öneriver

MODERN WEALTH MANAGEMENT

oneriver.co

robo advisor, machine learning, wealth management.

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In this paper, the new generation machine learning based digital investment system (portfolio management advisory) developed by Öneriver and the financial theory behind this system, which is about to be patented, are summarized.

The financial services industry is undergoing a substantial transformation in the way that advisory services are provided to investors. The transition to a more digital financial landscape particularly deepened after the 2007–08 global financial crisis, when tighter regulations on traditional banks and developments in computer science increased incentives to develop non-bank, technology-based financial companies. Robo-Advisory, which is a type of digital financial product offering algorithm-based, data-backed investment recommendations, first entered the literature in 2008 and has become the favorite of investors all over the world with its increasing popularity in recent years. The value of assets managed through robo-advisors, which has gained a lot of ground globally, reached $987 billion in 2020.

Robo-advisors provide financial advice to clients in a cost-effective way with moderate to minimal human intervention. In Turkey as well, especially companies providing wealth consultancy, banks and entities from the fintech industry seek to popularize robo-advisory services which has a market size growing day by day.

" Go as far as your eye can see. When you arrive,

you will be able to see even further. "

J.P. Morgan

About Oneriver

Oneriver shapes your savings specifically for you.

Oneriver, an initiative of İnfina Yazılım which has been providing software technology to financial institutions in Turkey for more than 25 years, invests in new technologies and is Turkey's first robo-advisor. The increasing importance of machine learning in the financial services sector is offered to the wealth management service providers with the difference of Oneriver Robo Advisor offering a high degree of automation and efficiency improvements. Oneriver envisions technology in digital wealth management, in addition to how wealth is managed in the digital age.

The process of investment advice is performed with the following steps:

Let's Get to Know You

First of all, we should get to know you better. Take the first step by solving our risk survey.
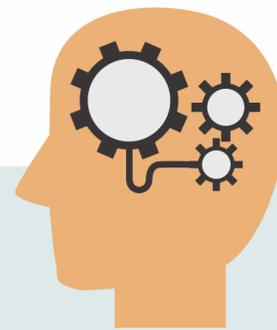
Let's Learn Your Goals

Let us shape your investments in line with your goals. Home, car, retirement. All available now.

Let's Make a Private Investment for You

How much risk can you take? How are the market conditions? What are the expectations of the consultants? In the light of these questions, let us make the most appropriate investment for you.

Let's Manage For You

Let us manage your investments for you while you live your life. You can keep track of your portfolio's performance wherever you want.

Robo Advisory

The robo-advisory business is growing at a rapid pace. Wealth management software, "Robo-Advisors", are using computer algorithms to automate much of the traditional portfolio construction process and to perform efficient asset allocation. The process is designed to operate with or without a low level of human intervention. For this reason, robo-advisory has also been referred to as "automated financial advice" or "digitized advice".

The history of robo-advisory began in the US. Betterment, the first robo-advisor, entered the market in 2010. In Europe, the first robo-advisors appeared in 2012/13 in the UK and in Germany.

