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Invest IQ: Empowering Novice Investors through a Web-Based Platform Leveraging Modern Portfolio Theory and Data Analytics

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ABSTARCT: Investing in the stock market can be daunting, especially for beginners. To meet this challenge, we introduce InvestIQ, a web-based platform designed to provide novice investors with the knowledge and tools needed to make informed investment decisions. Built on the principles of Modern Portfolio Theory (MPT), InvestIQ guides users through the process of selecting stocks based on their risk preferences, helping them create diversified portfolios that balance risk and return. The platform features an intuitive interface, educational resources, risk assessment tools, and a stock list tailored to the needs of novice investors. Leveraging data analytics, InvestIQ utilizes algorithms based on MPT to analyse market trends and recommend personalized investment strategies that maximize returns for a given level of risk. Additionally, InvestIQ incorporates portfolio optimization techniques to identify the most efficient allocation of assets within the recommended portfolios. By combining technology, financial theory, data analytics, and portfolio optimization, InvestIQ aims to democratize investing and promote financial literacy among students and individuals new to the world of finance.

KEYWORDS: Modern Portfolio Theory, Portfolio Optimisation, Data Analytics.

I. INTRODUCTION

Data Analytics: Data analytics is the process of combining data from different sources, identifying relationships, making predictions, and helping with decision-making. Data analytics can use machine learning, artificial intelligence, statistical models, and data analysis to identify patterns that may predict future behaviour.

Portfolio: A portfolio's meaning can be defined as a collection of financial assets and investment tools that are held by an individual, a financial institution or an investment firm. To develop a profitable portfolio, it is essential to become familiar with its fundamentals and the factors that influence it.

Portfolio optimization is a process that helps investors determine how much of a pool of assets to acquire to meet their goals for growth and risk. The goal is to maximize a portfolio's return while minimizing risk.

Project Introduction:

Investing in the stock market offers the potential for significant financial growth, but for many, navigating the complexities of financial markets can be intimidating, particularly for beginners. Recognizing the need to empower novice investors with the knowledge and tools to make informed decisions, we embarked on the development of InvestIQ, a comprehensive web-based platform tailored to the needs of individuals who are new to investing.

The primary motivation behind the creation of InvestIQ stems from the realization that traditional financial education often overlooks practical guidance on stock market participation, leaving many individuals feeling overwhelmed and ill-equipped to start their investment journey. By providing a user-friendly interface and leveraging the principles of Modern Portfolio Theory (MPT), InvestIQ aims to demystify investing and make it accessible to a wider audience, including students and individuals who are just beginning to explore the world of finance.

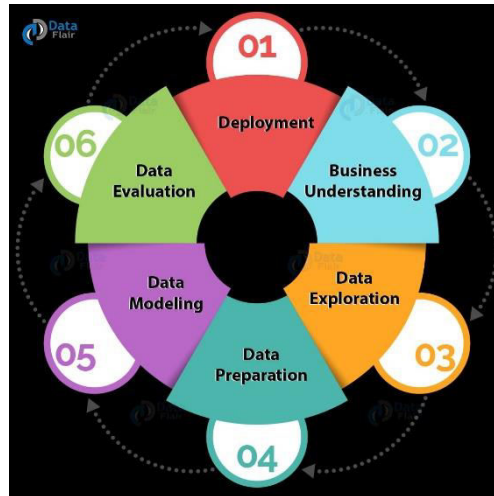


Fig 1: Process of data analytics.

The target audience for InvestIQ includes students seeking to enhance their financial literacy, young professionals looking to kickstart their investment journey, and anyone interested in building wealth through stock market participation. By catering to the specific needs of beginner investors, InvestIQ aims to democratize investing and promote financial independence and prosperity among individuals from all walks of life[1].

In this paper, we provide a comprehensive overview of the InvestIQ project, detailing its objectives, features, methodology, and significance. Through the exploration of InvestIQ's development process and functionality, we aim to demonstrate its potential to revolutionize the way novice investors approach stock market participation, ultimately contributing to the promotion of financial literacy and wealth-building opportunities for all.

