

# **Exploring the investment recommendations from Robo-advisors to investors with different risk appetites**

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## **ABSTRACT,**

Robo-advisors have gained popularity in recent years as a cheap and effective way for investors to get investment advice and manage their portfolios, yet few studies have analyzed individual robo-advisors in great detail. Using a sample of 3 different robo-advising platforms from the EU, this study tries to find out what the variations and consistencies are in the recommendations from these robo-advisors to investors with different risk appetites. To answer this, the study compares the robo-advisors based on four different dimensions, related to the risk profile creation of an investor, the asset allocation recommendations, the level of customization to the portfolio and the performance of the portfolio. The findings state that robo-advisors can provide a reliable investment option for individuals with different objectives, such as seeking stability and risk management. Although, the differences in risk appetite, asset allocation recommendations, level of customization and portfolio performance, explain the importance for an investor to consider its options in robo-advisors when creating an investment portfolio.

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# 1. INTRODUCTION

In the modern world, Artificial Intelligence has become an important technology and its power is undeniable. In recent years, the world has seen many new inventions related to AI, such as self-driving cars, talking robots and recently ChatGPT, the AI that answers all your questions. We're seeing a shift towards a modern, online world and a concept that belongs to that matter is Industry 4.0, which is a term used to describe the fourth industrial revolution. It is known for the development of advanced technologies such as Artificial Intelligence, robotics, big data and the Internet of Things (IoT). Its goal is to create smart factories that can operate autonomously, which increases productivity and enables the efficient production of goods (Infosys, (n.d.).

New technologies are also emerging in the asset management industry. Asset management is an important component of the financial sector, where the goal of the investors is to aim to maximize their profits while mitigating the risk of their investment. Investors have traditionally relied on traditional financial advisors to manage their assets, give advice on investment strategies, and make choices regarding investments on their behalf. Yet, robo-advising has become more popular as a result of technological inventions. Robo-advisors are digital platforms that use algorithms to offer customers automated portfolio management and investing advice. A Well-known example is the digital advisor from Vanguard, one of the largest investment companies in the world.

Robo-advisors have gained popularity in recent years as a cheap and effective way for investors to get investment advice and manage their portfolios. "They're everywhere now," said David Goldstone when talking about robo-advisors, who is a research and analytics manager at Backend Benchmarking, a company which is specialized in research on robo- advisors (Iacurci, 2022).

However, with the increasing number of robo-advisors available in the market, there is quite some choice and it has become challenging for investors to find a platform that's right for their investment goals, since every robo-advisor is different. It is quite challenging to find the right robo-advisor, since there exist many factors that play a role in the search, such as level of complexity, amount of fees, amount of customization, type of risk management strategies and even reputation (Wohlner, 2022).

That is why this study will answer the research question: **what are the variations and consistencies in the recommendations from Robo-advisors to investors with different risk appetites?** The goal of this question is to provide insights into these investment recommendations and how these recommendations compare to each other. By examining the variations and consistencies in these recommendations, the thesis aims to provide a broad understanding of the strengths and weaknesses of each robo-advisor and helps investors with different risk tolerances make informed decisions about their investment portfolios. In order to answer the research question, the robo-advisors will be compared to each other based on the following dimensions:

- *What criteria do robo-advisors use to determine an investor's risk profile, and how do these criteria differ across platforms?*

It's important to understand the factors that robo-advisors consider when determining a client's risk profile, since these factors have an impact on the investment recommendations the platform makes to the investor. To determine an investor's risk tolerance and investment goals, various platforms may use

various factors, including age, income, investing experience, and investment goals (DPN, 2023). Moreover, these factors may be weighted differently between platforms, resulting in variances in the investments they recommend.

- *What are the differences in asset allocation recommendations that different robo-advisors give to investors with different risk appetites?*

This sub-question aims to provide insight on how these platforms recommend investment portfolios to investors with various risk appetites by comparing the asset allocation recommendations made by robo-advisors. For example, one robo-advisor may give an overly risky recommendation to the same investor compared to another robo-advisor.

- *What level of customization do robo-advisors offer to investors with different risk appetites, and how does this affect the recommendations they receive?*

This sub-question examines the degree of customization provided by robo-advisors for investors with various risk appetites in an effort to provide insight on the manner in which various platforms customize their investment recommendations to fit the demands of investors. For instance, while some platforms may give more uniform suggestions that are less suited to individual investors, others may offer more individualized recommendations based on criteria like investing goals.

- *How do the results of the investment recommendations from the different robo-advisors compare after a specific time period?*

This sub-question intends to offer insights into the performance of various platforms over a substantial amount of time by examining the performance of investment recommendations given by various robo-advisors over a particular time period. It will be interesting to see whether robo-advisors that take a high-risk approach also received a high reward, and the same goes for different risk approaches.

## 2. LITERATURE REVIEW

### 2.1 The robo-advisor process & their benefits

Robo-advisors have emerged as a powerful force in the world of investment management, transforming the way people approach their portfolios. By making use of technology and sophisticated algorithms, these digital platforms have evolved the investment process, making it relatively easy and cost-effective for a lot of investors (Singh, 2023). In this first part of the literature review, we will explore the process of robo-advisors in detail and highlight their benefits.

The first step in the robo-advisor process is gaining information about the investor. Through extensive online questionnaires, the robo-advisors ask questions about topics such as financial goals, risk tolerance, investment horizon, and current financial situation (Tamplin, 2023). This information forms the foundation for the robo-advisor's understanding of the investor's profile and helps with determining investment recommendations which fit the profile of the investor.

Once the investor's information has been collected, the robo-advisor employs advanced algorithms to develop an appropriate asset allocation strategy (Tamplin, 2023). The RA takes into account factors such as the investor's risk appetite, desired returns, time horizon and analyzes large amounts of historical data and market trends. This analysis enables the robo-advisor to construct a diversified portfolio consisting of various asset classes, including stocks, bonds, exchange-traded funds (ETFs), and more.

The job of a robo-advisor doesn't end with portfolio construction. It continuously monitors the investor's portfolio to ensure it aligns with the predefined asset allocation strategy. Market conditions change and the portfolio's asset allocation may deviate from the target. To fix this, the robo-advisor employs automated portfolio rebalancing. This process involves selling or buying assets within the portfolio to bring it back in line with the desired allocation (Huffman, 2023). By executing these trades efficiently, the robo-advisor aims to optimize the portfolio's risk and return characteristics.