**Need of affordable access
to investment advice**

**Need of reaching to
investors by establishing
new methods**
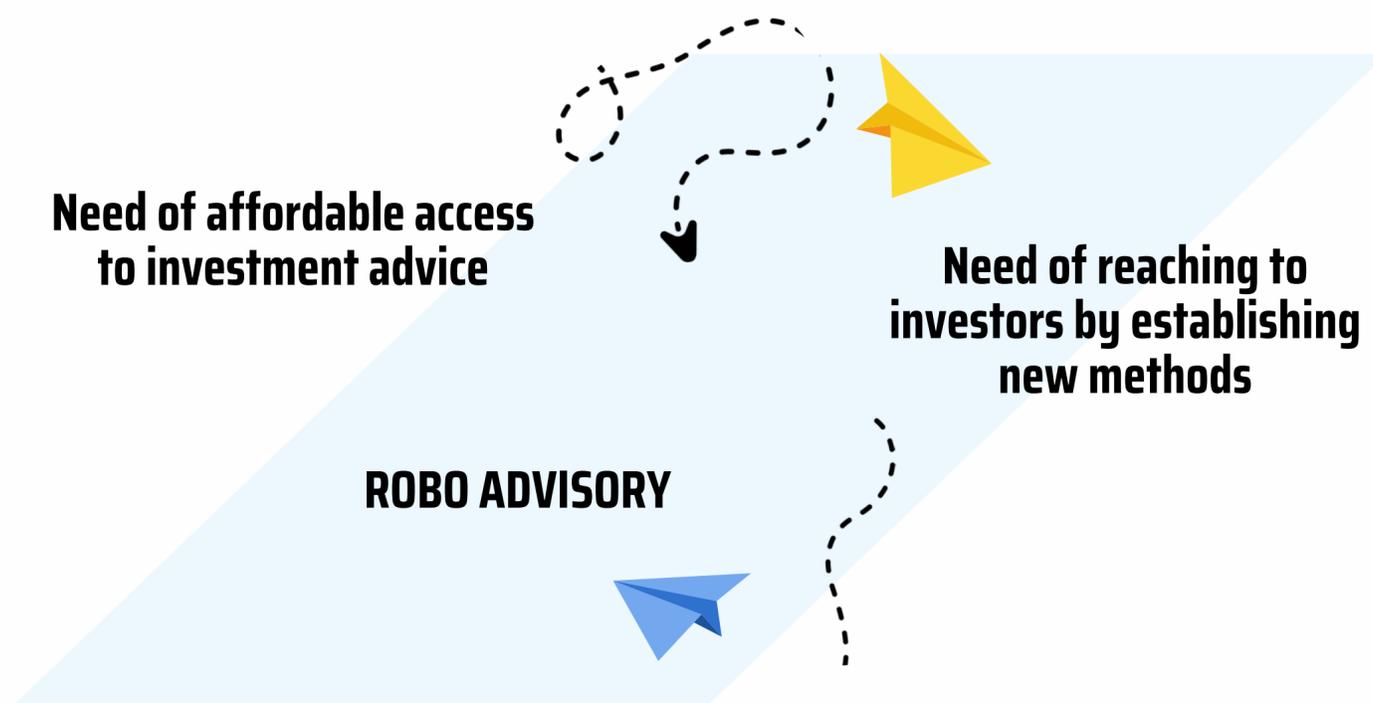
ROBO ADVISORY

Market size is typically indicated as "assets under management" (AUM) by robo-advisors. Between 2017 and 2020, the global robo-advisory AUM have grown from USD 297 billion to USD 1,068 trillion. The global robo-advisor AUM is expected to triple by the end of 2025 to about USD 2.85 trillion.

There are now over 200 robo-advisors available in the world, and all of them provide different investment management models.

The key advantage of robo-advisory is that it can be more efficient and thus cheaper for investors, resulting in higher returns.

Enhanced Version of the Markowitz Asset Allocation Model: **Black-Litterman Model**

In 1952, Harry Markowitz published the article "Portfolio Selection". Portfolio management has been shaped within the framework of Markowitz's Modern Portfolio Theory since then.
In traditional portfolio management, it has been considered that the allocation of the investor's total investment budget among different assets will reduce the risk factor, and it is thought that an optimal portfolio can be designed by the investor's preference for assets with low risk and high expected return potential.

The mentioned "diversity" factor in traditional portfolio management has some disadvantages. Investments always carry systematic risk factors but systematic risks are not risks that can be eliminated by increasing asset types. Therefore, diversification in the portfolio can only protect the risk factor to a limited extent in the event that the economic, political and social changes that have taken place affect the financial markets.

Such problems encountered when using Markowitz' model in practical portfolio management motivated Fisher Black and Robert Litterman working at Goldman Sachs to work on the development of models for portfolio choice and in 1991, The Black-Litterman Model was published in the "Journal of Fixed Income" by Fischer Black and Robert Litterman.
The Black-Litterman Optimization Model is a model that ensures that investor expectations are included in the optimal portfolio selection process.

Financial Model

The Black-Litterman model provides an excellent tool for the investors and has an advantage over many traditional asset allocation models. In traditional models investors cannot provide future expected returns forthe assets in the portfolio. Compared to the traditional models, Black-Litterman model has the ability to include future expected returns and even place more emphasis on stronger views to generate optimal portfolio weights to account for correlation between assets and consider the volatility of the assets or assume equal volatility among assets. **The most important difference** of this model compared to the Markovitz model is **how expected returns are calculated**. Apart from that, they are theoretically similar to the Markovitz model.

The Black-Litterman model enables investors to combine their views regarding the performance of various assets with the market equilibrium in a manner that results in diversified portfolios.

