

**T.C.  
BAHCESEHIR UNIVERSITY  
GRADUATE SCHOOL OF EDUCATION  
THE DEPARTMENT OF ECONOMICS**

**G. ÇELİK**

**THE COMPARATIVE ANALYSIS ON ROBO-ADVISOR  
AWARENESS IN EMERGING COUNTRIES: CASE STUDY ON  
TURKEY AND UAE**

**MASTER'S THESIS**

**MAHMOUD KALTHOUM**

**BAU 2023**

**ISTANBUL 2023**



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**ISTANBUL 2023**

**T.C.**  
**BAHÇEŞEHİR UNIVERSITY**  
**GRADUATE SCHOOL**

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## ABSTRACT

### **The comparative analysis on Robo-Advisor awareness in emerging countries: case study on Turkey and UAE**

Mahmoud Kalthoum

Master's Program in Business Administration

Supervisor: Assist. Prof. Serkan YEŞİLYURT

March 2023, 92 page

The purpose of this study is to better understand the advantages that artificial intelligence (AI) technology may provide in the banking business, especially in investment advice operations, for both the firm and the consumer. While this study examines the opportunities and problems of Robo-advisor systems on a basic level, it does not compare any particular Robo-advisors that are now available on the market. Although the algorithms used, as well as the technical characteristics of the apps and their deployment in businesses, are outside the scope of this investigation. Mixed method approach was used to investigate the purpose of this study. The finding of this study shows that robo-advisory is still in an early stage where further development and adoption are required for general consumer adoption. Customers in the Turkey and UAE financial industry are asking for transparency and more information on robo-advisory in order to accept this innovation. No matter if a person invests in securities, their monthly savings have a big impact. There are a number of personality traits and behavioural factors that also have significantly influence whether or not someone chooses to use a robo-advisor to make investment decisions. On the other side, robo-advisors benefit service providers by cutting costs, expanding their clientele, generating consistent revenue via management fees, improving service quality, and making it simpler to keep tabs on business processes and transactions.

**Keywords:** Robo advisor, Financial sector, Artificial intelligence, Financial technology, Investment.

## ÖZ

### Gelişmekte olan ülkelerde Robo-Danışman farkındalığı üzerine karşılaştırmalı analiz: Türkiye ve BAE vaka çalışması

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Bu çalışmanın amacı, yapay zeka (AI) teknolojisinin bankacılık işinde, özellikle yatırım danışmanlığı işlemlerinde hem firma hem de tüketici için sağlayabileceği avantajları daha iyi anlamaktır. Bu çalışma, Robo-danışman sistemlerinin fırsatlarını ve sorunlarını temel düzeyde incelerken, şu anda piyasada bulunan herhangi bir Robo-danışman ile karşılaştırma yapmamaktadır. Kullanılan algoritmalar, uygulamaların teknik özellikleri ve işletmelerdeki dağıtımları bu araştırmanın kapsamı dışında olsa da. Bu çalışmanın amacını araştırmak için karma yöntem yaklaşımı kullanılmıştır. Bu çalışmanın bulgusu, robo-danışmanın genel tüketici benimsemesi için daha fazla geliştirme ve benimsemenin gerekli olduğu erken bir aşamada olduğunu göstermektedir. Türkiye ve BAE finans sektöründeki müşteriler, bu yeniliği kabul etmek için robo-danışmanlık hakkında şeffaflık ve daha fazla bilgi istiyor. Bir kişi menkul kıymetlere yatırım yapsa da, aylık birikimlerinin büyük bir etkisi vardır. Birinin yatırım kararları vermek için bir robo-danışman kullanmayı seçip seçmediğini önemli ölçüde etkileyen bir dizi kişilik özelliği ve davranışsal faktör vardır. Öte yandan, robo-danışmanlar maliyetleri düşürerek, müşterilerini genişleterek, yönetim ücretleri yoluyla tutarlı gelir elde ederek, hizmet kalitesini iyileştirerek ve iş süreçleri ve işlemleri takip etmeyi kolaylaştırarak hizmet sağlayıcılara fayda sağlar.

Anahtar Kelimeler: Robo danışman, Finans sektörü, Yapay zeka, Finansal teknoloji, Yatırım.



To My Parents.

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## LIST OF ABBREVIATION

AI: Artificial Intelligence

ATM: Automated Teller Machine

AUM: Assets Under Management

TÜBİSAD: Informatics Industry Associations

HFT: High Frequency Trade

ETFs: Exchange Traded Funds

EMH: Efficient Market Hypothesis

NLP: Natural Language Processing

MiFID: Markets in Financial Instruments Directive

SIPC: Securities Investor Protection Corporation

UAE: United Arab State

EF: Efficient frontier

CAPM: Capital asset pricing model

ML: Machine learning

NLP: Natural language processing

WWW: World Wide Web



## **Chapter 1: Introduction**

Many market intermediaries and asset managers are adjusting their practices and business structures to account for the impact of AI. Advice and support services, risk management, client identification and monitoring, trading algorithm selection, and portfolio management are just some of the many areas where AI and ML are being put to use by various companies (Board of the International Organization of Securities Commissions, 2020). The use of robo-advisors, or other online automated platforms, is becoming in popularity as a means of investing throughout the world. Multiple estimates predict that by 2022, robo-advisors would oversee assets worth \$4.6 trillion USD (Meola, 2021). Even though robo-advice was first used by start-ups, it is now a part of the services offered by established financial institutions such as Vanguard, Schwab, and Fidelity (Agnew & Mitchell, 2018).

The proliferation of so-called “robo-advice” may result in the creation of a number of advantages, most notably in the areas of increased operational efficacy and increased accessibility to financial markets (Baker & Dellaert, 2017). To be more specific, since robo-advice minimizes the amount of human contact, it may become less costly. This enables some investors to have access to advising, investment, and wealth management services that they would not otherwise be able to afford (Abraham et al., 2019). Despite these possible benefits of automating financial advising, the use of robo-advisors may potentially introduce or aggravate certain hazards. Despite these potential advantages, the use of robo-advisors is becoming more popular. Because of this, regulators all over the world are investigating the potential benefits and dangers of robo-advisors, as well as the question of whether or not the regulatory frameworks currently in place for financial advisers are able to effectively address the risks and challenges that could be brought about by the proliferation of robo-advisors.

Robo-advisory was first launched in the United States in 2008, which is still the largest market for robo-advisory even though having a financial advisor is rather prevalent in the United States. According to a research that was published in the United States by A.T. Kearney (2015), the usage of robo-advisory services will become more commonplace during the next three to five years among American investors, and the rate of adoption of robo-advisory will grow. It was anticipated that the proportion of

robo-total advisory's invested assets that were made up of dollars would rise from 1.7% in 2017 to 5.6% in 2020 (AT Kearney, 2015). Users that fit the identified features of contemporary robo-advisors often have prior knowledge in the financial markets and in the usage of modern technologies. In addition to their riches, customers like these are not afraid of taking chances (Ngo-Ye, Choi, & Cummings, 2018). There are a large number of businesses in Turkey and UAE that provide this kind of service, despite the fact that robo-advisory services are relatively new phenomena that are still in the growth phase and have a big potential for future expansion. There are 10 distinct types of robo-advisors available right now, and many more are on the way (Di Digital, 2022).

### **1.1. The Rise of Robo-Advisors**

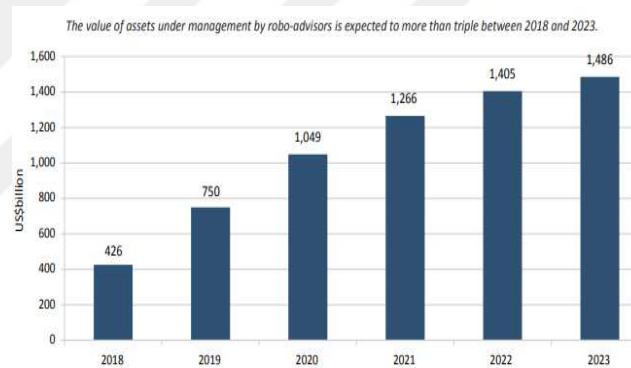
New technologies are constantly being used by the financial sector in order to provide financial services in a more cost-effective and time-efficient manner since the industry 1.0. After the global financial crisis of 2007–2008, when rules on conventional banks were tightened and advancements in computer science raised incentives to build non-bank, technology-based financial enterprises, the use of these technologies accelerated (IFC 2017). Automated Teller Machines (ATM), Mobile Payments, and Blockchain-Based Trade Finance Are all examples of financial technology innovations. Robo-advisors, or computerised financial advisors, are disrupting the wealth management services industry at this time.

Robo-advisors are online platforms that employ algorithms to automatically develop and maintain the portfolios of its customers. Robo-advisors were conceived as a low-cost replacement to conventional human advisors. Despite the fact that robo-advisors originated as fintech start-ups in the wake of the global financial crisis, their popularity has increased over the last few years. This is especially true as more conventional financial institutions have begun to provide their own robo-advisory services. One of the most successful and well-known brokerage companies in the United States, Charles Schwab, introduced its robo-advisory service, Intelligent Portfolios, in the year 2015. In the same year, BlackRock, the most successful asset management in the world, purchased the robo-advisory business Future Advisor. Robo-advice has also piqued the interest of large financial institutions such as Bank of

America and Wells Fargo, both of which have only lately begun to provide their customers with their very own automated advisory services.

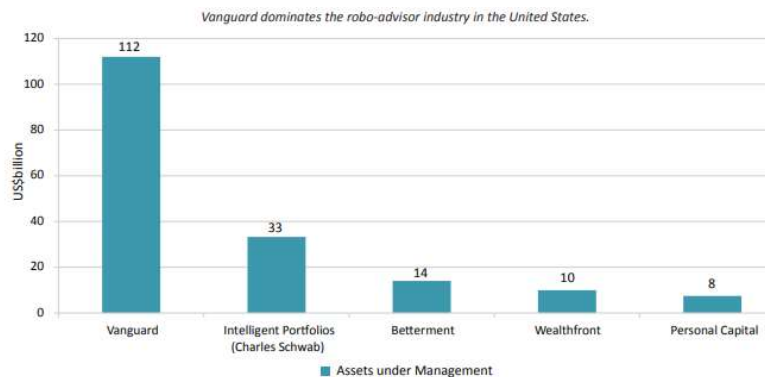
By a wide margin, the United States is the most important market for robo-advisors. The country collected 57% of all robo-advisor investments in 2017 and has the most robo-advisors of any economy (about 200) (Burnmark 2017; CBInsights 2017). Over US\$400 billion was invested with robo-advisors in 2018, and this number is expected to rise by 31% annually to approximately US\$1.5 trillion by 2023 as shown in Figure 1. Vanguard is now the leader in robo-advisory with \$112 billion in AUM, followed by Intelligent Portfolios with \$33 billion and Betterment with \$14 billion as in Figure 2.

Figure 1: Projected Assets Managed by Robo-Advisors in the United States, 2018–23



Source: Statista 2019

Figure 2: Largest Robo-Advisors in the United States, 2022



Source: Ortner 2018.

The use of automated financial advisers, or robo-advisors, is expanding outside North America. There are presently more than 70 robo-advisors in Europe, and five of them manage more than €100 million in assets (Burnmark 2017). The development of robo-advisors in emerging nations is another recent phenomenon. For instance, because to factors such as the region's expanding middle class and widespread use of advanced communication technologies, the number of robo-advisors in Asia is rapidly increasing (Forbes 2017). Several economies, including China (mainland), Hong Kong Special Administrative Region of China, India, Japan, Singapore, Thailand, and Vietnam already have their own versions of robo-advisors. Robo-advisors are also present in other developing areas, although their influence there has not yet been fully realised. As an example, the combined number of robo-advisors operating in Africa and Latin America is barely six (Burnmark 2017). In the years to come, it is anticipated that the use of robo-advisors will continue to spread all over the globe. According to some forecasts, robo-advisors will be responsible for the management of around 10 percent of global financial assets by the year 2020 (Business Insider 2017).

Despite being called "advisors," robo-advisors often provide more than just basic advising services, including full-scale portfolio management that gives users the freedom to abdicate investing decision-making while yet maintaining control. For instance, robo-advisors provided both advice and management services in 12 of the 15 economies studied (IOSCO, 2016). Investment management services may also involve tax planning and rebalancing for clients' existing portfolios.

### **1.2.Robo Advisor in Turkey**

The Finance industry is the major user of digital technologies and AI applications globally. OECD (2017) suggests that AI is increasingly being used the financial services providers in all sub-sectors such as “in banking (tailored products, chat boxes for client service, credit underwriting, and scoring, credit loss forecasting, fraud monitoring, and detection, customer service); asset management (Robo-advice, management of portfolio strategies, risk management); trading (algorithmic trading); insurance (Robo-advice, claims management)”. Anecdotal evidence suggests that AI is also growingly used in the Turkish Finance industry.



the Participation Banks Association of Turkey (2021) indicates that the use of modern fintech applications such as AI, ML, and Robo-advisory, has been evolving in Turkish participation banks. According to digital, internet, and mobile banking statistics of The Banking Association of Turkey (2021), the number of active digital customers in the Turkish Banking Industry has increased from 35 million to 78 million respectively in the years 2017 and 2021. The applications subjects of internet banking involve a wide range of investment subjects such as transactions in stocks and futures markets, mutual funds, foreign exchange, time-deposit, gold, repo, and government/corporate bonds besides fundamental banking transactions such as money transfer and payments.