In addition to rebalancing, robo-advisors also incorporate tax optimization strategies. Through techniques like tax-loss harvesting, the robo-advisor identifies investments that have experienced losses and automatically sells them to offset capital gains. This strategy helps minimize taxable events and potentially reduces the investor's overall tax liability, enhancing after-tax returns (Fidelity, 2022).

Robo-advisors provide investors with the convenience of regular monitoring and reporting. Investors can access their portfolios online, review performance metrics, and receive periodic reports detailing their progress towards their financial goals. This transparency ensures investors real-time insights, enabling informed decision-making and offering a comprehensive view of their investments.

The benefits of robo-advisors are numerous. Firstly, they have significantly lowered the barrier to entry for individual investors, making professional investment management accessible to a broader audience, such as university students, who regularly do not have access to a great amount of money. Moreover, robo-advisors typically have lower fees compared to traditional human financial advisors, often less than 1% of assets under management (Tamplin, 2023). This makes the RA's an affordable option, particularly for investors with smaller portfolios, such as the university students. The automated nature of robo-advisors ensures efficient portfolio management, timely rebalancing, and quick execution of trades, minimizing potential human errors and maximizing efficiency. Additionally, robo-advisors base their investment decisions on algorithms and historical data, eliminating human biases that may impact investment choices, thereby providing objectivity in the decision-making process (Abraham et al., 2019).

## 2.2 Theoretical Framework

In order to answer the sub-questions that belong to this research, several theories need to be used to understand the answers:

An important framework is the Efficient Market Hypothesis (EMH). "The EMH, one of the most accepted and eminent financial theories, stated that new information readily incorporated in security prices and market activities or analysis of historical and present data cannot help investors to predict future or to earn above average risk adjusted profit" (Naseer & Bin Tariq, 2016).

Based on this theory, stocks trade at their fair value and this would make it impossible for investors to purchase stocks that are undervalued. This would mean it would be impossible to outperform the market through technical analysis or expert stock selection (Downey, 2022). Understanding the EMH will be important for analyzing the performance of the investment recommendations from robo-advisors with different risk preferences, and assessing whether their recommendations are in line with the theory's principles.

Next, the Agency Theory could be used to analyze the principal-agent relationship between clients and their financial advisors.

The theory assumes that conflicts of interest arise when the interests of the principal (client) and the agent (financial advisor) diverge (Shen, 2023). Understanding the agency theory will be important for analyzing how robo-advisors make investment recommendations, and whether they prioritize the interests of the investor or their own interests.

Lastly, the Behavioral finance theory: "Behavioral finance is based on the alternative notion that investors, or at least a significant minority of them, are subject to behavioral biases that mean their financial decisions can be less than fully rational" (Byrne & Brooks, 2008). Understanding how robo-advisors adjust their recommendations in response to changes in an investor's risk appetite or market conditions will require an understanding of the behavioral factors that may influence their decision-making.

## 2.3 The impact of risk profiles on portfolios

Boreiko & Massarotti (2019) explore the impact of investor risk profiles on robo-advised portfolios, with a specific emphasis on portfolio composition and performance. The goal of the study is to clear up the underlying economic mechanisms that drive these variations and consistencies in recommendations. By analyzing the results of the study, there will be a better overview of the different factors that shape the investment strategies that are being used by robo-advisors. The findings of the study reveal that the risk profiles of investors significantly influence the composition of robo-advised portfolios. Investors with higher risk preferences are recommended portfolios with a larger allocation to equities, which have the potential to generate higher long-term returns. On the other hand, investors with lower risk preferences receive recommendations with a higher allocation to fixed-income securities, such as bonds, which provide stability and help mitigate volatility.

The economic rationale underlying these results lies in the principles of risk aversion and the risk-return tradeoff. Investors with higher risk profiles show a greater willingness to bear investment risk with the goal of potentially earning higher returns. Therefore, robo-advisors recommend portfolios with a higher allocation to equities, as these investments historically offer higher returns over the long run. Conversely, investors with lower risk profiles are more sensed to prioritize capital preservation and stability. Thus, the recommendations from robo-advisors emphasize a larger allocation to fixed-income securities to align with the risk preferences and objectives of these investors.

## 2.4 The performance of robo-advisors

Prior studies have also attempted to study the performance of robo-advisors. A study from Michael Puhle (2019) evaluated the performance of five German robo-advisors between a 3-year period. Puhle reported that no robo-advisor was able to beat the bench-mark they set before or after considering fees. Besides that, the performance of the robo-advisors varied greatly in the sample period, even for portfolios that belonged to clients with similar risk preferences. Lastly, the differences in performance remained unexplained, even after taking the different asset allocations in consideration (Puhle, 2019).

In another study, conducted by Albert Torno & Sören Schildmann, the performance of 138 different portfolios from 23 different robo-advisors were analyzed. The researchers reported that there were major differences between the portfolio recommendations of the robo-advisors. There were many portfolios that dominated others while having the same risk

strategy but managed to reach higher returns. The research also found that investment horizons play a minor role in the recommendation of robo-advisor portfolios, following a Mann-Whitney-U test that was computed on a 2 groups (portfolios with an investment horizon of 15 years and 3 years).

The greatest difference the researchers observed in the results, were the risk/return combinations from the lowest to the highest risk class. The study found a positive correlation between the mean values of the risk classes, which means that a higher return is associated with a higher risk within the portfolio. What stood out, is that the risk class “low” had significantly low returns in comparison to other risk classes, namely 1,70%, compared to 3,22% for “medium” & 4.38% for “high” (Torno & Schildmann, 2020).

The gap between these two studies lies in the scope and methodology employed in evaluating robo-advisors' performance. While both studies assess the performance of robo-advisors, they are different in terms of the number of robo-advisors analyzed, the duration of the evaluation period, and the specific metrics considered.

The studies conducted by Michael Puhle and Albert Torno & Sören Schildmann provide a broader analysis of the performance and portfolio recommendations of multiple robo-advisors, whereas this research specifically focuses on the performance of three different portfolios. Therefore, the gap between the studies and this research lies in the specific robo-advisors being studied, the focus on portfolio performance, and the comparison between different providers. This research contributes to the understanding of the performance and trends within the portfolios of Birdee, Sarwa, and Finax, providing valuable insights into their respective performances during the observed period.

### 3. HYPOTHESES

Robo-advisors have become popular platforms for providing people automated investment advice. Understanding the variations and consistencies in the recommendations the RA's provide, especially in relation to various risk appetites, is essential as investors increasingly rely on them. In the context of robo-advisors, this part provides a set of hypotheses that aim to investigate these variations and consistencies.