BL model's advantages are as follows:

↔ creates stable and mean-variance efficient portfolios

↔ has the ability to easily incorporate the subjective opinions of investors into the model

↔ user assigns levels of confidence to each asset view in the form of confidence intervals

↔ funds or portfolios are evaluated according to a benchmark portfolio.

Financial Model

Ideally robo-advisors are more objective than the traditional method in determining which product or product family to use. Because robo-advisors are objective, they outperform in the long run and in volatile market conditions, and this has been proven. Furthermore, unlike traditional services, robo advisor applications do not require a minimum investment amount.

The "main equation" of the final expected returns obtained with the Black-Litterman Model is shown below:

$$E(R) = [(\tau\textstyle\sum)^{-1} + P'\Omega^{-1} P)\,]^{-1}[(\tau\textstyle\sum)^{-1} \textstyle\prod + P'\Omega^{-1} Q]$$

Where Q is the vector representing analyst views on the expected returns, matrix P contains the information about available analyst returns, Ω represents the uncertainty in the views, τ is a scalar number indicating the uncertainty of the CAPM distribution. At the classical Black-Litterman formula, the value of (Ω) is held constant and does not affect the new Combined Return Vector (E[R]).

Oneriver has eliminated the ineffectiveness of (Ω) value by changing the scalar (τ). By making τ value variable, the weight given by the financial model to market projections has been changed, as the value of scalar (Ω) is increased, the weight given to the market projections is increased, thus more risky distributions are obtained.
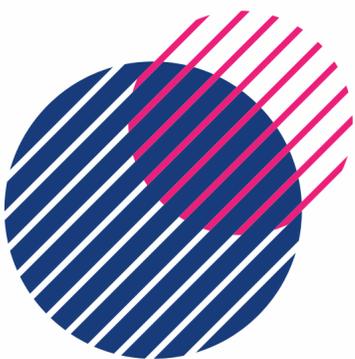
Contrary to the classical BL formula, **Oneriver** provides flexibility in the expected return.
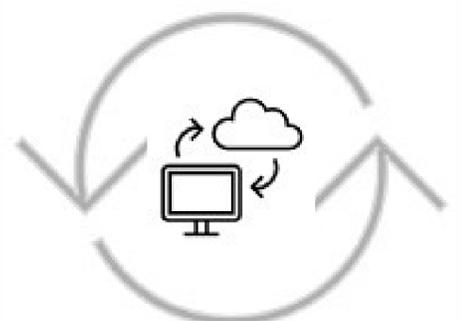
Machine Learning

The robo-advisor algorithm executes two main tasks: first, the collection of the client's data and the suitability assessment; second, making investment decisions.

Both of these tasks function with large sets of data that robo-advisors need to harness in order to achieve the best possible results. Machine learning has proven to be an effective tool to process large data sets.

In financial markets, machine learning (ML) has become a powerful analytical tool used to help and manage investment efficiently. Machine learning provides guidance on how to distribute the portfolio for optimal returns, and the distribution in the basket is made automatically with the scenarios created.

We combine the calculations that can be made in different office programs like excel with investment recommendations in the light of the financial model and offer them to investors in an automated and less costly way with machine learning.

An American robo advisor uses AI for an additional feature called "Path" which can provide answers to questions like when you can retire or which neighbourhood you can afford to live in. Betterment uses AI for some back-office tasks such as check processing.

Oneriver, a Turkish robo advisor uses ML in order to come up with market expectation which is one of the most essential parts of the B&L financial model.

Methodology for Asset Allocation

In the optimal portfolio selection process, the Black-Litterman Model provides the calculation of the new expected returns by combining the subjective expectations of the investors about the expected returns of one or more assets and the market equilibrium returns.

Since parameters which are assets' expected returns, variances and covariances affect optimal portfolio allocation, it is important to get their estimates right.

An investor creates an optimal portfolio from assets in a certain universe by maximizing the expected return of the portfolio with risk constraints, and the risk in this portfolio is measured by the weighted sum of the variances and covariances of all assets.

There are three distinctive attributions in the financial model used by the Oneriver: addition of parameters such as volatility and asset class constraints, investor age-based optimization and use of machine learning for market projections.

The parameter (τ) is calculated so that the variance matrix of expectations (Ω) of the Black-Litterman Model's method is calculated.