This statistic reveals that the volume of digital transactions in banking is 673 billion Turkish Lira representing a % 362 increase from 2017 to 2021. Although the statistics of the Turkish Banking Industry do not provide detail on the volume of AI applications, anecdotal evidence suggests that through mobile and digital banking channels AI applications have been actively used in the Turkish banking industry as suggested by various products offered by Turkish banks such as Robo-advisory, interactive voice response, or QR codes. For example, by analyzing Isbank's Personal Assistant 'Maxi' added to Is Bankasi mobile application in 2018, Memiş and Geylan (2021) conclude that this AI application has recorded an impressive number of queries, overwhelmingly positive feedback, and a very high percentage of accuracy. The banking industry utilizes AI applications for cybersecurity and fraud detection, loan and credit decisions, tracking market trends, compliance, and risk management.

About six percent of orders in BIST would be High Frequency Trade (HFT), according to research by Ersan and Ekinci (2016). After the enhancements to BIST's order submission platform and the decrease in tick size for some equities, HFT participation increased in big orders (11.96%) and in orders filed by portfolio/fund management companies (10.40%). Although I have no detailed data on the volume, impact, and effectiveness of the AI application framework, I may cautiously conclude that the Turkish finance industry has already started employing AI tools in its operations.

### **1.3.Robo Advisor in UAE**

In the United Arab Emirates, a new generation of digital investment platforms is emerging to meet the need for accessible, low-cost investment opportunities among the country's young, educated professionals and mass wealthy. Fees for using a robo-advisor, which can assess an investor's risk tolerance and then allocate them to a diversified portfolio of Exchange Traded Funds (ETFs) based on that assessment, may be as low as 0.5 percent annually, making them more competitive with online brokers (Matheson, 2020).

After a successful trial run in the sandbox environment provided by the Dubai International Financial Centre, robo-advisory Sarwa was granted a full operating licence in the UAE in the month of November. With a goal to "democratize the entire wealth management sector," Nadine Mezher, chief marketing officer and co-founder at Sarwa, is leading the company's efforts to expand beyond its current user base of around 2,700. Management fees for Sarwa range from about 0.85% per year for account balances under Dh183,662 to 0.50% for balances over Dh367,325, and the company calls itself a hybrid robo-advisory because it also employs human wealth advisers who can be reached via phone or in-person should a client require financial planning. According to research (Abumughli, & Aysan, 2021).

The level of artificial intelligence (AI) that is now available on the market in the UAE is quite low and varies widely depending on the types of individuals who are the most technologically advanced (Qasim, El Refae, & Eletter, 2022). According to the findings of a study conducted by Shakir and Vihari (2022), the government of the UAE and its associated authorities need to make an effort to raise public awareness of the services they provide, as well as to encourage and support these services by regulating them through the appropriate government bodies. They have the ability to develop and advance through raising their level of awareness. One of the things that may be done is to work on raising the general public's level of literacy about their understanding of FinTech. There is a plethora of research that demonstrates the contribution of public participation to the success of a firm. There is also a need to expand people's use of technology, which the government is in a position to support

and which is part of the problem. A more clear policy or set of laws should be implemented from their end in order to strengthen people's faith in the government.

#### **1.4.Problem Statement and Research objective and questions**

Most of the studies Bhatia et al. (2020); Brenner and Meyll (2020); Lourenço et al. (2020) are among those who have published peer-reviewed studies on robo-advice in the last several years. However, there are only a few resources accessible that provide insight into the new IT services from a management viewpoint. The present work provides a theoretical model that is then experimentally tested. There seems to be widespread agreement that robo-advice represents a significant advancement in financial technology (Kaya 2017). It is yet unknown why certain investors are prepared to spend large amounts of money utilizing a relatively new algorithmic technique (i.e., AI). They may not completely comprehend the situation, with start-up enterprises with minimal brand awareness in an industry that used to value customer trust (Kaya 2017; Lourenço et al. 2020). With regard to investment advising, the fundamental study purpose of this thesis is to examine the advantages and drawbacks of adopting artificial intelligence, more especially Robo-advisors, in the field. The goal is to investigate the advantages and drawbacks of investment advising services for both the adviser and the consumer. In a nutshell, the purpose of this thesis is to offer the reader with a thorough grasp of the benefits and drawbacks of establishing an artificial intelligence-based investment advising system in Turkey and UAE. In this regard, the following are the particular research problems that this thesis addresses;

RQ1: Has robo-advisory been adopted in Turkish and UAE and what attitudes do consumers have towards robo-advisory on the Turkish financial market?

RQ2: Which personal traits impact the consumer's decision and service provider to invest in securities and via a robo-advisor?

#### **1.5.Outline of the thesis**

Important ideas are discussed in the theoretical framework and literature review sections, and these theories will serve as the theoretical foundation for the case study. An examination of the literature demonstrates previous research on robo-advisory, as well as other innovations that are comparable to robo-advisory development, as well

as criticism. Throughout the chapter, the goal is to provide the groundwork for the empirical investigation to follow.

Second, the methodology section provides justification for how the study was carried out by outlining the strategy, technique, and data collecting used in the investigation. Following the description and motivation of the variables, descriptive statistics are used to evaluate the data. In this chapter, the rationale for the selected study kind and procedure is presented. It is presented in the empirical analysis chapter, which is based on the survey results, what the empirical findings are. Following that, an analysis will be done and linked to the literature framework. There is a discussion and examination of the research that led up to the results and their conclusions in this chapter. The conclusions of the investigation are summarized in this chapter, which is divided into two sections; the key results of the study are described, followed by suggestions for further investigation.

## **Chapter 2: Literature Review**

Robo-advisory is a computerized version of the human role in portfolio management that nonetheless makes use of time-tested models and ideas. The literature, ideas, and models used by robo-advisors are also discussed here, beginning with the aforementioned concepts of market efficiency, portfolio management, and current portfolio theory. It is also essential to have a fundamental understanding of both the financial system as a whole as well as the development of robo-advisors before attempting to comprehend the impact that robo-advisors have had on the stock market and evaluate whether or not they are a workable alternative. In the following parts, we will address the conceptual underpinnings of robo-advisors, as well as the theoretical foundations of artificial intelligence and financial advising services. In addition to that, it will investigate the fundamentals of the financial industry, and then it will provide a concise overview of the development of robo-advisors. Following an introduction to the theories, this study will evaluate the prior studies conducted on robo- advisors, focusing on the strengths and weaknesses of each.

### **2.1. Market Efficiency**

First proposed by Eugene Fama in the 1960s, the efficient market hypothesis (Fama, 1960). Regardless of the investing approach or philosophy that person chooses to follow, the Efficient Market Hypothesis (EMH) has served as a basis for making investment decisions. An investor's whole investment strategy might be based on whether or not they trust this hypothesis, which states that the stock price already accounts for all known information. If an investor does not believe in the efficient market hypothesis, he or she will assume that price differences in stocks may be exploited for profit (Bodie, Kane & Marcus, 2014). The research of Kendall & Sundrum (1953); Bodie et al, (2014) on the predictability of stock prices over a certain length of time was the seed for Fama's theory. According to Kendall's research, stock prices have no discernible pattern and cannot be predicted using the available data (Kendall, & Sundrum, 1953).

Kendall's work inspired the theory that stock prices "random wander." In the stock market, the price of a share reflects both the present information and the anticipated future information. The stock market reacts solely to unexpected and novel

pieces of information. The stock price will quickly adjust to reflect this new information, and the seemingly random pattern of its movement to the new level that Kendall observed is actually just the market adjusting to the new information. This confirms Fama's efficient market hypothesis, since the stock price already reflects all relevant information (Malkiel, 2016). Despite its influence on stock selection since its release in the 1960s, Fama's EMH has been criticised for being irrelevant and inaccurate.

Some people, like Robert Shiller, argue that the EMH is not true. Shiller has concluded from his empirical research that "random walks" in stock prices do not accurately represent underlying fundamentals (Shiller, 1981). In his book "A random stroll down Wall Street," Burton (2003) gives an example that shows how the EMH presented by Fama in the 1960s does not accurately represent the way the stock market operates. He tells about an encounter between a professor of finance and one of his students. A one hundred dollar note lies on the ground, and the student finds it. Don't bother picking it up, the professor continues, since "if it were genuine, it would not be there."

The point of this story is to illustrate how the financial markets work and why investors won't find any \$100 dollars laying around. The EMH was amended to state that markets are almost efficient most of the time as a result of the prevalence of investors whose investment strategy is based on the identification of mispriced equities. To ensure that markets are efficient, it is essential that investors seek to profit from gaps between stock prices and the perceived (real) worth of the company (Bodie et al, 2014).

After realising the impossibility of informationally efficient markets, Grossman and Stiglitz published their findings in 1980. Grossman and Stiglitz's approach accounts for the expense borne by those who want to buy mispriced equities. To prove that investors are rational and look for the highest possible profits, they show that investors who are prepared to pay the price for the extra knowledge to uncover the mispriced stocks should be paid with greater returns. This helps to explain the updated and contemporary interpretation of EMH, according to which markets are almost always efficient. Costs incurred by investors in their pursuit of knowledge necessary

to create extra profits are what eventually drive the market to function effectively (Fama, 1970).

## **2.2.Portfolio Management and Robo-advisors**

Investment policy, securities selection, and market timing are the three components of portfolio management that investment managers may use to identify drivers of success. According to research conducted on big U.S. pension plans, the single most significant aspect of portfolio management, also known as strategic allocation, is investment strategy, which accounts for 93.6% of total returns (Brinson, Hood & Beebower, 1986). Strategic allocation, often known as investment policy, is the process through which an investor decides which asset classes and weights should be chosen to achieve his or her investment goals (Brinson et al, 1986).

The investment manager has to select his or her own risk tolerance, investment horizon, and the investments risk level in light of the asset class and its weights. This is because each asset class is connected with its own unique degree of risk and return (Cochrane, 1999). Robo-advisory is a relatively new method of managing one's portfolio and has been around since 2006. It is essentially an automated procedure of the processes that were stated before, which involves the selection of investments in assets that correspond to the client's preferences regarding risk and return. It does this by using algorithms to put investors in various portfolios depending on the investors' level of risk aversion, which then automates the more conventional process of picking asset classes and weights. The investor responds to the online questionnaire about his or her level of comfort with risk in order to provide the algorithm with the necessary data (Moyer et al., 2015).

### **2.2.1. Passive Portfolio Management**

Active and passive portfolio management are two distinct approaches to handling investment assets (Al-Arabi & Jaimungal, 2018; Sharpe, 1991). At the outset, a specific market for securities is selected, such as the OMXS 30 or the S&P 500. Thereafter, an investor must decide whether to be active or passive in their approach. The passive investor accumulates all the securities that make up the market and retains them in proportion to their relative importance (Jasmeen & Satyanarayana, 2012,

Sharpe, 1991). The portfolio of a passive investor will include, say, 2% of Security X if Security X accounts for 2% of the market. Due to the lack of active management and the consequent reduction in transaction costs, a passive investor may achieve the same rate of return as the market at a fraction of the cost (Sharpe, 1991). Therefore, the passive investor thinks he or she will benefit more from cutting expenses than from attempting to outperform the market. An essential addition to robo-advisors' passive management techniques is the extensive diversity that may be obtained by following market representation with passive management.

### **2.2.2. Active Portfolio Management**

There are two ways in which an actively managed portfolio can add value for its owners: (a) the portfolio manager's primary objective is to achieve a higher rate of return for the portfolio than would be possible by simply buying an index like the S&P 500; and (b) the portfolio manager's secondary objective is to minimise the risks associated with the portfolio, as well as (b) regularly reviewing securities allocation and keeping an eye on securities and market circumstances. If a fund manager can achieve these two goals, they will be successful and will outperform the benchmark (Shukla, 2004). Active management is a costly approach to portfolio management that only benefits investors if the additional return they get outweighs the additional expense they incur (Sharpe, 1991).

Sharpe (1991) took a vehement stance against active portfolio management, arguing instead that the rule of arithmetic should be followed. When Sharpe said this, he was referring to the following in a mathematical context: "If active and passive portfolio management styles are defined in a reasonable way, it must be the case that: (a) Before costs, the return on the average actively managed dollar will equal the return on the average passively managed dollar and (b) after costs, the return on the average actively managed dollar will be less than the return on the average passively managed dollar." By "these statements will remain true for any time," Sharpe (1991) meant that he believed they were contingent upon the laws of addition, multiplication, subtraction, and division. Sharpe continues by stating that in order to validate someone who claims to be a successful active manager, the person in question must, for some inexplicable reason, have been exempt from the law of arithmetic. This conclusion reached by

Sharpe (1999) highlights the fact that active management is a game with no winners and no losers. When there are victors, there must also be those who come out on the losing end.

### **2.3.The Financial System and Investment Management Industry**

Financial markets and financial intermediaries facilitate the buying, selling, and trading of various financial assets, as well as the transfer of financial and real-world risk, and so constitute the foundation of the financial system and the investment management business. When an asset or financial contract is sold, bought, or otherwise transferred from one party to another, the transaction is said to have "transferred" (McMillan et al., 2011). In their 2011 article, McMillan et al. present the financial system and its primary functions as follows:

- 1. The primary function of saving is to postpone spending in the now in exchange for a higher rate of return in the future, with the assumed risk being acceptable.*
- 2. To borrow means to get funds via the use of a loan in order to finance immediate expenses using funds that the borrower does not now possess.*
- 3. To provide shares of ownership to investors as a means of funding ventures.*
- 4. Traders can hedge their bets by buying and selling assets and contracts that are positively (or negatively) associated with the risk they are trying to hedge.*
- 5. Swap property or contracts for other property or contracts, currencies, or money. For immediate shipment (spot market) or later shipment (futures).*
- 6. Benefit on the spread of knowledge by trading on data that may be used to forecast price movements.*

The supply and demand chain may be broken down into three basic categories: primary and secondary issuers, intermediaries such as investment banks, and investors. The investment management industry is often classified into these three main categories. Equity and debt issuers, respectively, use intermediaries to issue bonds, stocks, and other securities to investors in order to raise capital and/or satisfy risk management criteria. These claims can be used by the issuer to fulfil either of these goals (Sironi, 2016).