*H1: Robo-advisors will recommend significantly different asset allocations to investors with different risk appetites.*

While lower-risk portfolios are likely to contain fixed-income securities and cautious investments such as bonds, higher-risk portfolios are more likely to contain a bigger allocation to stocks, according to Boreiko & Massarotti (2019). The goal of this research is to identify the differences in investment strategies by comparing the asset allocation recommendations made by different robo-advisors to investors with different risk appetites.

*H2: The level of customization offered by robo-advisors to investors with different risk appetites significantly influences the recommendations they receive.*

This hypothesis proposes that the degree of customization provided by robo-advisors to investors with different risk appetites has a significant impact on the recommendations they receive. It suggests that robo-advisors offering higher levels of customization will tailor their recommendations more closely to individual risk preferences, resulting in portfolios that better align with investors' risk profiles. On the other hand, robo-advisors with lower levels of customization may provide more standardized recommendations that do not live up to the

expectations of the investors, because they do not reflect their specific risk tolerances and objectives.

D' Acunto and Rossi (2020) explain that there are 4 levels of customization that influence the recommendations investors receive:

*Portfolio personalization* refers to the robo-advisor's ability to offer financial advice tailored to the client's needs. One point of criticism that RA's often receive, is their lack of customization, because their risk profiling is based on information that is too limited.

*Client involvement* is referred to as the participation of the client in the creation of the investment plan. There are RA's that require the client to approve each and every trade they make, but there are also RA's that manage the portfolio on the client's behalf.

*Client discretion* assesses the client's capacity to refuse the robo-advisor's advice and is related to client involvement. This means the client ignores the advice of a robo-advisor as a result of their behavioral bias.

*Human interaction* is referred to as the level of engagement between a customer and a human-advisor. In this framework, there is no human interaction, since there are RA's involved that function automatically in an effort to cut expenses.

By analyzing to which extent these four levels of customization are applicable to the robo-advisors, this hypothesis aims to understand how the level of customization affects the alignment between investors' risk profiles and the investment strategies recommended by robo-advisors.

*H3: The results of the investment recommendations from different robo-advisors to investors with different risk appetite will significantly vary after a specific time period.*

This hypothesis suggests that the investment recommendations provided by robo-advisors with different risk appetites will result in significantly different results when evaluated over a specific time period. It proposes that variations in risk appetite, reflected in the level of risk taken in the recommended portfolios, will have a substantial impact on the investment outcomes. Robo-advisors offering higher-risk portfolios are expected to generate higher potential returns but also carry higher volatility and potential losses, while robo-advisors with lower-risk portfolios may aim for more stable and conservative returns.

## 4. METHODOLOGY

The focus of this research is on testing what the variations and consistencies are in the recommendations from different robo-advisors with different risk appetites. This will be done by conducting comprehensive research with a small sample of three robo-advisors, which will be put to the test and be compared to each other on the basis of the following dimensions:

### 4.1 The type of criteria that the robo-advisors use to evaluate an investor's risk profile

It's important to understand the factors that robo-advisors consider when determining a client's risk profile, since these factors have an impact on the investment recommendations the platform makes to the investor. Each robo-advisor may weigh each factor differently, which results in variances in the investments they recommend.

To find out what the differences are between the criteria robo-advisors use to determine an investor's risk profile, a couple of robo-advisors have to be selected, which meet multiple criteria. In order for a robo-advisor to be considered in the selection process, the robo advisor has to meet certain criteria, such as:

The robo-advisor has to be available in the Netherlands, otherwise it is impossible to create an account on the platform. The vast majority of the robo-advisors that are available on the market are only accessible in the United States, so that already shrinks the number of possible candidates.

The robo-advisor has to have a low minimum deposit, this way the research stays cheap to configure. Ideally, the best option would be to spend no money on the research and to use demo accounts with fake money on the robo-advisor platforms. Although, the robo-advisors then tend to only give few information about your portfolio composition. Only when you deposit money, you will get all the necessary information since you are then working with real financial securities and use real money.

The robo-advisor needs to have multiple portfolio strategies & risk/return trade-offs available. This is necessary to research how robo-advisors adjust their recommendations in response to changes in risk appetite.

The robo-advisor needs to have positive reviews, this indicates something about the reputation of the robo-advisor.

After carefully considering all the different criteria, three robo-advisors passed the selection process: Birdee, Finax & Sarwa. Once these platforms were chosen, it was time to create different risk profiles on each platform (see below). Robo-advisors use a range of criteria to determine an investor's risk profile, such as their age, income, investment goals, and risk tolerance. Understanding how different robo-advisors determine risk profiles and the criteria they use will be essential for analyzing their recommendations. In order to create these risk profiles, it is necessary to answer different questionnaires, which the platforms use to evaluate an investors risk profile.

By making these questionnaires, it makes it possible to write down the methods the different robo-advisors use and compare them to each other. This way it is possible to evaluate the first dimension: the type of criteria that the robo-advisors use to evaluate an investor's risk profile.

Investors' risk profile descriptions:

	<i>Birdee</i>	<i>Finax</i>	<i>Sarwa</i>
<i>Investment strategy</i>	Conservative	Moderate	Aggressive
<i>Age</i>	20 years old	20 years old	20 years old
<i>Sex</i>	Male	Male	Male
<i>Marital status</i>	Single	Single	Single
<i>Field of work</i>	Food delivery	Food delivery	Food delivery
<i>Investing experience</i>	2-5 years	2-5 years	2-5 years
<i>Investment period</i>	~3 weeks	~3 weeks	~3 weeks
<i>Yearly income</i>	€15,000	€15,000	€15,000
<i>Investment amount</i>	€50	€50	€50
<i>Aim of investment</i>	Wealth building	Wealth building	Wealth building
<i>Investment philosophy</i>	Minimize losses	Minimize losses and maximize returns	Maximize returns

### 4.2 The allocation to different financial securities

Comparing the asset allocation recommendations of the different portfolios and recording the variations and consistencies. On the websites of the robo-advisors, it is possible to see the portfolio composition in depth. This shows the type of financial securities that the three portfolios consist of. The idea is then to compare the financial securities of the different portfolios to each other and analyze the individual financial securities.

Evaluating the different portfolios on the basis of the following different criteria:

The equity/bonds distribution. H2 implied that lower-risk strategies are likely to prefer fixed-income securities and cautious investments such as bonds, while higher-risk strategies are more likely to advise a bigger allocation to stocks. It will be evaluated whether this also applies in this case.

Individual stocks/bonds. To what stock exchange is it listed? With what currency has it been bought? How has it been performing over the last years? Also evaluating why the portfolio consists of the amount that has been bought per financial security. Why not more or less?