First, the assets to be included in the portfolio are determined.

Asset returns (E(r)) and weights (w) are calculated.

Variance-covariance matrix (Σ) is calculated.
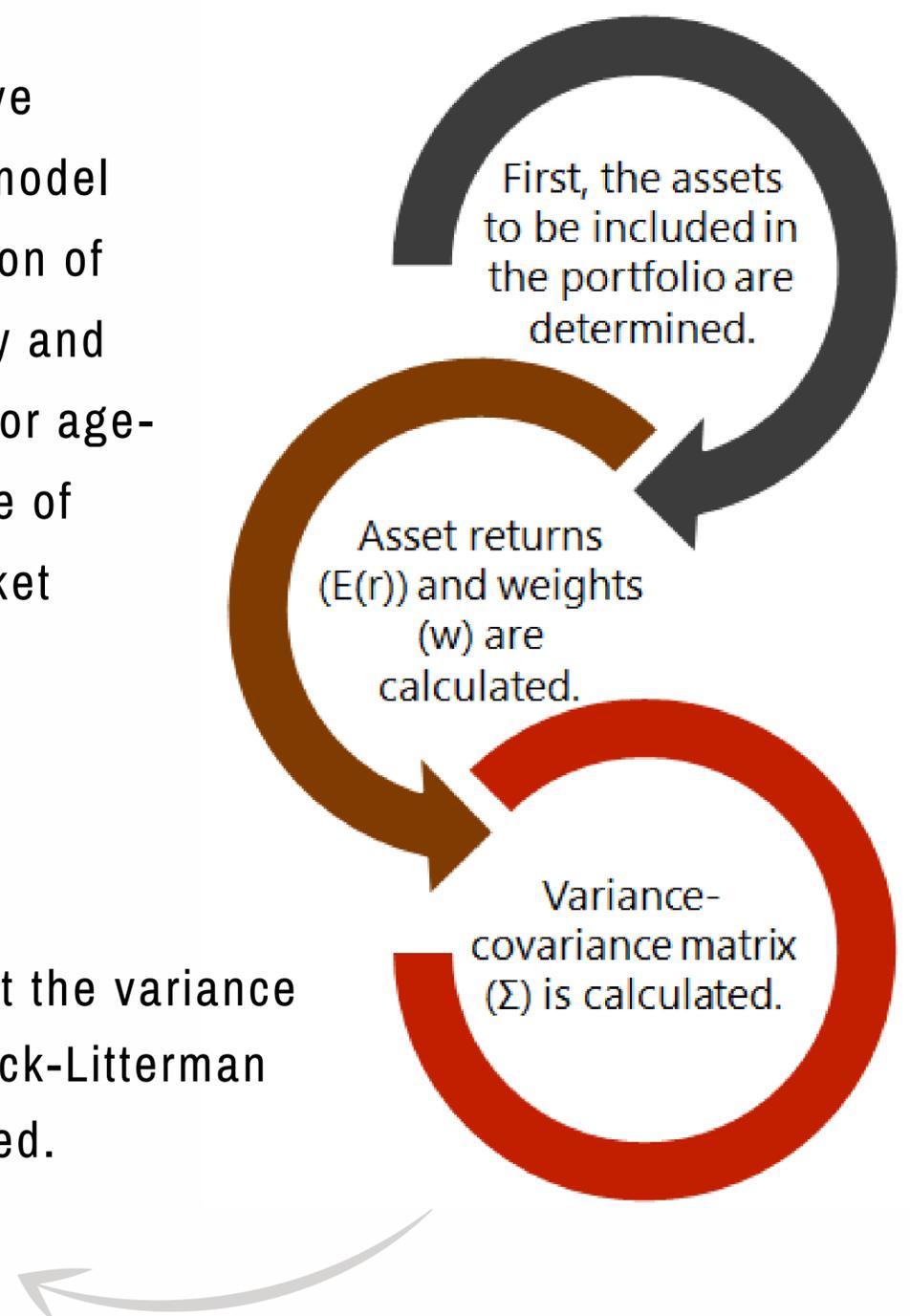
Methodology for Asset Allocation

Volatilities and correlations change over time and they may react with different speed to market news and may follow different trends.

- Oneriver constantly works to determine the **ideal covariance matrix** range under different market conditions and when using different asset classes. The covariance matrix range is changed in different periods.