The investor may be a governmental or corporate entity, or it may be a taxable person. The intermediary's role in this market is to connect the supply and demand sides of the market, converting cash flow and risk from one to the other while turning a profit. In the case of investors, intermediaries may recommend items or portfolio solutions that may be reached by direct or indirect investing. Platforms facilitated by intermediaries may also facilitate investor-product trading inside regulated and open markets (Sironi, 2016).

Due in large part to technology advancements, the investment management sector has changed from a swanky, high-priced advice atmosphere in the 1950s to a more streamlined, low-cost one in the present day (Sironi, 2016). This innovation has made it possible to automate the processes that take place in the back office, and it has also caused a change in the way investment decisions are made, from conventional human advice to algorithmic advising that is based on risk profiles. The ultimate investor gains from lower expenses and simplified investing processes as a result of all this (Sironi, 2016). While human advisers have traditionally handled all investment management, robo-advisors had amassed over \$100 billion in assets under management by 2015 (e.g. Beyer, 2017; Strzelczyk, 2017; Tergesen, 2015).

#### **2.4.Financial Technology-FinTech**

According to Schüffel (2016), Financial Technology (also known as Fintech) is an umbrella word that refers to a new financial sector in which any type of technology that increases the efficiency of financial transactions may be found. Although the word "fintech" is a relatively recent one, financial technology has been around for almost as long as technology itself. This also implies that this technology, unlike the Automatic Teller Machine (ATM), is not usually exclusive to the financial sector (Arner, Barberis & Buckley, 2015). Consider the internet, for example. Because of its historical significance, the internet is considered one of the most significant technical advancements ever produced. Its origins date back to 1965, when the first low-speed dial up network was established (Leiner et al., 1997). The internet has had significant ramifications for practically every business in the globe, and the fintech industry is no exception.

Following the Global Financial Crisis of 2008, the public's image of financial institutions, such as banks, shifted from optimistic to realistic and gloomy in tone. There were millions of job losses in the United States, and financial institutions were particularly hard hit, with global losses totalling more than \$1.37 trillion USD, a figure that was bigger than India's entire GDP at the time (Kranen, 2019). A worldwide crisis of this magnitude resulted in a loss of confidence in the incumbent system, which opened the way for new Fintech companies to break into the market in large numbers. As a result of the widespread criticism levelled at the banking sector, Fintech has grown into digital ways of replacing services that are typically supplied by financial institutions (banks) (Arner et al., 2015).

Often referred to as a disruption of the financial sector, fintech is transforming the way businesses conduct their operations (Cai, 2018; Arner et al., 2015; Scott et al., 2017). A number of different types of 'disruption' have emerged. According to Arner et al., (2015) there are six major categories into which contemporary Fintech may be divided:

1. **Finance and investment** - Alternative financing options, such as crowdsourcing, are available. As a financial intermediary, crowdfunding is one of the most prevalent and effective components of contemporary Fintech, which directly competes with traditional banking. There is no bank or other typical middleman engaged in this mode of fundraising for new enterprises; instead, the general public provides the necessary capital (Cai, 2018). This category also includes robo-advisory services, which are a significant component of it. Through the use of digital algorithms to provide digital algorithm-based financial advice for portfolio allocation generated from questionnaires or surveys, robo-advisory eliminates almost all of the human middlemen in the financial advising branche (Kranen, 2019).
2. **The second is the effort being made by financial institutions' financial operations and risk management departments** to enhance their compliance systems in light of the substantial regulatory changes brought about by the global financial crisis of 2008. Additional resources are being devoted to the development of digital systems for risk management and the maximisation of the economic potential of risk (Arner et al., 2015).

3. **Infrastructure and Payments:** Since the widespread use of electronic payments, the use of the internet and mobile devices to facilitate financial transactions has become an increasingly important part of the FinTech industry (Arner, Barberis & Buckley, 2015). These days, Fintech companies are replacing traditional financial institutions as intermediaries due to the rise of digitalized trading of securities and derivatives. Payment and savings account alternative PayPal is an example of a financial institution that is not included (an electronic wallet). With over 200 million users as of March 2019, Paypal, which launched in 1999, seems to be a quickly growing business.
4. **Security and monetization of personal data fall under this area**, which is primarily concerned with the commercialization of personally identifiable information. People's data has been a recurrent theme in the headlines, both in the United States and elsewhere. Cambridge Analytica & Facebook issue was brought to light on March 17th, 2018, as part of a larger investigation. A ground-breaking example is the expenditure of more than one million dollars to target 50 million Facebook users in order to influence the American election.
5. **Customer interface** - category listed by Arner, Barberis, and Buckley (2015) is customer interaction. A direct rival for conventional banks, this category is distinguished by the fact that significant, previously established corporations might easily adopt a kind of financial product or service for their large number of consumers.
6. **Block chain & Cryptocurrencies** – This is not one of the categories identified by Arner, Barberis, and Buckley (2015), nor does it mesh well with any of the others. However, block chain and cryptocurrencies are a significant development that deserves to be recognised. What matters most in the realm of Fintech is the ability to provide financial services or products that are either superior to or competitive with what is already available. A recent study by the authors describes block chain technology as "a potential disruptor for the financial industry." The main cryptocurrency Bitcoin is based on block chain technology, and it serves as the main antagonist for the banking sector, aiming to disintermediate transactions, decentralise power, and provide anonymity.

## **2.5. Artificial intelligence**

The ways in which we do business and the jobs we do are being disrupted by AI at an unprecedented rate. An AI is defined as “A system’s ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation” (Kaplan & Haenlein, 2019). Research in the field of artificial intelligence is not a new endeavour, but instead dates all the way back to the year 1960. Since then, a significant number of research studies have been carried out on this subject; however, in the 21st century, artificial intelligence has attracted a greater amount of interest among researchers and engineers about how to implement it in a variety of business service solutions. Artificial intelligence is comprised of several subfields, such as machine learning, deep learning, Natural Language Processing (NLP), and robotics. The applications of artificial intelligence may be found in a variety of academic disciplines, including engineering, psychology, mathematics, computer science, finance-economics and linguistics, to name just a few. In several domains, including medicine, the immense processing power of computers has exceeded the capabilities of human beings.

The rapid advancement of artificial intelligence has made it feasible for machines to learn, make choices on their own, and provide superior outcomes. This has made it possible for robots to learn and act. Already and up to now, solutions based on AI have had a considerable influence on the way people live their lives. The application fields of artificial intelligence are almost limitless, and its progress will undoubtedly bring about changes in contemporary ways of living, working environments, research practises, and other facets of modern civilization. Many people believe that artificial intelligence is one of the most innovative technologies now affecting a variety of different sectors and enterprises. This advancement has even been likened to the industrial revolution that occurred in the 18th century by scholars and professionals in the field (Khare, Stewart, & Khare, 2018).

There are now five main areas of study in artificial intelligence. The capacity to think one's way out of a situation is the first skill set to focus on. Knowledge, which includes the skill of accurately representing such information, is the second area. The third area is that of planning, which includes the skills of goal-setting and follow-

through. Ability to comprehend both written and spoken language constitutes the fourth dimension, whereas perception refers to the fifth (Kelnar, 2016).

Financial services provide a paradigm for implementing the aforementioned five AI aspects in actual business structures. Reasoning is used in financial markets for asset management and application processing. In the case of credit decisions, for instance, AI is used to assist lenders sort out applicants who pose a significant default risk from those who are credit-worthy but lack a complete credit history via the use of logical reasoning. Knowledge may then be put to use in the financial markets via the use of Intelligent Trading Systems, which filter both structured (databases, spreadsheets, etc.) and unstructured (social media, news, etc.) data at speeds much above those of human-based processing systems. Asset allocation to long-term financial instruments involves some degree of preparation. Individualized banking and financial planning both include this strategic thinking. You may use the chatbots and other communication features to develop intelligent agents, assistants, and customer care that will help you with your investments. A last example of the perception domain is the provision of financial advice based on the most recent data on all market activity. Another use of AI's perceptual dimension is in risk management, whereby algorithms are developed to examine past risk instances and detect precursors to emerging problems (Hakala, 2019).

## **2.6. Investment advisory**

Most people save and invest their money to maximise their profit while taking on a certain amount of risk. In order to provide investing advice, one must arrange the distribution of a client's money across a variety of financial instruments, such as stocks, cash, bonds, cryptocurrencies and mutual funds (Ghosh & Mahanti, 2014). Financial planning and management encompass a wide range of activities. Oral or written communication may be used to provide investment advice. An investment analyst's job is to find and execute the best long-term asset allocation for a given investor, based on his or her preferences and goals (De Castro, & Annoni, 2017).

The problem of investing advice may be broken down into two groups: those that involve making decisions in the face of uncertainty and those that do not (Ghosh & Mahanti, 2014). Identifying the client's personal qualities falls under the first

category, and allocating appropriate assets to the client's portfolio falls under the second category. When providing financial advice, the adviser must adhere to all applicable regulatory and legal obligations and keep a record of all investment recommendations made. The fast development of information technology and digitization, as well as the aim to bring openness and accessibility to the time-tested conventional wealth management sector, have all contributed to the emergence of new trends in the investment advice business in recent years (Jung et al. 2019).

It has become increasingly relevant for a greater proportion of society to invest and save money. Therefore, there has been a growth in wealth in financial assets and an increase in involvement in pension planning (Hakala, 2019). New rules, technology advancements, and shifting demographics, among other factors, are driving this transformation forward. Because of global and geopolitical uncertainties, low and negative interest rates, and longer lifespans, there has been a rise in the need for financial guidance (Novick et al., 2016). In the meanwhile, the supply of numerous investment goods has expanded, and as a result, the investing process is often seen as convoluted and challenging. The decision to seek guidance is a sensible response to the perceived concern and a lack of knowledge in the financial area. According to the definition, "Robo-advisors" are "digital platforms that include interactive and intelligent user support components, and that leverage information technology to guide consumers through an automated financial advice process" (Jung et al. 2018; Sironi 2016; Ludden, 2015).

The number of robo-advisors in fifteen different nations was projected to be around fifteen in 2016 (Moulliet et al., 2016). The United States, the United Kingdom, and Germany are among the nations that provide the most advanced robo-advisory services, according to Huikko and Hykkönen (2017). Robo-advisors were present in the European Union in 2017, with around 60-70 of them based in the United Kingdom and Germany, respectively, accounting for one-third of the total (Kaya & Schildbach, 2017). Betterment, Wealthfront, Future Advisor, Learnvest, and Nutmeg are some of the most well-known robo-advisors, with Betterment being the most popular (Vukovic & Bjerknes, 2017). Typically, the roboadvisory process is divided into three stages. The first step involves initial investor screening, the second involves the execution of

investment strategies, and the third and final phase involves the monitoring and evaluation of these methods (Kaya & Schildbach, 2017).

## **2.7.State-of-the-Art of Financial Advisory**

The conventional financial consulting sector is undergoing a dramatic shift. Traditional wealth management has been around for a long time, but in recent years, new, creative players have entered the market in response to the growing importance of transparency and ease of access made possible by advancements in information technology. The remainder of this chapter explores the notion of robo-advise and outlines the evolution of financial advisory over the previous several decades. In particular, we examine common features and qualities, variations from standard advice structures, and current market trends in the financial consulting sector.

### **2.7.1. Financial Advisory**

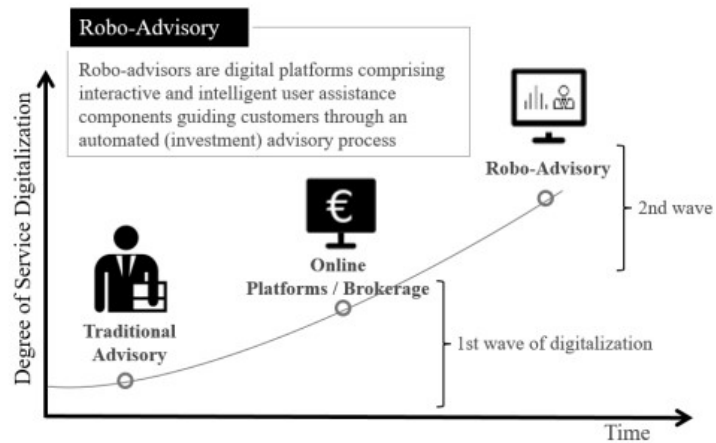
The primary objective of the financial advisory industry is to assist individuals or institutions in the process of making appropriate investments. This involves assisting investors in meeting their individual investment goals, whether those goals are focused on the long or short term. This concept is complementary to the definition of investing advice, which can be found here. "The supply of personal suggestions to a client, either at its request or at the initiative of the investment business, with regard to one or more transactions pertaining to financial instruments," is how the European Markets in Financial Instruments Directive (MiFID) defines investment advice (Cocca, 2016).

Individual financial advice has historically been available exclusively to the very wealthy. This is mostly due to the very high costs often associated with such services. However, the financial counselling business is dynamic and has lately expanded to accommodate individuals with smaller budgets (Jung et al. 2018). Figure 4 shows how a series of events over the last several decades is likely responsible for these shifts. Historically speaking, financial counselling as we know it now began in the 1950s in the United States, which is often regarded as the primary market for financial advisory services. Investors who could afford personal financial guidance and wealth management in general were limited to the few "ultra-high net worth" persons (those

with a net worth of more than \$30 million in 1950), mostly members of wealthy families (Sironi, 2016).