### 4.3 The level of customization the RA's offer to investors with different risk appetites

First of all, the level of customization generally refers to the extent to which robo-advisors adapt their recommendations to align with the specific risk profiles of investors. Higher levels of customization involve more personalized and individualized investment advice, taking into account the unique risk preferences and objectives of each investor. D' Acunto and Rossi

(2020) explain in their study called “Robo-Advising” that there are 4 levels of customization that influence the recommendations investors receive: *portfolio personalization, client involvement, client discretion* and *human interaction*.

By analyzing to which extent these four levels of customization are applicable to the robo-advisors, we aim to understand how the level of customization affects the alignment between investors' risk profiles and the investment strategies recommended by robo-advisors. Evaluation of the level of customization is based on the following criteria:

- The possibility to change individual financial securities.
- The possibility to invest in stocks of a specific industry.
- The possibility to invest in environment friendly stocks.
- The possibility to change the risk preference.

By evaluating these criteria, it is possible to draw a conclusion on which of the 4 levels of customization belong to the three robo-advisors.

#### **4.4 The results of the investment recommendations from the different robo-advisors**

The proposed research will involve conducting an experiment over a period of approximately three weeks, specifically from May 24rd to June 15th. The goal of this experiment is to evaluate the performance of three different investment portfolios. The primary objective is to investigate the variations in portfolio composition and track their progress over time.

The experiment aims to analyze the performance differentials between portfolios of investors with different risk appetites. The performance can be evaluated based on the following factors:

- The risk & return rate.
- Returns compared to index funds.
- Possible changes in the portfolio.

#### **4.5 Data description**

The data for this study will consist of the recommended asset allocations and investment strategies provided by different robo-advisors for each risk profile created. The data will be collected by inputting the risk profiles into the selected robo-advisors and recording the recommendations provided. The data will be recorded in a spreadsheet, which includes information such as the different assets by name, their price and percentage of the portfolio. Moreover, additional information will be added, such as the portfolio composition expressed in type of financial securities, the countries where the securities are listed in and the currency that has been used to acquire the portfolio. The progress of the portfolio will be recorded for a total of 3 weeks of time, from May 24<sup>th</sup> until June 15<sup>th</sup>.

## **5. RESULTS**

### **5.1 Risk-profile creation**

In the process of creating a risk profile, the type of criteria used by robo-advisors plays an important role. It helps them evaluate an investor's risk tolerance and determine an appropriate investment strategy. Summarizing the differences in their risk-profile creation process provides valuable insights.

Birdee begins the account setup process by presenting multiple investment goals to choose from, such as buying a property or preparing for retirement. Next, thought-provoking questions are asked, focusing on risk tolerance. What can be noticed is that Birdee uses three image-based questions with real numbers, which allows users to choose between different risk-reward scenarios, which makes the user think. Based on the answers, Birdee provides investment portfolio advice, and investors also have the option to choose a sustainable and socially responsible investment theme, such as biotech and real estate. This would mean that a part of the users portfolio would consist of financial securities that belong to those industries.

Sarwa's risk-profile creation process starts directly with a comprehensive questionnaire. It covers various aspects, including financial situation and investment preferences. The questionnaire explores factors such as investing budget, age, annual income, and investment knowledge. To measure risk tolerance, Sarwa presents scenarios to assess risk aversion and comfort with potential losses and portfolio fluctuations. After evaluating the responses, Sarwa advises investors on a suitable risk level and displays the asset allocation accordingly.

Finax initiates the account setup by making the investor choose the purpose of the investment, with options such as intelligent wallet, emergency fund, retirement, and more. After selecting one of the options, the user proceeds to a detailed questionnaire covering investment horizon, target value, investment frequency and size, income, risk attitude, knowledge and experience, and responsible investments. Finax then recommends a strategy, displaying the stock-to-bond composition and expected results.

After summarizing the risk-profile creation processes of the three Robo-advisors, it becomes clear that they share a similar overall approach. All three platforms begin by asking the user about their investment goal, followed by a questionnaire consisting of unique questions used to create the risk profile and assess the user's risk appetite. However, there are notable differences among the Robo-advisors.

Birdee stands out for its distinctive questions and the inclusion of responsible investments as an option. The platform's questionnaire primarily focuses on evaluating the user's risk appetite.

Sarwa, on the other hand, employs the most comprehensive and extensive questionnaire compared to the other two Robo-advisors. It covers a wide range of topics, including age, investment knowledge, income, and various other factors, while Birdee only covered these topics after the questionnaire.

In contrast, Finax's questionnaire is relatively short and basic in comparison. To elaborate, the RA only included one question related to the investor's risk attitude. The simplicity of Finax's questionnaire suggests a more streamlined approach to risk-profile creation.

## 5.2 Asset allocation recommendations

When analyzing the three portfolios of Birdee, Sarwa, and Finax, significant differences can be noticed in their risk profiles, asset allocations, regional exposures, and currency choices. These differences reflect varying investment strategies and objectives tailored to meet the needs of investors with different risk appetites. The essential distinctions are being shown in table 1 and the full portfolio's in detail can be seen in appendix 1.

Birdee's portfolio is constructed as a low-risk investment strategy, emphasizing capital preservation and income generation (The Investopedia Team, 2020). With a substantial allocation to bonds at 70%, the portfolio seeks stability and regular interest payments. The remaining allocation of 22% to equities introduces a growth component while maintaining a low-risk profile. By prioritizing fixed-income securities, Birdee's portfolio aims to provide stability and a potential source of income. Additionally, the portfolio is heavily weighted towards Europe, which accounts for 80% of the allocation, indicating a preference for the stability and potential returns offered by developed economies within the region. The US represents 15% of the portfolio, providing exposure to the world's largest economy, while 5% is allocated to emerging global markets for a small level of diversification. Importantly, all holdings within Birdee's portfolio have been fully acquired using the Euro as currency.

In contrast, Sarwa's portfolio is designed as a high-risk investment strategy, seeking potential growth opportunities. The portfolio exhibits a significant emphasis on equity investments, with stocks comprising 88% of the allocation. This allocation reflects a strong belief in the growth potential of the stock market and the pursuit of long-term capital appreciation. The remaining 12% is allocated to bonds, providing some stability and diversification during market fluctuations. Sarwa's portfolio demonstrates a well-diversified regional composition, with 49% allocated to the US, 36% to developed markets, 12% to emerging markets, and 3% to global bonds. The highest individual allocation within the portfolio is assigned to the Vanguard Total Stock Market ETF, indicating a conviction in the potential growth of the US stock market. The entire portfolio has been purchased using the US dollar as the currency.