II. LITERATURE SURVEY

"Portfolio Selection" by Markowitz (1952)

Modern Portfolio Theory (MPT) serves as a cornerstone in portfolio construction, advocating for diversification and asset allocation to manage risk and enhance returns. Markowitz's seminal paper (1952) introduced the concept of efficient portfolios and the mean-variance optimization framework, laying the groundwork for modern portfolio management practices. In the realm of data analytics, advances in technology have enabled investors to leverage vast amounts of data to inform investment decisions. Lo and MacKinlay (1999) discuss the application of machine learning techniques in financial forecasting and investment strategies, highlighting the potential of data-driven approaches to enhance portfolio performance and risk management. Similarly, Gao et al. (2019) explore the use of big data analytics in identifying market anomalies and predicting stock returns, demonstrating the value of data analytics in uncovering investment opportunities and optimizing portfolio allocation.

"Portfolio Selection: Efficient Diversification of Investments" by Sharpe (1991)

Portfolio optimization techniques aim to identify the most efficient allocation of assets to achieve desired investment objectives. Sharpe (1991) introduces the Sharpe ratio as a measure of risk-adjusted return and proposes a method for constructing optimal portfolios based on maximizing the Sharpe ratio. While existing research provides valuable insights into investing education, MPT, data analytics, and portfolio optimization, there remain opportunities for further exploration and innovation in advancing investment practices and empowering beginner investors. By integrating these insights into the development of InvestIQ, we aim to contribute to the enhancement of investing education and the promotion of financial literacy among individuals new to the world of finance.

"The Econometrics of Financial Markets" by Lo and MacKinlay (1999)

In the realm of data analytics, advances in technology have enabled investors to leverage vast amounts of data to inform investment decisions. Lo and MacKinlay (1999) discuss the application of machine learning techniques in financial forecasting and investment strategies, highlighting the potential of data-driven approaches to enhance portfolio performance and risk management.



"Optimal versus Naive Diversification: How Inefficient is the 1/N Portfolio Strategy?" by DeMiguel et al. (2009)
 Recent research by DeMiguel et al. (2009) examines the benefits of incorporating estimation error in portfolio optimization models, highlighting the importance of robust optimization techniques in managing uncertainty and improving portfolio performance.

III. DESIGN

The data we used consist of date, volume, closing price, open, high, close, adjacent close. The data itself is a culmination of 10 individual datasets, each dataset representing individual stock[2].
 The solution relies on mean variance optimization of our portfolio, to achieve higher return while also mitigating risk. We assume that our expected return is historical return

$$E(R) = \sum_{i=1}^n w_i E_i \tag{-1}$$

$E(R)$ - Expected Return of Portfolio
 w_i - Weight of i^{th} Stock
 E_i - Expected Return on i^{th} Stock

$$\sigma_p^2 = \sum (r_j - E(R))^2 \tag{-2}$$

σ_p^2 - Variance of Portfolio
 r_j - Return of Portfolio on i^{th} Date

We find both $E(R)$ & σ_p^2 for all possible weight combinations for our stocks

Date	Open	High	Low	Close	Adj Close	Volume
01-01-2014	46.87	46.87	41.78	45.79	42.8037	4824700
08-01-2014	41.23	41.5	36.5	38.18	35.69	10139200
15-01-2014	38.76	39.97	37.75	38.43	35.9237	1911800
22-01-2014	38.5	38.75	36.11	36.49	34.11022	1856900
29-01-2014	36.14	37.48	34.23	36.75	34.35326	2748200
05-02-2014	36.45	39.48	35.42	39.15	36.59674	2057600
12-02-2014	39.22	39.38	35.91	36.89	34.48413	1684300
19-02-2014	36.9	37.01	32.8	33.31	31.13761	2836200

Table 1: Sample dataset for a stock

The dataset consists of 522 rows & 7 columns. We have taken the dataset of the following stocks: Bajaj Finance, BPCL, HDB, Infosys, Kotak Mahindra, Tata Steel, TCS, TTNP(Titan phramaceuticals), Wipro Ltd .
 After transformation we store each individual dataset within a dictionary of 10 keys.