The introduction of bargain brokers in the 1970s brought financial advisory services to the attention of the middle class in the United States, which resulted in a significant shift in the availability of financial services. Since discount brokers do not provide genuine investment advice, they instead only execute buy and sell orders at a lower fee rate. As a result, discount brokers are less expensive than regular financial consultants. This was a game-changer since it opened the possibility of investing in the stock market to a far wider spectrum of people. Since discount brokers "have captured a considerable percentage of Assets Under Management (AUM) since their inception in the 1970s," discount brokers continue to play an important role today (Sironi, 2016).

Figure 4: The digitalization of financial advisory services towards digital platform



Source: (Jung et al. 2018; Sironi, 2016).

The subsequent event that was a game changer took place in the 1990s, when the industry was confronted with a significant shift in terms of connection and accessibility as a result of the advent of the World Wide Web (WWW). With the advent of the internet, online trading became theoretically available to an even more extensive set of public investors. These investors ranged from those with a high net worth to those with affluence, all the way down to retail investors who managed their own portfolios.

Human interaction, in the form that it was formerly practised by conventional investment advisers in earlier times, seemed to be subservient for the vast majority of retail investors, and it was only available for investors who could afford a full-service advisor at this point in time. Despite this, the majority of new investment possibilities were only available to a few set of people, namely those whose primary focus was on trading (Sironi, 2016).

In the years that followed, advancements were made quickly in information technology. Transaction costs have been significantly reduced as a result of the highly developed connectivity made possible by computers, smartphones, tablets, and other electronic devices, as well as the diminishing information asymmetry that has resulted from significantly easier and quicker access to information. The concept of algorithmic trading, also known as Algo Trading, came into existence recently as a completely automated investment instrument that offered fresh prospects to prospective investors. Not only have technology advances but also an unparalleled familiarity with social media and digital technologies, notably observed in millennials, have prompted a fundamental transformation in the behaviour of people in today's society. Millennials in particular have shown this behaviour change (Sironi, 2016). These changes foreshadow the arrival of robo-advisors, which aim to transform the industry by streamlining the client experience, reducing costs, and creating investing plans that take into account the specific circumstances of each individual investor (Nicoletti & Nicoletti, 2017).

### **2.7.2. Robo-advisors**

It's understandable that hearing the phrase "robo-advisor" could make you think of a humanoid robot doling out financial advice, but it's only partly accurate. Rather than having a robot in the room with you, you just have access to its virtual counterpart. To help clients navigate the maze of the traditional financial counselling industry, robo-advisors have emerged as digital platforms that include user assistance components that are both interactive and intelligent (Jung et al. 2018; Sironi, 2016; Ludden et al., 2015). Recent conceptualizations of robo-advisors (Jung et al., 2018; Tertilt & Scholz, 2017; Sironi, 2016) break down the ways in which robo-advisors differ from traditional advisory services at two conceptual levels (customer assessment

and customer portfolio management), which are summarised in table 1 and discussed in greater depth below.

**Table 1:** The key characteristics of robo-advisors

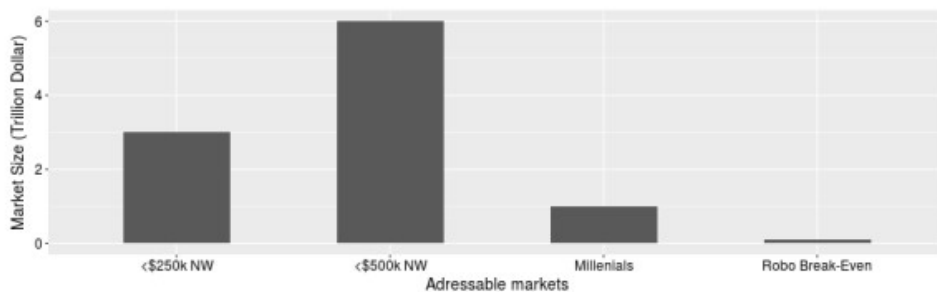
|                                      |   |
|--------------------------------------|---|
| <p>Customer Assessment</p>           | <p><b>Private families make up the target section:</b><br/> This target segment does not take real wealth into consideration.<br/> There is neither a client selection nor screening procedure in place.</p> <p><b>Automated customer profiling:</b><br/> Self-reporting as a quantitative tool<br/> Risk perception surveys<br/> Self-reporting surveys that probe for preferences, aims, and niche interests.</p>   |
| <p>Management Customer Portfolio</p> | <p><b>Automated investment process:</b><br/> Robo-advisors have completely automated the investing process, thus there is no need for human intervention in the profiling or maintenance of client portfolios.<br/> Quantitative optimization serves as the foundation for asset allocation.<br/> Rebalancing of portfolios may either include active client engagement or passive management (quantitative only).<br/> Evaluation of the portfolio strategy: either dynamic (with modifications made by the client) or static (fixed after initial process).</p> <p><b>Passive investment products:</b><br/> There are no actively managed financial solutions available to bring down expenses.<br/> Instruments with an open and comprehensible pricing system.<br/> Exchange-traded funds (ETF) and exchange-traded commodities are popular investment options (ETC).</p> |

Source: (Jung et al. 2018).

The potentially disruptive nature of robo-advisors as a result of these essential elements has several ramifications. To begin, one of the results of the completely automated client profile and investing procedure is a fee structure and minimum investment amount that are both far lower than average (Jung et al., 2019). For instance, the minimum amount required to make an investment in Germany might vary anywhere from 0 to 10,000 euros (Dorfleitner et al., 2017). As a direct consequence of this, the proliferation of robo-counselors has led to the emergence of a new low-budget investor class that was not previously catered to by conventional financial advisors. Millennials, or persons who were born between the middle of the 1990s and the early 2000s, are a main target market for roboadvisors because they are an investment population that is more likely to be drawn in by the use of technology than to be turned off by it, like older investors (Sironi, 2016).

Figure 5 demonstrates that there is a sizable market potential when the group of millennial investors is taken into consideration. As a result of the predicted break-even point being much lower than the potential market and, as a consequence of this, the chance for robo-advisory companies to earn a profit, the industry is becoming appealing to companies that are only now entering the market (Waliszewski, & Zięba-Szklarska, 2020; Wong 2015). To summarise, the primary reasons why robo-advisors can disrupt the conventional advice sector are their low costs, ease of access, and attraction to new consumers such as younger investors and those who are computer savvy.

Figure 5: Compared to the potential scale of addressable markets, \$16–40 billion in assets must be managed by robo-advisors before they can achieve break-even



Source: (Wong, 2015)

Independent robo-advisors like as Betterment and Scalable Capital targeted first-time, low-net-worth investors who are computer savvy but lack substantial capital. After that, they began poaching clients from conventional advisers by focusing on investors with \$250,000 in net worth (NW) or more (Sironi, 2016). Robo-advisory solutions are progressively being included into the business models of conventional wealth management advisers. Vanguard Personal Advisor Services and Schwab Intelligent Portfolios are two of the most well-known instances of this kind of hybrid advising framework. Each has \$47 billion and \$10 billion in assets under management (AUM) at the start of 2017, making them the two biggest robo-advisors (Statista, 2017).

## **2.8.How does a robo-advisor work?**

To begin assisting with investing choices, robo-advisors first help individuals define their investment strategy based on their financial objectives and tolerance for risk. A robo-first advisor's questions to a prospective customer often concern the investment's goals and expected duration. Investment plans provided by robo-advisors may be used to save for retirement, make significant purchases, create an emergency fund, or provide a stream of income to pay living costs. These inquiries are supplemented by objective and subjective inquiries about the client's risk tolerance and propensity. Client income and expected retirement age are two examples of objective risk measures. Asking a customer how they feel about market swings and how they would respond to a drop in the market are examples of subjective queries (Lam, 2016). Standardized online brief questions are used to evaluate customers in order to keep expenses down and the procedure simple.

Robo-advisors consider these two factors when deciding how to distribute a client's investment capital across various asset classes using algorithmic decision-making. The majority of these algorithms have their roots in contemporary portfolio theory (Abraham, Schmukler, & Tessada, 2019). The most widely used asset allocation model is Harry Markowitz's (1952) portfolio selection framework, which asserts that the best portfolio is the one that maximises anticipated return while taking the least amount of risk possible. Robo-advisors build portfolios with more risk by raising the proportion of equities to bonds in the portfolio and investing in riskier assets

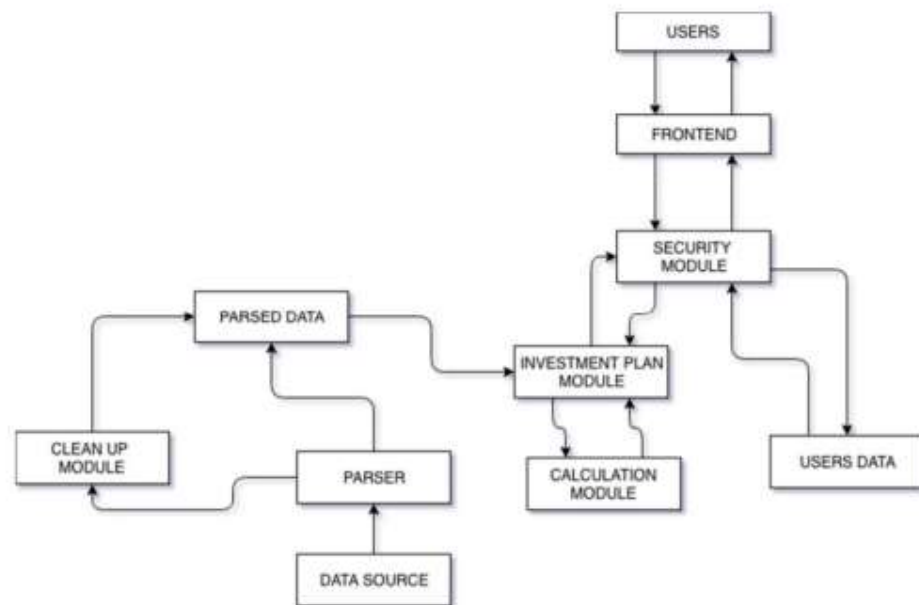
within each kind of instrument (for example, moving away from government to municipal bonds or from U.S. to emerging market stocks). When optimising a portfolio, it is important to take into consideration both the investing objectives and the degree of risk that is wanted. For instance, the asset allocation will be different whether the purpose is to create income for costs or to save for the long term, even though the amount of risk will remain the same.

Not only may algorithms be created to propose an initial allocation of money, but they can also be constructed to continually monitor portfolios and identify deviations from the risk level that was initially planned. When deviations from the target are found in the portfolio, rebalancing operations are carried out immediately. For instance, over the course of time, the value of stock may rise at a rate that is higher than the value of bonds, leading to an increase in the proportion of the portfolio that is invested in equity. The portfolio might be rebalanced by selling some of the stock holdings if there is a larger proportion of equity than there should be. In addition, as time passes and the date draws nearer at which the funds are required, the portfolio may be rebalanced in such a way as to minimize the risks involved. Rebalancing may also take place if the investor alters the level of risk, they are willing to take or the objectives they have set for their investments.

A consequence of the current theory of portfolio management is the idea that investors may minimize risk without losing projected returns by diversifying their asset holdings. Robo-advisors mostly provide investments in exchange traded funds (ETFs) and index funds since these types of investments provide diversity at a reasonable cost. The performance of these financial vehicles is often based on a group of stocks or an index (investing in all the securities included in the index and in the same proportion as the index). As a consequence of this, investors may acquire a "market portfolio" while limiting the expenses associated with trading by purchasing just a few funds. Moreover, investors who passively hold funds do not need to participate in active monitoring and trading, which results in an even larger reduction in the expenses associated with trading. Robo-advisors seem to take a cautious approach, favouring funds with broad geographic reach, extensive track records of successful operations, high levels of market liquidity, and positive long-term performance (Deutsche Bank, 2017; Phoon and Koh, 2018).

Using a robo-advisor just requires the use of the internet, since the whole of the procedure, from creating an account to monitoring and rebalancing the portfolio, can be completed devoid of any involvement from a human being. Several computerized financial advisers are known as robo-advisors. These kinds of robo-advisors are often more affordable, and as a result, they are designed with the general market in mind. However, some robo-advisors provide customers with a hybrid system that includes some level of human engagement, although on a limited basis. For instance, there may be a cap on the total number of interactions, or communication may be limited to just taking place via the internet rather than in person. Although the costs charged by these robo-advisors are more than those charged by conventional human advisers, they are still less expensive.

Figure 6: Design for a general robo-advisor



Source: Ivanov et al., 2018.

## 2.9. Benefits and Limitations of Robo-Advisors

Several benefits exist for those interested in wealth management services that employ robo-advisors rather than the more conventional methods that depend on

human advisors. Robo-advisors have a lot going for them, and one of them is that they are simple to use. Robo-advisors allow customers to get financial advice and manage assets whenever and wherever they have access to the Internet, rather than needing to schedule an appointment with an advisor and go to a physical place for a meeting.