Finax's portfolio follows a moderate-risk investment strategy, aiming to strike a balance between potential growth and stability. With an equal allocation of 49% to both stocks and bonds, the portfolio seeks to combine the potential for capital appreciation with the stability and income generation of fixed-income securities. The regional composition of the portfolio is well-diversified, with 50% allocated to the US, 40% to Europe, and 10% to global markets. This allocation allows for exposure to a wide range of industries and sectors in established economies, while also capturing potential growth opportunities in emerging or less-represented markets. The highest individual allocation within the portfolio is assigned to the Xtrackers II Global Government Bond UCITS ETF, providing exposure to low-risk global government bonds. Like Birdee's portfolio, all holdings within Finax's portfolio have been acquired using the Euro currency.

In summary, these three portfolios of Birdee, Sarwa, and Finax demonstrate different risk strategies tailored to meet the unique objectives of the investor. Birdee's portfolio prioritizes capital preservation and income generation through a significant allocation to bonds, while Sarwa's portfolio seeks high-risk growth through a dominant equity allocation. Finax's portfolio aims for a balance between growth and stability with an equal allocation to both stocks and bonds. Some similarities are also to be seen, since Sarwa and Finax both allocate roughly 50% of

their assets to the US market. Moreover, Birdee & Finax both make use of the Euro as the currency to acquire the assets.

Table 1: A comparative table of the three robo-advisors.

	Birdee (defensive)	Finax (moderate)	Sarwa (aggressive)
Bond %	70%	49%	6%
Stock %	22%	49%	88%
Geographical distribution	Europe: 80% US: 15% Global: 3% Emerging global: 3%	US: 50% Europe: 40% Global: 10%	US: 49% Developed markets: 36% Emerging markets: 12% Global: 3%
Highest individual allocation	Amundi Index Corp UCITS ETF	Xtrackers II Global Government Bond UCITS ETF	Vanguard Total Stock Market ETF

## 5.3 Portfolio customization

Birdee offers investors the option to customize their portfolio beyond the standard options, such as defensive, moderate, and dynamic portfolios. The RA provides three thematic portfolios: SMEs and small caps, biotech and real estate, allowing investors more flexibility in their investment choices. Small and medium-sized enterprises and small caps represent a large portion of businesses in the EU, amounting for 99% of all businesses (European Commission, n.d.). These companies typically have market values below 2 billion euros and offer both growth potential and higher risk. Birdee allows investors to allocate 30%, 20%, or 10% of their portfolio to SMEs and small caps, with the performance history for each allocation level available for reference.

Similarly, Birdee offers customization options for investing in biotech and real estate. Biotechnology encompasses companies operating in fields such as microbiology, biochemistry, genetics, and molecular biology (Kagan, 2022). Real estate investment involves tangible assets such as land, buildings, and natural resources, offering both income and potential capital appreciation. Birdee allows investors to allocate 30%, 20%, or 10% of their portfolio to these sectors, providing diversification and exposure to these specific industries.

In contrast, Sarwa offers limited customization options. Investors can adjust the risk level of their portfolio, choosing from six different levels ranging from low-risk with over 90% allocated to bonds to high-risk with over 80% allocated to stocks. Additionally, Sarwa allows investors to include Bitcoin in their portfolio, with a minimum investment amount of \$2500. However, the allocation to Bitcoin is limited to 5% due to the volatile nature of cryptocurrency.

On the other hand, Finax does not offer customization options within a single account. While investors can create multiple accounts with different investment goals, they cannot adjust the risk level or investment objective of an existing account. In some way, this can benefit the investor average investor, since individuals are generally subject to behavioral biases. which

means their financial decisions can be less than fully rational, as explained in the Behavioral Finance Theory (Byrne & Brooks, 2008).

It is important to note that when comparing these robo-advisors to established players like Betterment and Vanguard, the customization options may vary. For instance, Betterment provides experienced investors with access to a flexible portfolio where asset class weights can be adjusted. They also offer access to asset classes such as commodities, high yield bonds, and real estate investment funds (Holeman, 2022). These established players often have a broader range of customization features and investment options available to deal with different investor preferences.

D' Acunto and Rossi (2020) explained in their study that there are 4 levels of customization that influence the recommendations investors receive. After evaluating the three robo-advisors, we can state that all three robo-advisors make use of the portfolio personalization level, this refers to the robo-advisor's ability to offer financial advice tailored to the client's needs, through a questionnaire. No sign of client involvement has been seen, while it is also not possible for the client to refuse the RA's advice, so portfolio personalization is the only appropriate level for the three RA's.

## 5.4 Performance of portfolios

The performance analysis of Birdee's defensive portfolio reveals relatively stable results. Throughout the observed period, the portfolio value remained around 50 euros, as illustrated in Appendix 2 & 3. On May 24th, the portfolio was valued at 49.68 euros, and by June 15th, it had increased to 49.76 euros, resulting in a modest return of 0.16%. Such a result is considered normal for a short-term period.

As a benchmark, Birdee's portfolio performance can be compared against a portfolio which consists of the S&P500 and the S&P500 bond index, when also taking the same bond/stock distribution into consideration. During the same period, the S&P500 managed to gain 7,5%, while the S&P 500 bond index gained 1,12%, as to be seen in appendix 4. This meant that the S&P 500 entered a new bull market, with a 20% rise from its October low (Sor, 2023). Taking 70% of the S&P 500 bond index and 22% of the S&P500, results in a performance of 2,43%, which means Birdee's portfolio underperformed compared to the portfolio that consists of these two index funds.

Birdee's portfolio has undergone significant changes. The robo-advisor has introduced three new ETFs into the portfolio, consisting of two bond-tracking ETFs and one equity-tracking ETF. What is noticeable is that the new addition in the equity segment focuses on the Japanese region. On May 24th, the portfolio primarily comprised the Amundi Index US Corp SRI UCITS ETF, accounting for nearly 40% of the portfolio. However, by June 15th, this allocation had decreased to 5%, indicating that the robo-advisor implemented asset sales and purchases to achieve a more diversified portfolio. This adjustment is a result of portfolio rebalancing, a process involving the realignment of assets to maintain the desired asset allocation (Huffman, 2023).