The dataset utilized for this project comprises historical data spanning the past ten years. It is essential to acknowledge that past performance and historical trends may not necessarily reflect or predict future outcomes or conditions.

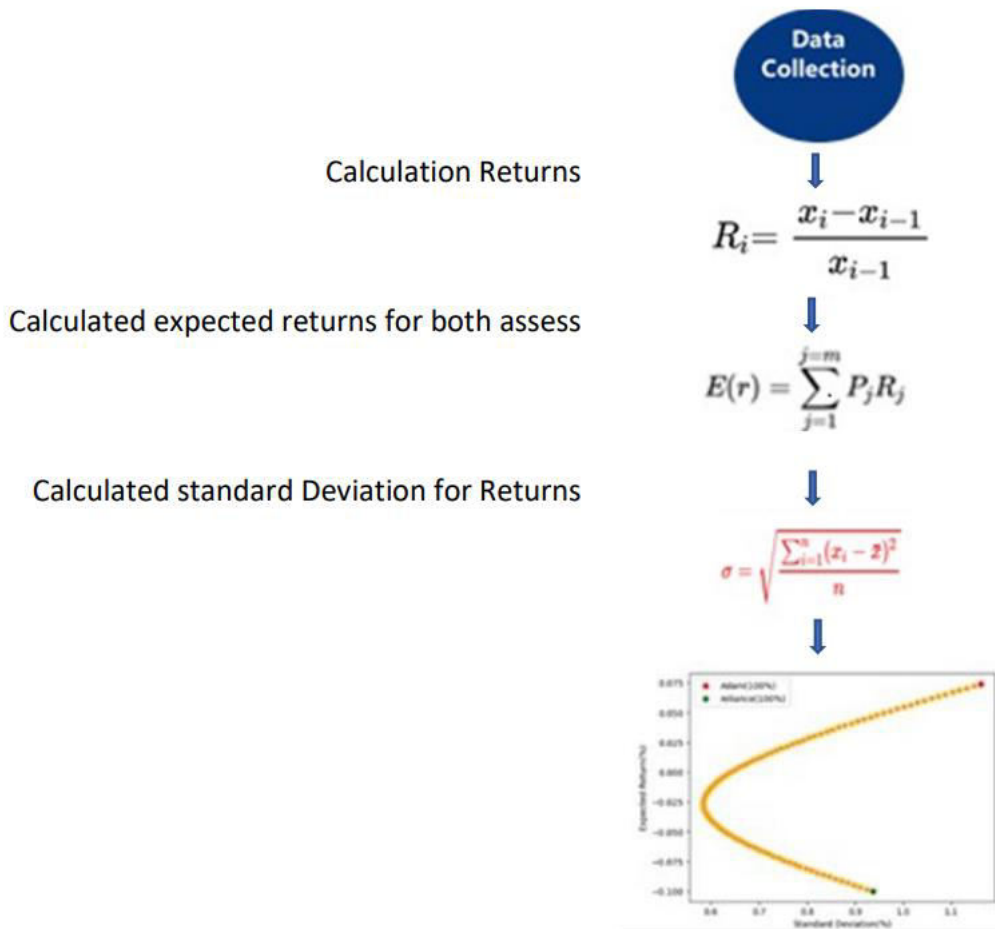


Fig 2 :Process of obtaining Efficient Frontier

IV IMPLEMENTATION & RESULT

We've utilized Pandas, Numpy libraries for data analysis and data manipulation. Our solution consists of two step approach, first, we find out the efficient frontier, results will be displayed by plot build using plotly package[3].