The cost of financial advice is another area where robo-advisors might help. Robo-advisers, in contrast to traditional advising companies, don't have to pay for costly overhead like human advisors' wages or an actual office space. This allows them to lower the required starting capital. When compared to the US\$25,000 needed to start an account with a private financial adviser at Bank of America, the US\$5,000 needed to open an account with their robo-advisor is far more reasonable. There is no starting-balance requirement with certain robo-advisors like Betterment. Robo-advisers also have the advantage of having more affordable costs than traditional advisors. A completely automated robo-advisor, for instance, may charge a fee of 0.25 percent of assets handled, whereas the minimum price for typical human advisers is 0.75 percent and may exceed 1.5 percent (EY 2015). Robo-advisers may save you money on trading costs, which financial advisors traditionally charge on top of administrative fees, since they use a passive investment strategy.

Investing with a robo-advisor may help you save more money via a strategy called "tax harvesting." This refers to the process of reinvesting the revenues from the sale of a loss-making asset into another investment with a comparable level of risk (keeping the same risk profile of the portfolio). The amount of capital gains, and hence the amount of tax due, is reduced when a loss is reported. Performing tax harvesting requires several actions, including spotting harvesting chances in a portfolio with many assets, locating acceptable replacements, and engaging in multiple trades. Tax harvesting is a process that can be performed more often and effectively by robo-advisers than by human advisors.

Robo-advisors also have the potential to assist mitigate some of the behavioural biases that are often seen in the financial consulting industry. Human advisers have a number of inherent biases, including the potential for subjectivity, a limited ability to monitor many assets at the same time, a concentration on local securities, and a preference for goods for which they get commission. Therefore, robo-advisors may

help offset some of these biases since they remove the decision-making process from the hands of people and place it in the hands of automated algorithms. However, even when robo-advisors are deployed, there is still a possibility that certain biases will be present. For instance, much like human advisers, robo-consultants could utilise specific brokers and other financial businesses not because they are the least expensive but because they earn larger fees from them. This is because robo-advisors are essentially automated versions of human financial advisers (Fein 2015). In addition, given that humans must always be the ones who programme algorithms, it is possible for biases to be added throughout the process of their construction, whether knowingly or subconsciously. For instance, robo-advisors could suggest to their customers that they keep a significant portion of their investment in cash so that it can be redeployed and used to generate further revenue (Vox, 2016).

Robo-advisors, even though they have the potential to make wealth management services more accessible and more affordable, might nevertheless include fees. Robo-advisors may not be able to know their customers as well as human advisers do because of the many encounters, personalised inquiries, and tighter connections they have with their clients. However, robo-advisors are simple to use and save a lot of time. Questionnaires with a "one size fits all" approach may be too simplistic and limited in their scope, making it difficult to get an accurate picture of a client's current financial condition as well as his or her requirements. In addition to that, these surveys assume that people who have a similar risk profile would offer the same responses to the same subjective questions, which may not always be the case (Deutsche Bank, 2017). Robo-advisors also lack other crucial components of a client-advisor connection, such as assisting customers in defining their financial objectives, providing counselling during market downturns, or helping clients cope with potential changes in their life. Robo-advisors are not yet widely available (Accenture, 2015).

In addition, it's possible that a restricted risk assessment won't provide a full picture of the client's total financial situation. It's possible that robo-advisors won't inquire about a client's other assets (including pension funds and real estate), upcoming costs, prospective obligations, spouse's financial situation, or acquired insurances, amongst other pieces of information (FINRA, 2016). If robo-advisors make decisions based on incomplete data, the advice they give could not be the best possible ones.

Robo-advisors may potentially cause consumers to lose interest in their financial decisions. Because the whole process is automated, customers may not try to comprehend how the service operates, and they may not even regularly check their investments if they do not feel the need to. This is a particularly pertinent problem in situations in which robo-advisors are made available to consumers with relatively lesser wealth who may or may not have any prior expressivity investing goods (OECD, 2017).

Robo-advisors are still in their infancy; thus their business models have not been put to the test over the long term or in the face of adverse economic conditions. Therefore, it is still unknown to what degree customers would be safeguarded in the event that a robo-advisor business goes bankrupt. Several legal systems have included safeguards to protect customers. For instance, robo-advisors operating in the United States are obliged to be members of the Securities Investor Protection Corporation (SIPC). This organisation offers insurance coverage of up to \$ 500,000 per client in the event that a member business declares bankruptcy.

#### **2.10. Previous studies on Robo-Advisors**

The management of passive portfolios is the approach that Robo-advisors use most of the time. Since this is the case, the part that follows will discuss the empirical data and research that have been conducted on the technique. The management of investment portfolios is a well-established field of study, and there have been many empirical studies conducted on the effectiveness of markets. Some research provides compelling arguments in favour of passive management, while other studies applaud trading tactics that have delivered returns that are greater than the risks they have been exposed to. Due to the inefficiencies of the market, strategies that are producing risk-adjusted excess return cannot ever discount the potential that pricing models are incorrect about the model's viewpoint on risk and return. This is because these strategies are generating excess return. Due to the unpredictability of the situation, it is nearly difficult for there to be a definitive contradiction to the efficient market theory (Campbell, Lo, Mackinlay & Whitelaw, 1997).

Within the realm of the financial services business, Brinson et al. (1991; 1986) centred their attention on the concept of robo-advisory. However, the primary

emphasis of this investigation is on Robo-advisory in terms of its potential as a disruptive technology and how it will operate in the wealth management sector. Studies have concluded that the primary concerns of the most recent generation of robo-advisors are compliance with financial rules, cost reduction, and providing consumers with wealth management that is easy to understand (Jung et. al, 2018; Xue et. al, 2018; Baker & Dellaert, 2018; Ji, 2017). Recent research recommends that the next generation of robo-advisors focus more on the behavioural quirks associated with consumer preferences and allow a greater degree of personalization (Jung et. al, 2018; Xue et. al, 2018; Faloon & Scherer, 2017). Other research that has been done on robo-advisors has concluded that these programmes represent a significant step forward for the field of investment management. Investment services, which in the past needed highly skilled and costly employees, will now be accessible to a wider market as a result of automation, and this is because of how investment services are delivered. As a direct consequence of this, a greater number of investors will have stronger portfolios and investments (Beyer, 2017; Faloon & Scherer, 2017; Hougan, 2015).

As was said before, there are not a lot of research on how well robo-advisors do their jobs. In their research, Vukovic, & Bjercknes (2017) explore and reproduce the performance of robo-advisors that operate in the United States. Additionally, they attempt to mimic a made-up robo-advisor and its success on the Norwegian market. There are no studies that have been undertaken on the performance of robo-advisors in the market. Recent research on robo-advisors is summarised in Table 2, which can be found on the page that follows.

**Table 2:** Previous studies on robo-advisors with summary of the results

| Study  | Author(s)                                | Subject             | Results and finding                          |
|--|--|---------------------|--|
| Designing a robo-advisor for risk-averse, low budget consumers | Jung, Dorner, Weinhardt & Puzmaz (2018). | Robo-advisor design | Identify requirements and design principles. |

|  |                                       |                                   |   |
|--|---------------------------------------|-----------------------------------|---|
| BlackRock Robo-Advisor 4.0: When AI replace human discretion           | Tokic (2018).                         | Robo-advisor design               | Case to replace human discretion with AI.   |
| Group Recommendation based on Financial Social Network for RoboAdvisor | Xue, Zhu & Yin (2018).                | Categorise users risk preference. | Risk recommendation model for groups with filtering algorithms.   |
| Robo-Advisory  | Jung, Dorner, Glaser & Morana (2018). | Design and outlook                | Today robo-advisors target underdeveloped retail customers.   |
| Human vulnerability and robo-advisory                                  | Beltramini (2018).                    | Human vulnerability               | Suggest an approach to machine-human interface for human vulnerability rather than machine's performance. |
| Humans versus ROBOTS   | Levine & Mackey (2018).               | Human vs Robots                   | Robots can easily replace humans. Human action needs to be justified with added value.                    |
| Has Your Advice Evolved with Technology?                               | Pandya (2018).                        | Financial planning                | Financial institutions need to engage technology into their practice.                                     |

|  |                            |                                    |   |
|--|----------------------------|------------------------------------|---|
| Are Robots Good Fiduciaries?<br>Regulating Robo-Advisors             | Ji (2017).                 | Regulations                        | Regulations should focus on loyalty issues at to avoid conflicts of interest.                             |
| Automated Advice: A Portfolio Management Perspective on RoboAdvisors | Vukovic & Bjerknes (2017). | Estimate roboadvisors' performance | Replicates U.S. Robo-advisor performance and simulate fictive robo-advisor on Norwegian market.           |
| Algorithmic Portfolio Choice: A lessons from panel survey data       | Scherer (2017).            | Investor risk variables            | Assess set of variables to be included in algorithmic portfolio advice.                                   |
| Robo-Advisors: What it Means to You                                  | Hougan (2015).             | Human vs Robots                    | Robots need to offer truly differentiated solutions to survive. Humans need to leverage on robo-advisors. |

## **Chapter 3: Research Method and Analysis**

This chapter provides a comprehensive study design as well as potential techniques that may be used in order to achieve the objectives of the research. The methodology of the research will be discussed first; after that, the population, the size of the representative sample, and lastly the demographic data will be analysed. This is an explanation of the process that must be followed in order to collect and analyses the data. The statistical tools that are used for data analysis is brought to a successful conclusion by this chapter.

### **3.1. Research Design**

This study employed a multi-faceted strategy to comprehensively investigate the role of robo advisors in the financial market. A cross-sectional survey design was utilized as the primary method for data collection, which involves collecting data from a specific group of individuals at a single point in time (Zikmund, 2000). This design is suitable for obtaining a snapshot of the research phenomenon and capturing information about a population. Due to limitations in resources and time, a longitudinal survey design was not feasible, and thus the cross-sectional survey design was chosen as the most appropriate approach to meet the research objectives.

The objective of conducting research using the qualitative approach is to gather in-depth, non-numerical information about a specific topic. Instead of focusing on a large population, the typical goal of qualitative research is to gain rich insights from a small sample. Data collection in this approach involves techniques such as observations, interviews, and participant observation, as described by Rojek, Shaw, and Veal (2006). Qualitative research provides a mechanism for exploring various aspects of a research topic in a nuanced manner. By employing qualitative research methodologies, researchers can gain a deeper understanding of individuals, their perspectives, and their lived experiences, as emphasized by Berg (2009). This approach allows researchers to capture the complexity and richness of human experiences, opinions, and behaviours, which may not be fully captured by quantitative methods alone.

### 3.2.Mixed method Approach

Recent publications in the field of robo-advisory, such as those by Chandani et al. (2021), Bhatia et al. (2021), and Aw, Zha, & Chuah (2023), highlight the significance of qualitative research in analyzing financial markets. While quantitative research techniques are widely acknowledged for their advantages, qualitative research provides a valuable source of rich descriptions and explanations of real-world experiences that may not be readily obtained through statistical analyses alone. Bhatia et al. (2021) argue that there are compelling reasons to conduct further qualitative research to uncover hidden beliefs and motives in the financial industry, emphasizing the importance of grounding AI in the financial sector in qualitative research (p.214).

Although the findings of a purely qualitative study may be fruitful, a mixed qualitative and quantitative strategy allows the researcher to take full use of the strengths of each (Teddlie & Tashakkori, 2003). Researchers have come to acknowledge the value of mixed method research, which combines qualitative and quantitative techniques to draw more robust conclusions and get a deeper understanding of the study problem.

For the sake of this analysis, we will refer to mixed method research as a study design that combines quantitative and qualitative techniques in order to learn more about the topic under investigation. Triangulation (i.e., the support that one technique lends the other's conclusions) is one way in which merging qualitative and quantitative methodologies may enable elaborate analysis, lead to richer discoveries, and confirm findings.

Teddlie and Tashakkori (2003) also highlight three scenarios in which mixed method methods outperform single approach solutions. Three benefits of doing research using a combination of techniques are highlighted:

- (1) new perspectives on the study problem are revealed;
- (2) stronger conclusions are drawn; and
- (3) a wider range of respondent perspectives may be captured.

### **3.3. Quantitative Data**

The goal of quantitative research is to determine the extent to which a phenomenon or event fluctuates by using a method that is both systematic and well-defined, and then analysing these findings by means of a number of statistical procedures. Therefore, the researcher may utilise quantitative data to assess and make sense of responses to a survey or questionnaire.

### **3.4. Source of data**

In order to collect the data, the study makes use of a combination of primary and secondary sources. The key data sources are going to be collected via the usage of the questionnaire. According to Saunders et al. (2010), one of the methods that is used the most often in order to obtain the necessary data from a large sample is the employment of a questionnaire. The fact that each respondent is asked the identical series of questions makes the questionnaire an efficient method for gathering replies from a large sample. For the objectives of this study, the data will be acquired from a representative sample of customers who have visited the same business on at least two different times each individually. A questionnaire with only predetermined answers was used to compile most of the data.

Therefore, the researcher concluded that the questionnaire would be the most efficient method to use in order to collect primary data. Consequently, the papers the company has generated will be used to enhance the data that will be obtained through a structured questionnaire in this study.

### **3.5. Data collection and description**

The data is cross-sectional in nature, and it was gathered via a survey conducted between October 31 and November 30, 2022. Cross-sectional data consists of measurements taken from several observations at the same instant in time, and timing discrepancies are often disregarded (Carter- Hill, Griffiths & Lim 2011). Second interviews with service providers were conducted because there was a dearth of relevant prior research and the topics addressed in this thesis were unique to the financial markets of Turkey and the United Arab Emirates. Accordingly, in order to provide solutions to the study questions, primary data was gathered by direct

observation. With its freshness and applicability to the current investigation, primary data is an asset. Because it has not been gathered by a third party, the reliability and accuracy of primary data are more easily guaranteed. However, issues with primary data exist owing to its potential high price, lengthy collection time, and sensitive nature (Bryman & Bell, 2007).