Regarding Finax's portfolio performance, it exhibited significant growth during the observed period. From May 24th to June 15th, the portfolio experienced a notable increase of 2.4%, which is substantial for such a brief timeframe. The only asset in the portfolio that displayed a bearish trend during this period was an ETF tracking Europe's 600 largest companies. This outcome can be attributed to the exceptional performance of US stocks,

particularly the inclusion of an iShares ETF tracking the S&P 500, which rose by more than 5% during the same period.

As a benchmark, Finax's portfolio performance can also be compared against the portfolio which only consists of the S&P500 and the S&P500 bond index, when again taking the bond/stock distribution in consideration. Taking 49% of the S&P 500 bond index and 49% of the S&P500 results in a performance of 4,87%, which means Finax's portfolio underperformed compared to these two index funds.

Similarly, Sarwa's portfolio achieved a notable return of 5.84% during the specified period, largely driven by the performance of the US stock market. The inclusion of the Vanguard Total Stock Market ETF played a significant role, contributing over half of the portfolio's gains. Meanwhile, the bond component of the portfolio maintained a consistent value.

When using the same benchmarking method as used for Birdee and Finax and taking in the bond/stock distribution that has been displayed in table 1, the performance amounted 6,7%, which again means that sarwa's portfolio underperformed compared to the portfolio consisting of the two index funds.

In summary, the portfolios of Birdee, Finax, and Sarwa have demonstrated varying performance during the observed period. Birdee's defensive portfolio demonstrated stability, while Finax and Sarwa experienced significant growth primarily driven by the strong performance of the US stock market. However, it is important to note that all three robo-advisors underperformed compared to the index fund portfolio.

Nevertheless, it is crucial to consider that the underperformance is not necessarily a negative aspect. The robo-advised portfolios showed relatively good performance and their underperformance can be attributed to their higher level of diversification compared to the index fund portfolio, which consisted of only two assets. This implies that the index fund portfolio has the potential for higher growth in a bullish market. However, over the long term, the robo-advised portfolios offer a safer approach and are less likely to experience significant value declines in a bearish market compared to the index fund portfolio.

Table 2: A comparative table based on the performance of the three robo-advisors.

	<b>Birdee</b>	<b>Finax</b>	<b>Sarwa</b>
<b>Risk</b>	Low	Medium	High
<b>Returns</b>	0,16%	2,4%	5,84%
<b>Index fund portfolio returns</b>	2,43%	4,87%	6,7%
<b>Under or over performance</b>	Under By 2,27%	Under by 2,47%	Under by 0,94%
<b>Type of changes to portfolio</b>	Large change	No changes	No changes



## 6. DISCUSSION

This study aimed to investigate and compare the investment recommendations provided by three robo-advisors to investors with varying risk appetites. The study sought to answer specific hypotheses regarding asset allocation recommendations, portfolio customization, and portfolio performance. In this discussion, it will be evaluated whether the hypotheses have been answered and the implications of the study will be discussed.

### 6.1 Evaluating the hypotheses

First of all, the study analyzed the portfolios of Birdee, Sarwa, and Finax to understand factors such as risk profiles, asset allocations and regional exposure. The findings revealed significant differences among the portfolios, reflecting varying investment strategies tailored to different risk appetites. Birdee's portfolio prioritized capital preservation and income generation, Sarwa's portfolio aimed for high-risk growth, and Finax's portfolio sought a balance between growth and stability. Some similarities were also found, such as in the regional exposure and the choice of currency to acquire the assets. Although, based on the different bond/stock compositions and individual assets that were included in the portfolio, the hypothesis that the robo-advisors would provide different asset allocation recommendations based on risk profiles can be accepted.

Furthermore, the study explored the customization options offered by the robo-advisors. It was found that Birdee provided thematic portfolios and allowed investors to allocate percentages to specific sectors, while Sarwa offered limited customization options, and Finax did not offer customization within a single account. Therefore, the hypothesis that the robo-advisors would differ in their portfolio customization options has been confirmed.

The study also examined the performance of the three robo-advised portfolios over a period of three weeks. Significant differences were observed in their performance. Sarwa achieved the highest returns, and there were notable variations in returns among the three portfolios. Additionally, the study found differences in portfolio changes. Birdee frequently adjusted its portfolio through rebalancing, while Finax and Sarwa made no changes. The hypothesis suggesting that portfolios with higher risk would generate greater potential returns was validated by the results. Thus, the hypothesis that the robo-advised portfolios would perform differently after a specific period can be accepted.

### 6.2 Implications of the study

The findings of this study have several implications for both investors and the robo-advisor industry. Firstly, the variations in the risk-profile creation processes among the robo-advisors highlight the importance of understanding an investor's risk tolerance and goals. Different robo-advisors accommodate different preferences, allowing investors to choose the approach that aligns with their individual needs.

Secondly, the differences in asset allocation recommendations explain the importance of considering risk appetite when creating an investment portfolio. The study showed that robo-advisors tailored their recommendations to provide options ranging from low-risk to high-risk strategies, enabling investors to align their portfolios with their desired level of risk and potential returns.

Moreover, the study shed light on the customization options offered by robo-advisors. While some robo-advisors provided flexibility for investors to allocate percentages to specific sectors or industries, others had limited options. This highlights the need

for investors to consider their preferences for customization when selecting a robo-advisor.

Lastly, the portfolio performance analysis revealed that the robo-advised portfolios showed relatively good performance during the specified period. Although, they underperformed compared to an index fund portfolio, this can be attributed to the higher level of diversification and risk mitigation strategies employed by the robo-advisors. This implies that robo-advisors can provide a reliable investment option for individuals seeking stability and risk management.

In summary, the results of this study proclaim that robo-advisors offer a dependable investment alternative for individuals who prioritize stability and effective risk management. Although, the differences in risk appetite, asset allocation recommendations, level of customization and portfolio performance, explain the importance for an investor to consider its options in robo-advisors when creating an investment portfolio.

## 7. CONCLUSION & LIMITATION

This study explored the investment recommendations from three different Robo-advisors to investors with varying risk appetites: Birdee, Sarwa, and Finax. The study attempted to understand the differences and consistencies in their recommendations, giving understanding on the strategies used by these Robo-advisors to address the various risk profiles of investors.

Through an analysis of their risk-profile creation processes, it became clear that the RA's share a similar overall approach. All three platforms begin by asking the user about their investment goal, followed by a questionnaire consisting of unique questions used to create the risk profile and assess the user's risk appetite. Although, Birdee stands out for its distinctive questions and the inclusion of responsible investments as an option. Sarwa, on the other hand, employs the most comprehensive and extensive questionnaire compared to the other two Robo-advisors. In contrast, Finax's questionnaire is relatively short and basic in comparison.