Second, we display the plot by converting it into SVG format which later is going to be displayed via NEXT JS(React). We have implemented the required calculations by following OOP approach[4]. The above is a efficient frontier, the graph consists of data points, these data points are our possible portfolios we can construct. But looking this graph we can say there are two types of portfolios, ones that have less return for given risk and ones that have higher return for given same risk, its worth noting that one should invest in the later portfolios not former one.

We can find out the better portfolio for a given risk by drawing a horizontal line and vertical line, draw a vertical line at selected Risk, this vertical line will intersect many data points but for which data point does it have maximum return is our ideal portfolio The portfolio you can construct will never be better than portfolios that are lying on efficient frontier.

We eliminate risk via diversification.

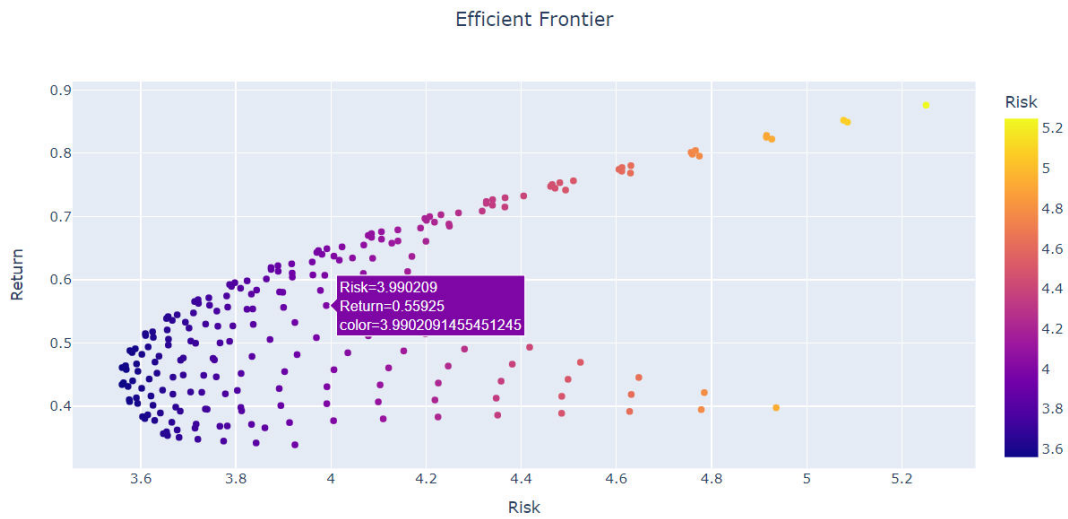


Fig-3: Construction of Efficient Frontier of 3 stocks

The portfolio constructed with 4 assets yeilds slightly higher return than portfolio with only 3 assets, returns even more higher return than two asset only portfolio for given risk as shown in table 1.

Co-relation coefficient (r)	Effect of diversification on risk
+1	No risk reduction is possible
+0.5	Moderate Risk reduction is possible
0	Considerable amount of risk reduction is possible
-0.5	Most of the risk can be eliminated
-1	All risk can be eliminated

Table -2 Co-relation coefficient with their Effect of diversification on risk

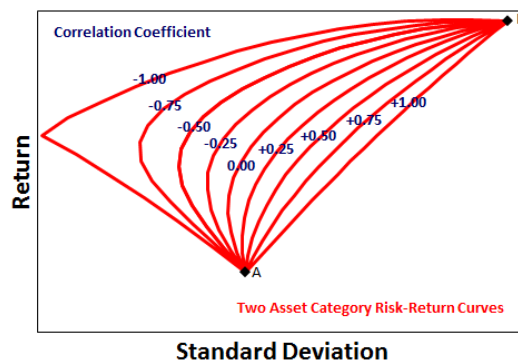


Fig 4: Two asset catagiry Risk Return Curves

```
port2 = Portfolio(stocks[0], stocks[1], stocks[2], stocks[3])
x = []
y = []

for i in port2.getAllWeights():
    x.append(port2.getPortStd(i))
    y.append(port2.getPortReturn(i))
fig = px.scatter(x=x, y = y, title="Efficient Frontier", labels={'x':'Risk', 'y':'Return'}, color=x)
fig.update_layout(coloraxis_colorbar=dict(title='Risk', title='x':0.5, 'xanchor':'center'))
fig.show()
```