- Using **asset class constraints**, different risk scales for each customer and ranges are determined to maximize the sharp ratio.

- By using **age-based optimization**, the investor's risk group is kept constant, but the risk he should take according to age is changed. In the method of suggestive, the risk taken by a customer decreases as he gets older.

- Thanks to the **volatility constraints method**, the lowest and highest volatility are determined by taking the covariance matrix and the starting point as a reference. By using the CFA method with the optimizer, portfolio distribution is prevented from exceeding a certain volatility. When we take into consideration the covariance matrix, when there are two negatively correlated assets in the portfolio, the volatility of the portfolio decreases due to their negative correlation. The inclusion of the covariance matrix ensures a more realistic calculation of portfolio volatility, where 2 securities with high volatility but negative correlation actually result in a lower portfolio volatility compared to 2 securities with high volatility but positive correlation.

Methodology for Asset Allocation
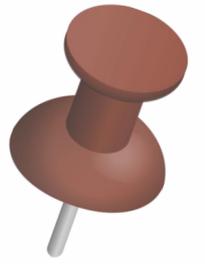
• ML enables objective and data driven market projections. Oneriver's method focuses on an analysis of trends of assets' closing prices. Machine learning is powerful to extract patterns from vast amounts of data according to traditional approach and also reinforcement learning can make the machine learn and continuously improve that no human being can beat. Since machine learning works purely based on data output, it can spot the nuances a human might miss.

• It is possible to create portfolios with better-diversified asset distributions by using the Black-Litterman Model, which was developed to prevent certain assets from being over-involved in a portfolio. Oneriver, using the Black-Litterman Model creates optimal portfolios for various risk profiles and ages.

" Rely on time, not timing. "

Burton Malkiel

Business Model

How and which companies do we support ?

Providing on-premise and cloud based solutions to private pension companies, banks, brokerage houses and portfolio management companies. We provide support in two different concepts.

✦ To generate optimum portfolio distribution recommendations for private pension system funds, mutual funds, stocks, and assets classes.

✦ To manage the investment portfolios of small and medium-sized personal investors who cannot receive individual portfolio management services.

## What is the advantage of the Oneriver model ?

SaaS solutions leverage the existing platform that the vendor has already implemented, provisioned and tested. On-premise solutions, on the other hand, take time, human resources and money, while they also have to be upgraded manually, whether software or hardware. On-premise solutions offer more flexibility in this regard, allow enterprises to customize almost everything, and provide better customer data security. Oneriver has a capacity to provide both type of usage.

One of the differences of Oneriver, each mutual fund to be included in the portfolio is mapped, the indices are taken into account, and the fund distribution is optimized by creating a distribution over them.

In active management, the market is constantly monitored and, on the basis of this, the securities that appear to be most advantageous at a given time are included in the portfolio. The passive management approach is based on the strategy of maintaining the portfolio created at the beginning, unchanged and independent of market fluctuations. The portfolio distribution can be renewed as often as the investor wishes, every day or every month. The investor decides how active or passive his portfolio will be. That means a portfolio is formed under the control of the investor.

Work Flow Chart

Öneriver RA workflow consist of following main steps:

