Mutual Funds are registered as a tax exempt trust structure, for PMS portfolios the tax implications are the same as those for investors investing directly. If stocks are held for more than a year, it results in long term capital gain tax @ 10 percent plus surcharges. If the portfolio manager indulges in

short term trading activity, it may result in short term capital gains, which would mean the investor has to pay tax.

2) Irrational Markets : Even after an in depth analysis, rigid backtesting in various timeframes, the market may not favour our strategies. This is an inherent risk with all investment methods. We cannot predict each and every move in the market and make money every time. What we can and will do is follow the system with pre-defined stoploss and targets with proper risk mangement so that we avoid blowing up the accounts due to wild market moves.

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 Conclusion and Future Work

The primary objective of this project was to create a Portfolio Management System which can maximize the returns for a user according to his risk appetite by combining the financial aspect of Fundamental and Technical Analysis with Machine Learning algorithms to optimize the results. We have created a basket of strategies depending on the capital available and risk profile of the user which can generate healthy returns and outperform the benchmark index.

We also plan to analyze the existing client portfolio to check whether it needs re-balancing depending upon various parameters. The final industry level project after future developments can include a completely automated portfolio management system with no human interference thus completely eliminating the emotional and psychological bias which humans face while trading and will create a truly Quantitative Portfolio Management System.

CHAPTER 7

BIBLIOGRAPHY

1) Hargreaves, Carol. (2017). MACHINE LEARNING APPLICATION IN THE FINANCIAL MARKETS INDUSTRY. Indian Journal of Scientific Research. 17. 253.

2) Oliinyk, Viktor Kozmenko, Olga. (2019). Optimization of investment portfolio management. Serbian Journal of Management. 14. 10.5937/sjm14-16806.

3) G. Nuti, M. Mirghaemi, P. Treleaven and C. Yingsaeree, "Algorithmic Trading"

. Fonseka and L. Liyanage, "A Data mining algorithm to analyse stock market data using lagged correlation"

4) M. Kumar et al., "Forecasting of Annual Crime Rate in India: A case Study," 2018 International Conference on Advances in Computing, Communications and Informatics (ICACCI), Bangalore, 2018, pp. 2087-2092