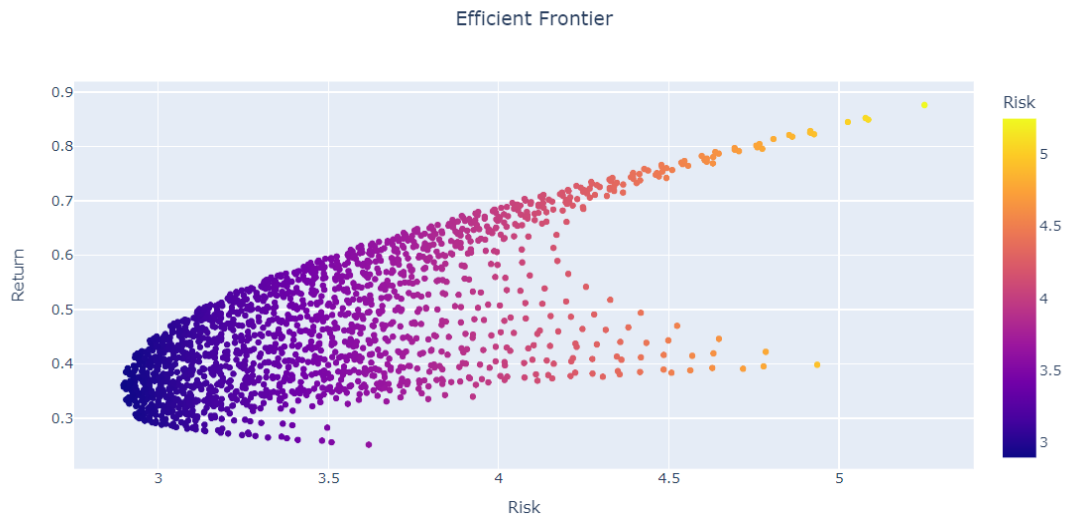


Fig-5 : Efficient Frontier of 4 stocks

V. CONCLUSION

This is a big advancement in alleviating the problems that beginners face in the stock market as having a web-based platform suited for those who are new to investing. This is an end-to-end one stop solution platform powered by principles from Modern Portfolio Theory (MPT), data analytics and efficiently designed portfolio optimization techniques to get the novice investor started with ease.

The platform provides a user-friendly interface and educational materials to help alleviate some of the complexity involved in stock market participation, rendering it more accessible to different demographics. The platform conducts guided processes through portfolio construction drive financial literacy and independence among students, young professionals, enthusiasts who are into this market for the first time.

Using historical data and sophisticated optimized algorithms, our platform helps users create the most optimal risk-return balanced portfolios. With the help of data analytics tools, users can do research on market trends both long-term and short-term, identify investment opportunities and make decisions correctly to minimize risk and to generate maximum ROI. With the continued development of this platform, by listening to users and expanding in all sorts exciting directions, it has shown potential to change the way new investors get into investing. Through democratizing investment knowledge and incentivizing financial education, it endeavors to provide individuals with the tools they need to succeed at managing their money effectively and building wealth smartly via active participation in stock market.

REFERENCES

[1]Markowitz, H. (1952). Portfolio Selection. The Journal of Finance, 7(1), 77-91.
 [2] Sharpe, W. F. (1991). Portfolio Selection: Efficient Diversification of Investments. Journal of Business, 34(1), 56-75.
 [3]Lo, A. W., & MacKinlay, A. C. (1999). *The Econometrics of Financial Markets. Princeton University Press.
 [4] DeMiguel, V., Garlappi, L., & Uppal, R. (2009). Optimal versus Naive Diversification: How Inefficient is the 1/N Portfolio Strategy?. The Review of Financial Studies, 22(5), 1915-1953.



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