In contrast to a qualitative approach, surveys may reach many respondents quickly. In contrast to qualitative interviews, where there may be some variation in question design, this one use standardized questions. People who are asked to fill out surveys are under no obligation to do so. On the other hand, surveying has its own unique set of difficulties that must be considered. Not asking follow-up questions might cause you to lose out on vital details. There is also the issue of the survey's design, which must avoid asking irrelevant questions that can discourage participation. To wit: (Bryman & Bell, 2007). Before releasing the poll to the general public, a select group of people provided feedback to ensure it would stand up to scrutiny under real-world conditions. Given that the survey cannot be modified once it has been released, this was crucial in ensuring the survey's quality and determining whether they comprehended the questions. The poll questions probe respondents' thoughts and feelings about robo-advisory, making the results of the study very subjective.

The link to the questions was shared on social media platforms including LinkedIn, Twitter, and Facebook in addition to the intranet of Turkish and UAE financial institutions. Because of the need to maintain anonymity, the selected bank will remain nameless. The algorithms that social media platforms use determine who will actually view the poll. It begins on a more intimate scale inside the network, after which the survey will be disseminated across the network. The survey was open for participation for one month, during which time **435 individuals** took the time to respond to it. The poll did not have a particular audience in mind when it was designed, and the identical link was sent across all platforms. It is plausible to assume that most of the people in this sample are now employed in the financial sector. All these variables have the potential to skew the results.

Despite this, doing the poll with participants who have prior experience working in the financial market or with robo-advisors can prove to be beneficial in this

particular instance. It is possible that individuals within these categories will need to accept robo-advisory first before the innovation can be propagated to general customers. This is because robo-advisory is a fresh idea. When you have a useful invention, you have an obligation to disseminate that innovation, and the most likely people to do so in the early stages are members of the relevant segments. If the invention is already being utilised by individuals in the financial sector, then people are probably going to be more inclined to trust it and accept it.

### **3.6.Survey description**

The data for this research was gathered using an online poll developed through the Google Forum. The poll consisted of ten questions that explored participants' perspectives on robo-advising and human advisory services, as well as their general investing practices. The survey began with questions about personal characteristics and then transitioned into three distinct directions: individuals who have never invested in securities, individuals who have invested in securities but not through a robo-advisor, and individuals who have invested in securities both directly and indirectly through a robo-advisor. Most of the questions were highly structured, in the form of multiple-choice questions, but there were also some open-ended questions that allowed respondents to provide unique responses. These open-ended questions have the potential to capture important data that may have been missed by the survey. Two questions deviated from the multiple-choice format.

The first question requested the respondents to compare robo-advice with human advisory in terms of cost, usability, revenue, and user experience. The respondents were asked to offer their responses in the form of a matrix. The second question asked about ways in which robo-advisory may be made more effective. In response to this question, respondents were given the opportunity to choose the answer that they felt most accurately reflected their perspective, including the option to select more than one answer. The absence of multiple-choice options in these questions served the objective of determining what the respondents considered to be significant in order to implement the robo-advisory, which may contain a wider variety of options outside simply those offered in the multiple-choice format. It is important to note that the persons who responded to the survey did not answer all 28 questions. Instead, the

respondents were guided to other questions based on the answers they provided to the questions that came before. This was done in order to differentiate between distinct aspects of individuals' personalities and their prior experiences in the field of robo-advisory so that differences in the two groups could be analysed.

In addition, we have ensured that all responses will remain anonymous in order to ensure that they will answer all the questions in an entirely accurate manner. See Appendix A for a summary of the results of the survey. Included in Appendix A are the questions that were asked as well as the possible answers that the respondents might choose for each question. Additionally, we gave the responder with a definition of both human advising and robo-advisory services. The following are the definitions:

- Robo-advisory is the practise of providing personalised financial advice (i.e., on securities like shares and funds) online, with little to no human intervention.
- Human advising is discussion with a financial adviser to get personalised recommendations on financial instruments (i.e. securities like shares and funds).

### **3.7.Data Analysis Technique for Quantitative data**

The data collected for this research were analyzed using statistical tools, such as SPSS 23. The reliability and validity of the measurement instrument were assessed. In cases where there was a strong correlation between variables, the validity of the constructs depended on the accuracy of the researcher's measurement. Cronbach's Alpha was used to calculate internal consistency.

### **3.8.Qualitative Data**

The goal of this inductive method is to propose a brand-new theory by deducing from existing facts. Moreover, the inductive method is more appropriate for our research because we aimed to discover the significance of the role that robo-advisor service providers play in the financial market. To do this, we conducted interviews with these providers and then conducted searches based on the information gleaned from these interviews.

Regarding to that, we chose to do a qualitative study where we interviewed top four service provider and interviewed about their services and how they influenced their consumers. A detail of interviewees listed below.

**Table 3:** List of Interviewees

| <b>RESPONDENTS</b> | <b>POSITION</b>               |
|--------------------|-------------------------------|
| Interview 1        | Investment Manager            |
| Interview 2        | Senior Database Administrator |
| Interview 3        | Senior Software Engineer      |
| Interview 4        | Trade in stock market         |

### **3.9. Interview Sample**

Our initial plan was to conduct interviews with representatives from destination Turkey and the UAE.. Despite this, we were only able to conduct interviews with those who provided the robo service. According to the selection of the institution that we wanted to employ in this investigation, the method of sampling known as chosen generic purposive sampling was used. They seek to generalise to a population, and they believe that the members' important characteristics are pertinent to the research questions. This is one of the primary approaches that is used in non-probability sampling. The criteria for picking instances or persons may be defined a priori in a generically chosen purposive sampling method (Bryman, 2016).

### **3.10. Construction of Interview Questions**

In reference to Bell, Bryman, & Harley (2022), who maintained that it is vital to establish an interview guide in order to cover the areas that are significant for the research and minimise the overflow of information, this sentence is intended to explain why an interview guide is required. As a result, we focused our questioning exclusively on those people who want to invest in securities or use the services of robo-advisory in order to get the information we desired. We utilised open-ended questions, and those who participated were given the opportunity to ask follow-up questions. In addition, Bell, Bryman, & Harley (2022) concluded that open inquiries allow for the formation of replies using the respondent's own language.

In addition, the framework of the interview questions was derived from the theories that we used during this research, and the majority of the queries concentrated on those people who want to invest in securities or use the services of robo-advisory. For the sake of our research, we chose to carry out interviews that were only semi-structured. According to Bryman (2016), a semi-structured interview includes a wider variety of questions that are broader in scope than those in a structured interview. However, in a semi-structured interview, the responder is given the opportunity to improvise over the course of the interview, which results in a more relaxed setting. While participants are given the opportunity to ask follow-up questions, they will have a greater sense of ease when interacting with the people conducting the interview.

### **3.11. Data Collection**

We aimed to conduct interviews with individuals who hold positions such as investment managers, senior database administrators, senior software engineers, and stock market traders, as we believed they would possess the relevant expertise for our research. Our approach during the interviews was to create a relaxed and comfortable setting, encouraging open and candid discussions. We made efforts to ensure that the participants felt at ease to ask any questions that came to mind.

### **3.12. Interview Procedure**

We did one semi-structured interview with representatives from each industry. In terms of the interviews, we were interested in seeing how they responded when they were asked the questions that we had prepared. In addition, it was essential for us to ensure that the responders would have the opportunity to answer follow-up questions. At the outset of our interviews, we told each respondent about our ethics and that we would not disclose their identities and will protect the secret of their privacy, both of which they agreed to. We then proceeded to conduct the interviews.

We began by providing some background information about our issue to the respondents, and then we discussed the purpose of our research with them. In addition to that, prior to beginning our interview, we inquired about their ethical stance by inquiring whether or not they want to maintain their anonymity. They have reaffirmed that they do not need confidentiality currently. The interview was taped so that any

potential misconceptions could be eliminated, as well as so that the responses of the responder could be compiled after the interview had been completed.

### **3.13. Interview Data Analysis**

For the purpose of doing the analysis, the N.Vivo programme was used. In order to refresh our memories regarding the interviews that we carried out, prior to beginning the process of writing the analysis, we looked back over the recorded data. After that, we tried to establish a connection between the information that we had gathered and the hypotheses that we had developed. In addition to that, the interviews served as the basis for categorising the data analysis into several topics.

### **3.14. Reliability and Validity**

The concept of reliability, often known as dependability, refers to the issue of whether the outcome of a study will remain the same if it is carried out once again (Bell, Bryman, & Harley, 2022). Because the reliability of a quantitative study is dependent on the stability of the measuring equipment, it is more tangible than the dependability of a qualitative study. Our goal is to put together a collection of interviews with those people who want to invest in securities or use the services of robo-Advisory. During this research, we spoke to a total of six individuals; hence, if someone else were to do the same research using a different sample, the conclusions they reached may be different, but the overall findings might be comparable.

"The precision of the equipment, the reliability of the data, and the validity of the conclusions in the study" (Bernard, & Bernard, 2013). According to the definition provided by Bell, Bryman, & Harley (2022), validity is "does the measure instrument measure what it should be measuring?" In addition, a discussion of whether the results that have been generalised from a research project may be related is included. There are many distinct kinds of validity, including the following:

- Intern validity asks the question, "Is the conclusion (which is often associated with causality) correct?"
- External validity asks if the findings may be extrapolated to other types of units.

Due to the dependability of these sources, interviews are carried out in collaboration with managers who are acknowledged authorities in their respective fields. Despite the fact that it is difficult to achieve high validity via interviewing, we decided to carry out observation research instead. Internal validity is defined as the existence of a causal relationship between two phenomena. For example, we collected data that is displayed in the statistics, and this led to an outcome in which the data from our interviews is valid. This demonstrates that there is a relationship between the two phenomena (Saunders, & Bezzina, 2015).

The fact that the respondents in our research did not provide the same responses in both interviews raises the possibility that the validity of our study is questionable. In addition, the model that was used for the observation research is irrelevant when it comes to their homepages since those sites are entirely unique, yet all their social media platforms have the same layout and the same underlying factor.

## **Chapter 4: Result and Finding**

This chapter begins by presenting the findings from the survey, then moves on to the findings from the descriptive statistics, and then goes into depth on the qualitative data. In addition to that, it contains an analysis of the outcomes.

#### 4.1.Survey statistics

Table 4.1 below provides descriptive data for all 334 survey participants. It should be noted that due to the optional nature of some survey questions, some respondents may have chosen to ignore or not see certain questions, resulting in discrepancies in the observation of variables as the question sequence was based on their past responses.

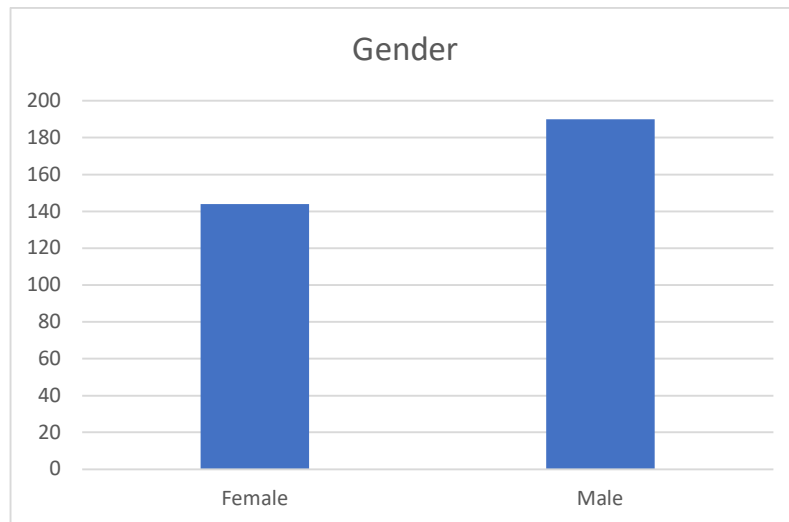
##### 4.1.1. What do you identify as?

**Table 4. 1:** Distribution of respondents by Gender

|              | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------|-----------|---------|---------------|--------------------|
| Valid Female | 144       | 43.1    | 43.1          | 43.1               |
| Male         | 190       | 56.9    | 56.9          | 100.0              |
| Total        | 334       | 100.0   | 100.0         |                    |

**In Table 4.1**, the respondent rate of male is greater than female. As we can see out of 334 respondents, 57% were male and 43% are female who participated in this study.

Figure 4. 1: Distribution of respondents by Gender



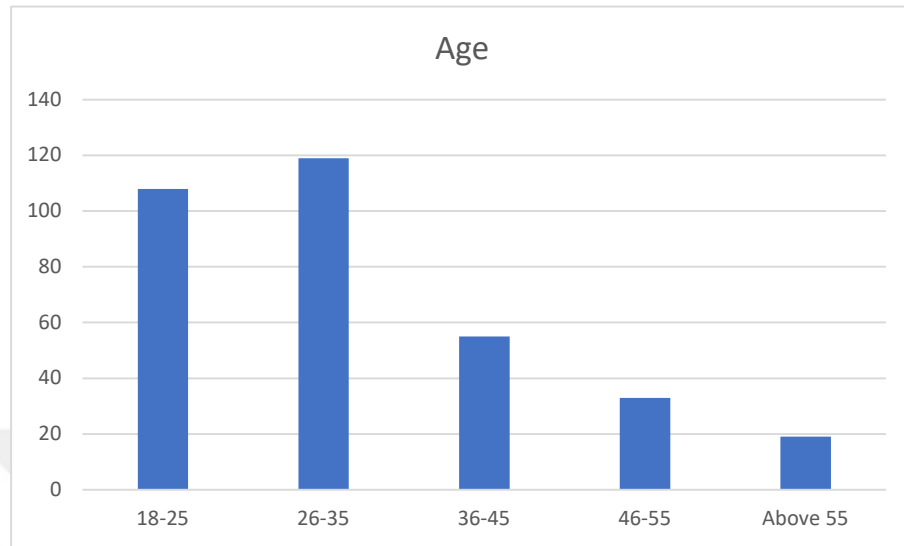
#### 4.1.2. How old are you?