Furthermore, the asset allocation recommendations provided by the Robo-advisors revealed significant differences in risk appetite, regional exposures, and currency choices. Birdee prioritized capital preservation and income generation through a substantial allocation to bonds, with a strong focus on European markets. Sarwa emphasized high-risk growth through a dominant equity allocation, while Finax aimed for a balance between growth and stability with equal allocations to stocks and bonds, diversifying across the US, Europe, and global markets.

In terms of portfolio customization, Birdee offered investors thematic portfolios, enabling them to allocate specific percentages to sectors such as SMEs and small caps, biotech, and real estate. Sarwa provided limited customization options, allowing investors to adjust the risk level and include a small allocation to Bitcoin. Finax, on the other hand, did not offer customization within a single account but allowed investors to create multiple accounts with different investment goals.

Regarding the performance of the portfolios, Birdee's defensive portfolio demonstrated stability, while Finax and Sarwa experienced significant growth primarily driven by the strong performance of the US stock market. However, all three Robo-advisors underperformed compared to the benchmark portfolio consisting of the S&P 500 and the S&P 500 bond index. It is important to note that the underperformance can be attributed to the higher level of diversification in the Robo-advised portfolios, which provide a safer approach in bearish markets.

Reflecting on the research process, the study conducted a comprehensive analysis of the risk-profile creation processes, asset allocation recommendations, portfolio customization options, and portfolio performance of the three Robo-advisors. The study involved gathering information from their websites and examining the portfolios. The findings provided insights into the variations and consistencies among the Robo-advisors, offering a deeper understanding of their strategies and approaches to meet investors' risk appetites.

Although, the research also had its limitations. The research consisted of a limited sample size, namely three robo-advisors. Including a larger sample size of Robo-advisors would provide a better understanding of the variations in investment recommendations. This was mainly the result of a limited time frame to conduct this research. That's also why the performance of the portfolios was only recorded for three weeks of time, which might also be a limitation. The performance of the portfolios was influenced by various factors, including market condition and economic trends. It is important to consider that the performance results obtained in this study may not be indicative of future performance or applicable to different market environments.

Moreover, The findings of this study are specific to the three Robo-advisors analyzed and may not be generalizable to other platforms. The recommendations and strategies employed by Robo-advisors can vary significantly, and the results of this study should be interpreted within the context of the specific platforms investigated.

For future work on this topic, further research could explore the performance of the Robo-advised portfolios over longer periods and in different market conditions. Additionally, studying investor satisfaction and feedback regarding the customization options and portfolio performance could provide valuable insights into the effectiveness of these features.

In conclusion, this study contributes new knowledge to the field by exploring the investment recommendations from Robo-advisors to investors with different risk appetites. By examining the variations and consistencies among Birdee, Sarwa, and Finax, we have gained insights into their risk-profile creation processes, asset allocation recommendations, portfolio customization options, and portfolio performance. These findings can inform investors in making informed decisions and contribute to the growing body of research on Robo-advisors and their role in the investment landscape.

## 8. APPENDIXES

### Appendix 1

Birdee portfolio defensive, May 22th 2023.

Name of asset	Price in euro	% of portfolio
<b>Lyxor Euro Overnight Return UCITS ETF</b>	3,79	2,61
<b>iShares \$ Treasury Bond 3-7yr UCITS ETF</b>	2,49	4,96
<b>BNP Paribas Easy JPM ESG EMBI Global Diversified Composite UCITS ETF</b>	1,25	5,04
<b>BNP Paribas Easy MSCI World SRI S-Series PAB 5% Capped UCITS ETF</b>	1,25	2,53
<b>BNP Paribas Easy MSCI USA SRI S-Series PAB 5% Capped UCITS ETF</b>	1,25	7,47

<b>BNP Paribas Easy MSCI Europe SRI S-Series PAB 5% Capped UCITS ETF</b>	8,74	10,01
<b>Amundi Index US Corp SRI UCITS ETF</b>	3,73	37,57
<b>BNP Paribas Easy € Corp Bond SRI Fossil Free UCITS ETF</b>	8,75	4,96
<b>BNP Paribas Easy € High Yield SRI Fossil Free UCITS ETF</b>	3,75	4,96
<b>BNP Paribas Easy JPM ESG EMU Government Bond IG 3-5 Y UCITS ETF</b>	15	7,51
<b>Total</b>	50	100

Sarwa aggressive portfolio, May 24th 2023.

Name of asset	Price in dollar	% of portfolio
iShares Core MSCI EAFE ETF	17,41	35,29
Vanguard Emerging Markets ETF	5,81	11,78
Vanguard Real Estate ETF	2,41	4,88
Vanguard Total Bond Market ETF	1,47	2,98
Vanguard Total International Bond ETF	1,47	2,98
Vanguard Total Stock Market ETF	20,3	41,14
Cash	0,47	0,95
<b>Total</b>	49,34	100

Finax moderate portfolio, May 24th 2023.

Name of asset	Price in euro	% of portfolio
Xtrackers Stoxx Europe 600 UCITS ETF	4,8	9,68
Xtrackers MSCI Europe Small Cap UCITS ETF	1,45	2,92
Xtrackers II EUR Corporate Bond UCITS ETF	5,97	12,04
Xtrackers II EUR High Yield Corporate Bond UCITS ETF	2,97	5,99
iShares Core MSCI EM IMI UCITS ETF	4,94	9,96
UBS Lux Fund Solutions - Bloomberg USD Emerging Markets Sovereign UCITS ETF	3,01	6,07
Xtrackers II Global Government Bond UCITS ETF	12,23	24,67
iShares Core S&P 500 UCITS ETF	9,58	19,32
SPDR S&P 400 U.S. Mid Cap UCITS ETF	2,18	4,40

SPDR Russell 2000 U.S. Small Cap UCITS ETF	1,45	2,92
Cash	1	2,02
<b>Total</b>	<b>49,58</b>	<b>100</b>

## Appendix 2

Birdee defensive portfolio, June 15<sup>th</sup> 2023.