Regular monitoring and rebalancing

Asset allocation/ portfolio optimization

Machine learning

Asset universe selection

Investor profile identification
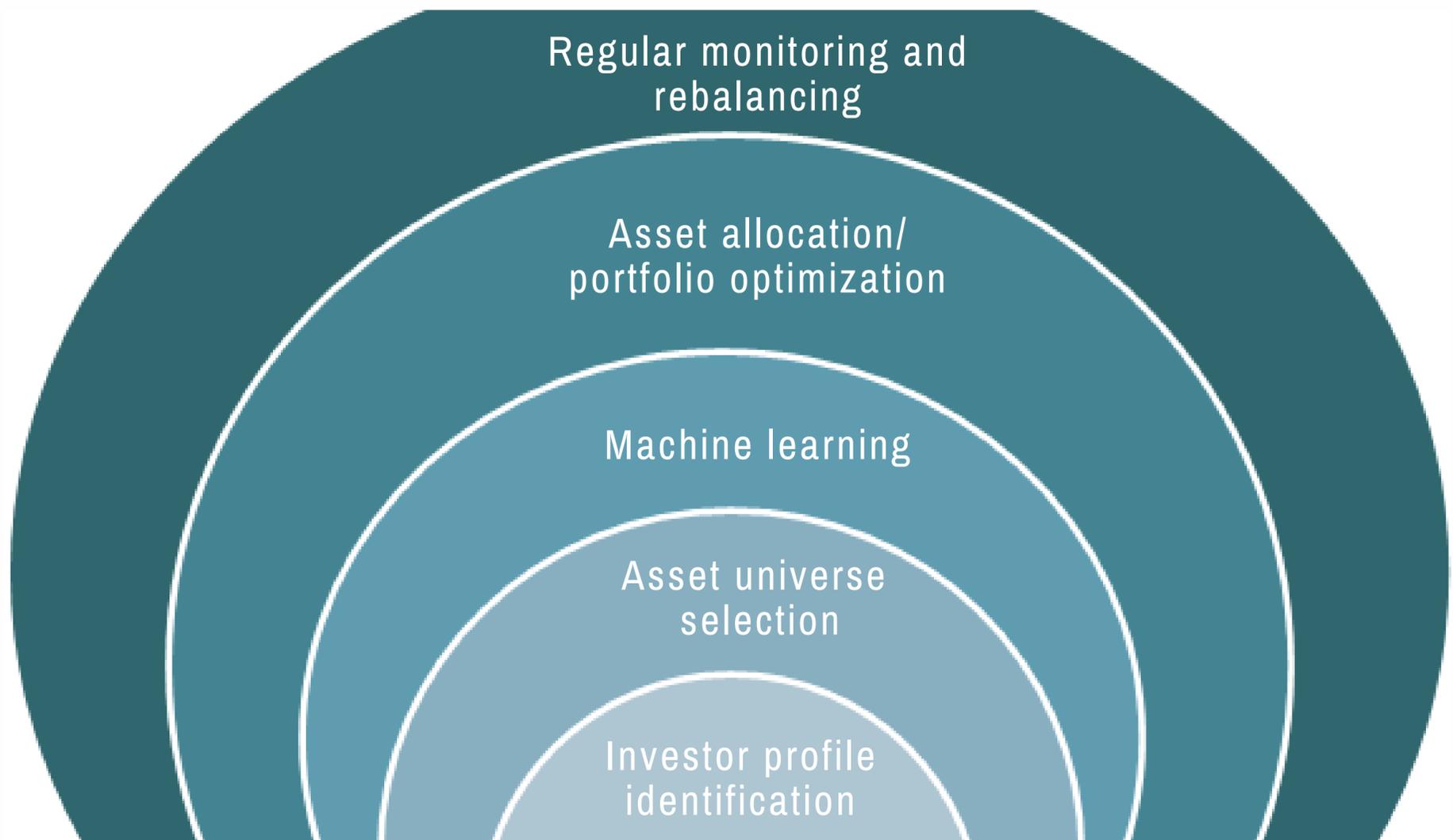
1- While determining the constraint method, we take into account investor's personal traits, risk willingness, investment horizon and objectives.

2- In the light of the information obtained from the first step, cluster definitions are made and the ideal covariance range is tried to be determined for time-varying volatility and correlations.

3- Machine learning is introduced with the LSTM model, which is very suitable for classifying, processing and predicting time series over daily prices of different asset classes. And this model is used in financial market projections.

4- While creating the distribution we aim to maximize the sharpe ratio, which is the distribution with the highest amount of potential income with the lowest amount of volatility.

5- In time portfolio distribution changes as the prices of the securities included in the portfolio changes, resulting in a sub-optimal distribution. Therefore portfolios are monitored daily and rebalanced whenever needed.

Conclusion

The development of new technologies, innovations, and digitization has come to the point where they can provide benefit to the financial sector as well. Artificial intelligence and machine learning have increased the interest in their application to the financial field, as financial markets have a dynamic and variable structure and are affected by many micro and macro factors. The use of robo-advisory reduces financial advisory services costs, making them available to a wider group of recipients, especially small and medium-sized personal investor.

As a follower of rapidly changing technological innovations, Oneriver will continuously improve its investment methodology with the suitable financial method contribution. And in this way, it will try to offer its business partners efficient and high-yielding portfolios with robo-advisory system.

Öneriverrobo-advisory system can help financial firms to provide even small and medium-sized personal investors start saving and push investors into properly diversified portfolios instead of generally accepted investment myths.

Get in touch with us