**Table 4. 2:** Distribution of respondents by Age

|             | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------|-----------|---------|---------------|--------------------|
| Valid 18-25 | 108       | 32.3    | 32.3          | 32.3               |
| 26-35       | 119       | 35.6    | 35.6          | 68.0               |
| 36-45       | 55        | 16.5    | 16.5          | 84.4               |
| 46-55       | 33        | 9.9     | 9.9           | 94.3               |
| Above 55    | 19        | 5.7     | 5.7           | 100.0              |
| Total       | 334       | 100.0   | 100.0         |                    |

The above table shows the respondent rate of participants by age. In table we can see majority of respondents belong to the category of 26-35-year-old with the percentage of 35%, while the lowest rate is belonging to above 55 years. Moreover, respondents who are under the age of 18-25 are 32.5%, and 26.4% are those respondents whose age is from 36 to 55 years.

Figure 4. 2: Distribution of respondents by Age



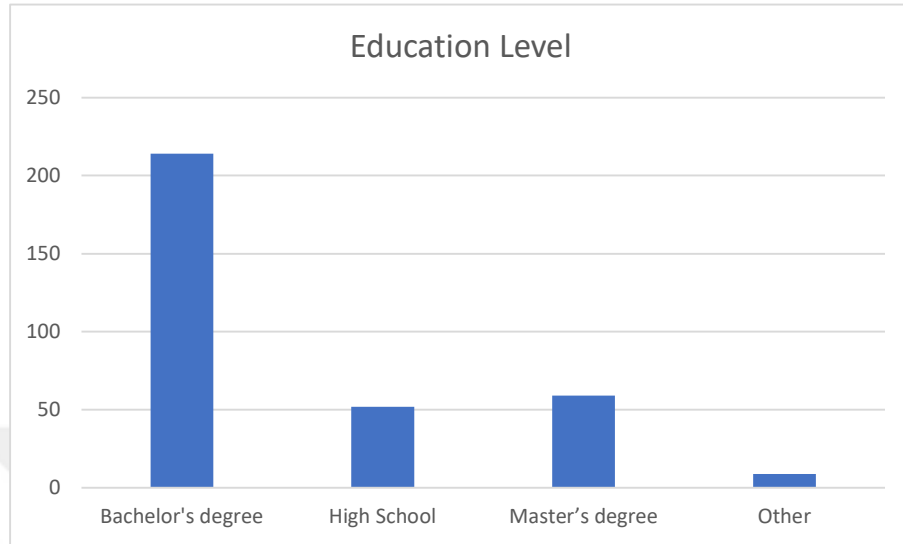
**4.1.3. What level of education do you have?**

**Table 4. 3:** Distribution of respondents by Education level

|                         | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------------|-----------|---------|---------------|--------------------|
| Valid Bachelor's degree | 214       | 64.1    | 64.1          | 64.1               |
| High School             | 52        | 15.6    | 15.6          | 79.6               |
| Master's degree         | 59        | 17.7    | 17.7          | 97.3               |
| Other                   | 9         | 2.7     | 2.7           | 100.0              |
| Total                   | 334       | 100.0   | 100.0         |                    |

The above table show the education level of respondents. In table majority of participants have bachelor's degree, almost 64% with 214 number of frequency participated. Participants belong to master's degree are only 15.6%.

Figure 4. 3: Distribution of respondents by education level



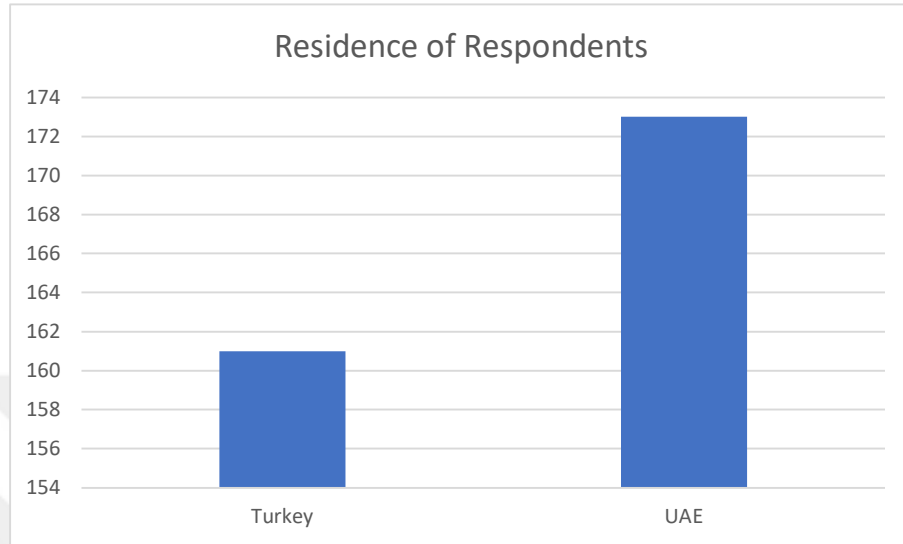
#### 4.1.4. Residence of Participants

Table 4. 4: Distribution of respondents by residence

|              | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------|-----------|---------|---------------|--------------------|
| Valid Turkey | 161       | 48.2    | 48.2          | 48.2               |
| UAE          | 173       | 51.8    | 51.8          | 100.0              |
| Total        | 334       | 100.0   | 100.0         |                    |

In this study, we collect data from Turkey and UAE, from where majority of respondent's residence is UAE with the percentage of 51% and people from Turkey are 48%.

Figure 4. 4: Distribution of respondents by residence



**4.1.5. What is your monthly wage (InDollars)?**

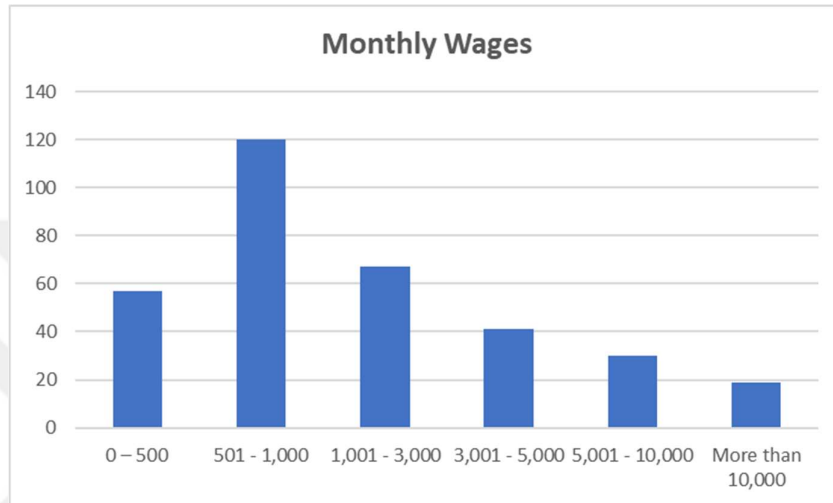
The below table shows the monthly salary or income of respondents in Dollars. The monthly income ranges from \$0 to more than \$10,000.

**Table 4. 5:** Distribution of respondents by monthly wages

|                  | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------------|-----------|---------|---------------|--------------------|
| Valid 0 – 500    | 57        | 17.1    | 17.1          | 17.1               |
| 501 - 1,000      | 120       | 35.9    | 35.9          | 53                 |
| 1,001 - 3,000    | 67        | 20.1    | 20.1          | 73.1               |
| 3,001 - 5,000    | 41        | 12.3    | 12.3          | 85.4               |
| 5,001 - 10,000   | 30        | 9.0     | 9.0           | 94.4               |
| More than 10,000 | 19        | 5.7     | 5.7           | 100.0              |
| Total            | 334       | 100.0   | 100.0         |                    |

Table shows 36% respondent's income is \$501-\$1000 and majority respondents belong under this category. While 20% those whose monthly salary is \$1001 - \$3000, 17% those who have \$0-\$500 monthly salary, 12% those who 3001-5000 salary per month. And only 6% those have greater than \$10,000 monthly salary.

Figure 4. 5: Distribution of respondents by monthly wages



#### 4.1.6. How much are your monthly savings (In Dollar)?

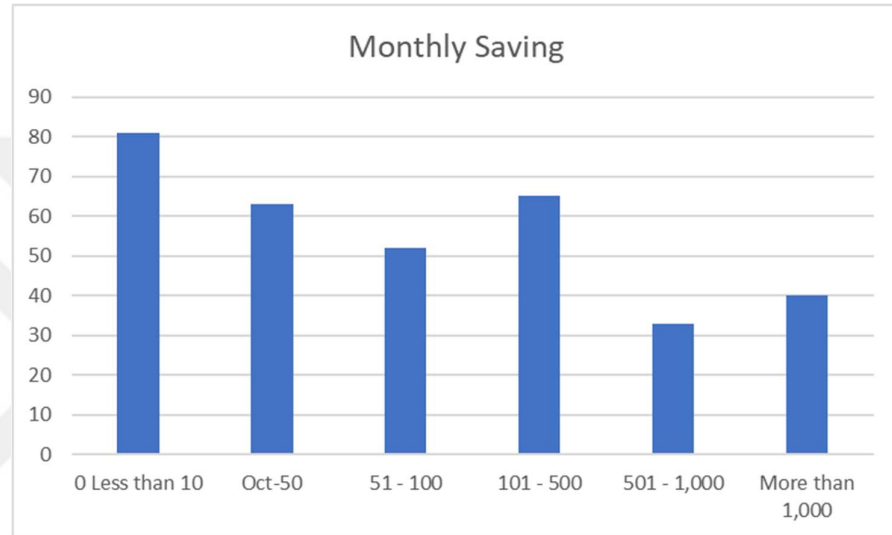
We also focus on the monthly saving of respondents, below table shows the respondents rate

Table 4. 6: Distribution of respondents by monthly savings

|                      | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------|-----------|---------|---------------|--------------------|
| Valid 0 Less than 10 | 81        | 24.3    | 24.3          | 24.3               |
| 10 - 50              | 63        | 18.9    | 18.9          | 43.2               |
| 51 - 100             | 52        | 15.6    | 15.6          | 58.8               |
| 101 - 500            | 65        | 19.5    | 19.5          | 78.3               |
| 501 - 1,000          | 33        | 9.9     | 9.9           | 88.0               |
| More than 1,000      | 40        | 12.0    | 12.0          | 100.0              |
| Total                | 334       | 100.0   | 100.0         |                    |

The finding of this questions shows majority of the respondents do not have saving and their lowest rate of saving money is 24% who have saving below \$10. While 19% respondent those save money from \$10 to \$500 from their income each month.

**Figure 4. 6:** Distribution of respondents by monthly savings



**4.1.7. How much risk are you willing to take when investing in securities?**

Under these questions we see the response of respondents regarding to invest in securities either they want to take risk or not.

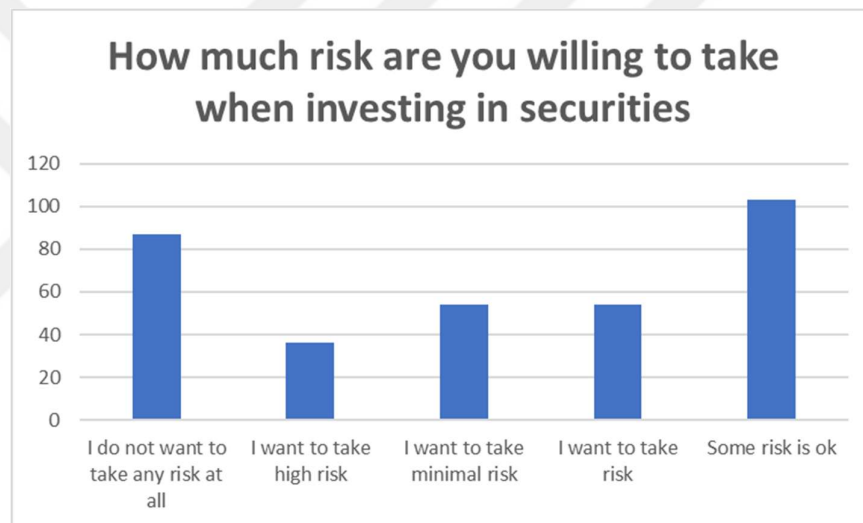
**Table 4. 7:** Distribution of respondents by risk for investing in securities

|   | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid I do not want to take any risk at all | 87        | 26.0    | 26.0          | 26.0               |
| I want to take high risk                    | 36        | 10.8    | 10.8          | 36.8               |
| I want to take minimal risk                 | 54        | 16.2    | 16.2          | 53.0               |

|                     |     |       |       |       |
|---------------------|-----|-------|-------|-------|
| I want to take risk | 54  | 16.2  | 16.2  | 69.2  |
| Some risk is ok     | 103 | 30.8  | 30.8  | 100.0 |
| Total               | 334 | 100.0 | 100.0 |       |

From table findings we can see majority of the respondents are agreeing to take some risk for investing in securities and only 10% respondents are risk lover who want to take risk at higher level. While 26% respondent are those who are risk averse.

Figure 4. 7: Distribution of respondents by Age risk for investing in securities



#### 4.1.8. Do you invest or have invested in securities shares funds ETFs ETCs bonds etc?

We also check how much respondents have investment in securities but only 33% respondents are those have investment in any type of securities, share, funds, bonds and ETCs. While 67% are those who didn't invest in security ever because mostly respondents are risk averse.