Name of asset	Price in euro	% of portfolio
Lyxor Euro Overnight Return UCITS ETF	2,5	5,02
iShares \$ Treasury Bond 3-7yr UCITS ETF	2,48	4,98
Xtrackers USD High Yield Corporate Bond UCITS ETF	1,23	2,47
Xtrackers Eurozone Inflation-Linked Bond UCITS ETF	2,31	4,64
BNP Paribas Easy MSCI World SRI S-Series PAB 5% Capped UCITS ETF	2,53	5,08
BNP Paribas Easy MSCI USA SRI S-Series PAB 5% Capped UCITS ETF	2,53	5,08
BNP Paribas Easy MSCI Europe SRI S-Series PAB 5% Capped UCITS ETF	6,22	12,50
BNP Paribas Easy MSCI Japan SRI S-Series PAB 5% Capped UCITS ETF	1,28	2,57
Amundi Index US Corp SRI UCITS ETF	2,47	4,96
BNP Paribas Easy € Corp Bond SRI Fossil Free UCITS ETF	9,96	20,02
BNP Paribas Easy € High Yield SRI Fossil Free UCITS ETF	2,5	5,02
BNP Paribas Easy JPM ESG EMU Government Bond IG 3-5 Y UCITS ETF	13,75	27,63
<b>Total</b>	<b>49,76</b>	<b>100</b>

Finax moderate portfolio, June 15<sup>th</sup> 2023.

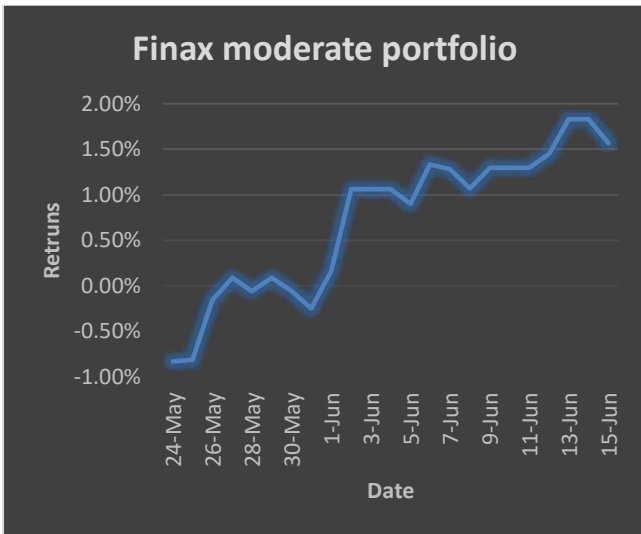
Name of asset	Price in euro	% of portfolio
Xtrackers Stoxx Europe 600 UCITS ETF	4,86	9,58
Xtrackers MSCI Europe Small Cap UCITS ETF	1,48	2,92
Xtrackers II EUR Corporate Bond UCITS ETF	5,98	11,79
Xtrackers II EUR High Yield Corporate Bond UCITS ETF	3,02	5,95
iShares Core MSCI EM IMI UCITS ETF	5,19	10,23
UBS Lux Fund Solutions - Bloomberg USD Emerging Markets Sovereign UCITS ETF	3,08	6,07
Xtrackers II Global Government Bond UCITS ETF	12,24	24,13
iShares Core S&P 500 UCITS ETF	10,08	19,87
SPDR S&P 400 U.S. Mid Cap UCITS ETF	2,28	4,50
SPDR Russell 2000 U.S. Small Cap UCITS ETF	1,51	2,98
Cash	1	1,97
<b>Total</b>	<b>50,72</b>	<b>100</b>

Sarwa portfolio aggressive, June 15<sup>th</sup> 2023.

Name of asset	Price in dollar	% of portfolio
iShares Core MSCI EAFE ETF	17,87	34,22
Vanguard Emerging Markets ETF	6,23	11,93
Vanguard Real Estate ETF	2,58	4,94
Vanguard Total Bond Market ETF	1,48	2,83
Vanguard Total International Bond ETF	1,48	2,83
Vanguard Total Stock Market ETF	21,88	41,90
Cash	0,7	1,34
<b>Total</b>	<b>52,22</b>	<b>100</b>

### Appendix 3:

Finax portfolio performance between May 24<sup>th</sup> and June 15<sup>th</sup>.

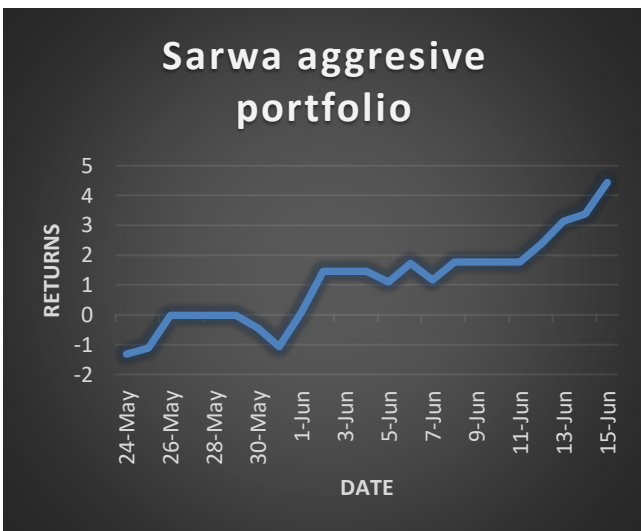


### Appendix 4:

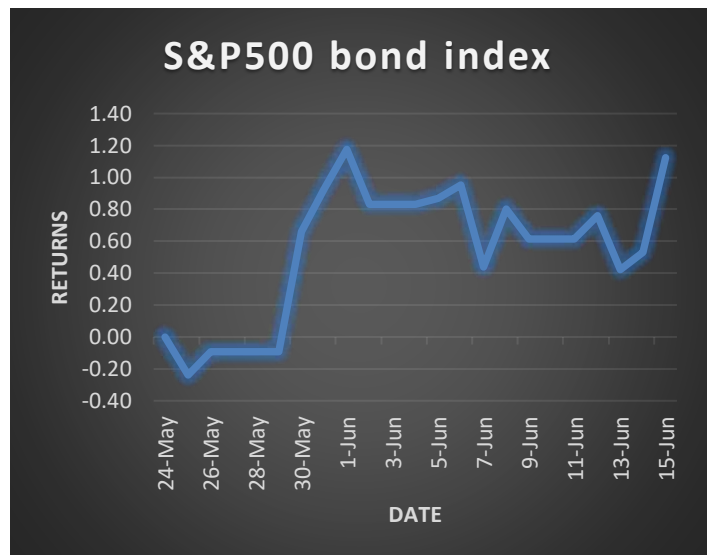
S&P500 performance between May 24<sup>th</sup> and June 15<sup>th</sup>.



Sarwa portfolio performance between May 24<sup>th</sup> and June 15<sup>th</sup>.



S&P500 bond index performance between May 24<sup>th</sup> and June 15<sup>th</sup>.



Birdee portfolio performance between May 24<sup>th</sup> and June 15<sup>th</sup>.



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