**Table 4. 8:** Distribution of respondents by investment in securities (shares , funds, ETFs, ETCs, bonds

|          | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------|-----------|---------|---------------|--------------------|
| Valid No | 224       | 67.1    | 67.1          | 67.1               |
| Yes      | 110       | 32.9    | 32.9          | 100.0              |
| Total    | 334       | 100.0   | 100.0         |                    |

#### 4.1.9. Why do you not invest today?

This question also related to risk aversion why people do not invest.

**Table 4. 9:** Distribution of respondents by investing today.

|                                   | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------------------------|-----------|---------|---------------|--------------------|
| Valid Who have investment         | 110       | 32.9    | 32.9          | 32.9               |
| I am not interested               | 43        | 12.9    | 12.9          | 45.8               |
| I do not have any money to invest | 55        | 16.5    | 16.5          | 62.3               |
| I do not have enough knowledge    | 77        | 23.1    | 23.1          | 85.3               |
| I do not have time                | 20        | 6.0     | 6.0           | 91.3               |
| I do not want to take risks       | 29        | 8.7     | 8.7           | 100.0              |
| Total                             | 334       | 100.0   | 100.0         |                    |

There are multiple factors which we investigated from survey as mentioned in above table. One of the main factors which is restricted people to invest is people have no enough knowledge about investment, where they have to invest or how to invest, which security is beneficial for them. Another factor is shortage of money; people have

not enough money to invest. Some of respondents said they have no interest or have no time for investment, or some said they don't want to take any type of risk.

**Figure 4. 8:** Distribution of respondents by investing today



#### 4.1.10. What type of securities do you invest in?

The below table shows the investment off respondents where they prefer to invest or invested. The figure of 224 those who never invested in their life. The below table shows respondents invested in multiple securities like bonds, crypto currency, funds, shares, ETCs, and ETFs.

**Table 4. 10:** Distribution of respondents by securities investment

|                 | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid           | 224       | 67.1    | 67.1          | 67.1               |
| Bonds           | 9         | 2.7     | 2.7           | 69.8               |
| Crypto currency | 11        | .6      | .6            | 70.7               |
| ETCs            | 5         | 1.5     | 1.5           | 74.6               |
| ETFs            | 4         | 1.2     | 1.2           | 75.7               |
| ETFs, Bonds     | 1         | .3      | .3            | 76.0               |
| Funds           | 13        | 3.9     | 3.9           | 79.9               |
| Funds, Bonds    | 1         | .3      | .3            | 80.2               |

|                                   |     |       |       |       |
|-----------------------------------|-----|-------|-------|-------|
| Funds, Crypto currency            | 1   | .3    | .3    | 80.5  |
| Funds, Crypto currency            | 1   | .3    | .3    | 80.8  |
| Funds, ETFs                       | 3   | .9    | .9    | 81.7  |
| Shares                            | 31  | 9.3   | 9.3   | 91.0  |
| Shares, Bonds                     | 1   | .3    | .3    | 91.3  |
| Shares, Crypto currency           | 1   | .3    | .3    | 91.6  |
| Shares, Crypto currency           | 2   | .6    | .6    | 92.2  |
| Shares, ETFs                      | 2   | .6    | .6    | 92.8  |
| Shares, ETFs, Bonds               | 1   | .3    | .3    | 93.1  |
| Shares, ETFs, ETCs                | 2   | .6    | .6    | 93.7  |
| Shares, ETFs, ETCs,<br>Bonds      | 1   | .3    | .3    | 94.0  |
| Shares, Funds                     | 16  | 4.8   | 4.8   | 98.8  |
| Shares, Funds, Bonds              | 1   | .3    | .3    | 99.1  |
| Shares, Funds, Crypto<br>currency | 1   | .3    | .3    | 99.4  |
| Shares, Funds, ETCs               | 1   | .3    | .3    | 99.7  |
| Shares, Funds, ETFs               | 1   | .3    | .3    | 100.0 |
| Total                             | 334 | 100.0 | 100.0 |       |

#### 4.1.11. How often do you buy or sell securities?

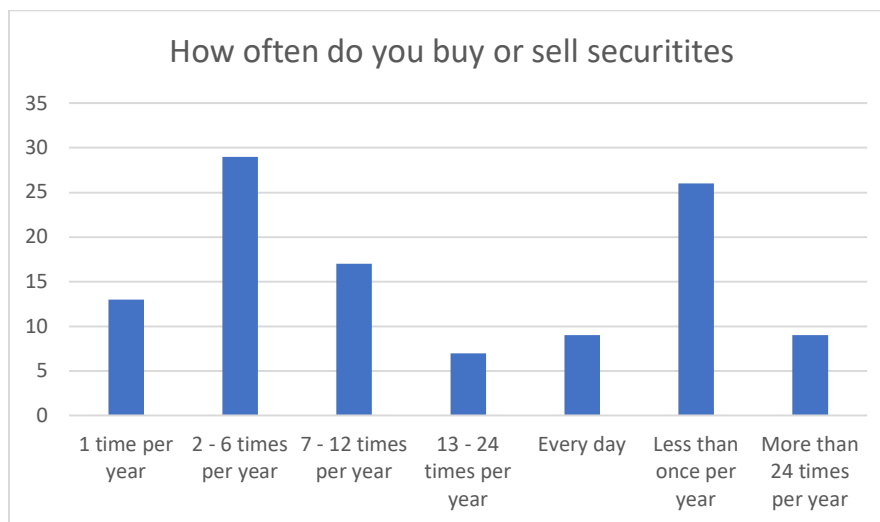
The below table show that most of respondents sell or buy their securities “6 times per year” with the percentage of 8.7% and least respondent rate is 2.7% where respondents buy or sell their securities “every day or more than 24 times in year”.

**Table 4. 11:** Distribution of respondents by selling and buying securities

|       | Frequency | Percent | Valid<br>Percent | Cumulative<br>Percent |
|-------|-----------|---------|------------------|-----------------------|
| Valid | 224       | 67.1    | 67.1             | 67.1                  |

|                             |     |       |       |       |
|-----------------------------|-----|-------|-------|-------|
| 1 time per year             | 13  | 3.9   | 3.9   | 71.0  |
| 2 - 6 times per year        | 29  | 8.7   | 8.7   | 81.7  |
| 7 - 12 times per year       | 17  | 5.1   | 5.1   | 86.8  |
| 13 - 24 times per year      | 7   | 2.1   | 2.1   | 73.1  |
| Every day                   | 9   | 2.7   | 2.7   | 89.5  |
| Less than once per year     | 26  | 7.8   | 7.8   | 97.3  |
| More than 24 times per year | 9   | 2.7   | 2.7   | 100.0 |
| Total                       | 334 | 100.0 | 100.0 |       |

**Figure 4. 9:** Distribution of respondents by selling and buying securities.



#### 4.1.12. How do you invest?

Those who have invested in the stock market or are considering doing so were asked this question, and they were given the option of selecting several answers. The

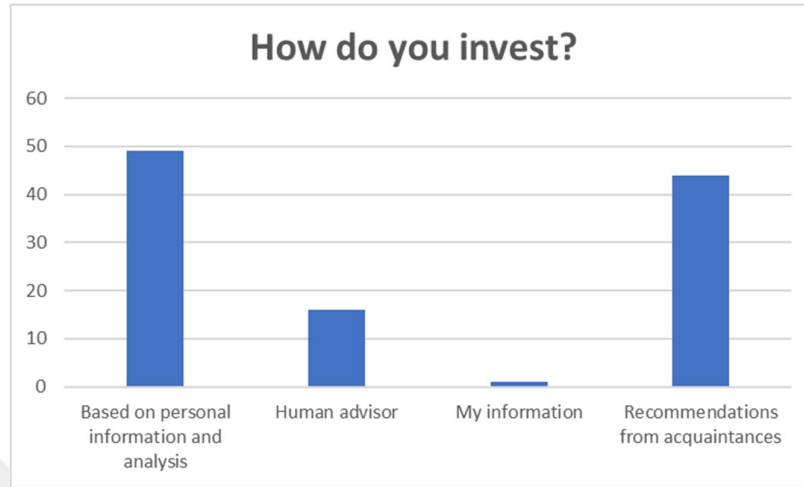
below table shows the respondents rate about how they invest in securities and on which bases they invested. Most of the participants said they invested on basis of personal information and analysis or recommended acquaintances.

**Table 4. 12:** Distribution of respondents by investment

|  | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid                                      | 224       | 67.1    | 67.1          | 67.1               |
| Based on personal information and analysis | 49        | 14.7    | 14.7          | 81.7               |
| Human advisor                              | 16        | 4.8     | 4.8           | 86.5               |
| My information                             | 1         | .3      | .3            | 86.8               |
| Recommendations from acquaintances         | 44        | 13.2    | 13.2          | 100.0              |
| Total                                      | 334       | 100.0   | 100.0         |                    |

Based on the data in the table, 49% of investors say they make decisions using just private data and research. And 12.8% of investors have done so because of the advice of friends and family. Only 4.8% of those polled said they invest with the help of a human adviser.

**Figure 4. 10:** Distribution of respondents by investment



**4.1.13. Do you invest, or have invested, via robo-advisory (digital automated advisory)?**

According to the table, 8.1% of respondents said that they do presently invest or had previously invested through robo-advisory. This equates to 27 different persons. 25 percent of investors have not used robo-advisors in any capacity. The percentage of male respondents who invest or have invested through robo-advisory is 8%, whereas the percentage of female respondents who invest or have invested via robo-advisory is 3%. 50 percent of the 27 people who now invest in or have previously invested in robo-advisory services have a level of income that may be considered high (more than \$5000 to \$10000 per month). In addition to this, the vast majority of them have reached a high degree of educational attainment.

**Table 4. 13:** Distribution of respondents by investment in digital automated advisory

|       | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------|-----------|---------|---------------|--------------------|
| Valid | 224       | 67.1    | 67.1          | 67.1               |
| NO    | 83        | 24.9    | 24.9          | 91.9               |
| Yes   | 27        | 8.1     | 8.1           | 100.0              |
| Total | 334       | 100.0   | 100.0         |                    |

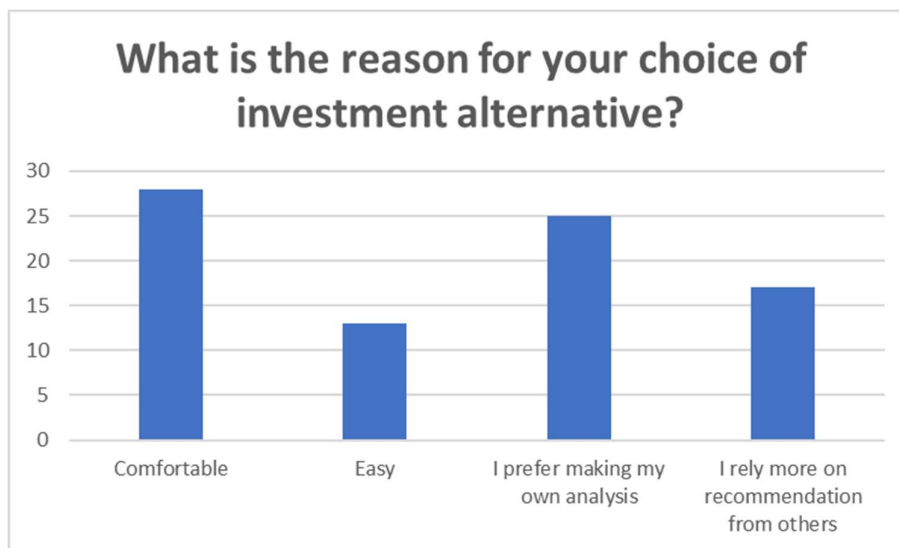
#### 4.1.14. What is the reason for your choice of investment alternative?

The below table shows the trust level of respondents on robo-advisor who invested through it. We asked the reason for choosing investment alternative from respondents, most of the respondents said it is comfortable and the percentage of that respondents is 8.4%, while 7.5% those who said they prefer to make their own analysis and 5.1% those who said they rely more on recommendation from others.

**Table 4. 14:** Distribution of respondents by choice of investment alternative

|   | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid                                     | 251       | 75.1    | 75.1          | 75.1               |
| Comfortable                               | 28        | 8.4     | 8.4           | 83.5               |
| Easy                                      | 13        | 3.9     | 3.9           | 87.4               |
| I prefer making my own analysis           | 25        | 7.5     | 7.5           | 94.9               |
| I rely more on recommendation from others | 17        | 5.1     | 5.1           | 100.0              |
| Total                                     | 334       | 100.0   | 100.0         |                    |

**Figure 4. 11:** Distribution of respondents by choice of investment alternative



#### 4.1.15. Which Robo-Advisor do you invest via?

We also ask from respondents about the way of investment in Robo-Advisor, the below table show the responding rate of it. Different tools like sigma, Avanza, binance, Lysa, Opti, Nordea were used by respondents as shown in table.

**Table 4. 15:** Distribution of respondents by robo-advisor via

|   | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| Valid   | 308       | 92.2    | 92.2          | 92.2               |
| Avanza Auto   | 2         | .6      | .6            | 92.8               |
| Binance   | 2         | .6      | .6            | 93.4               |
| Foreks Digital  | 1         | .3      | .3            | 93.7               |
| Lysa, Opti  | 1         | .3      | .3            | 94.0               |
| Nordea  | 1         | .3      | .3            | 94.3               |
| Opti  | 3         | .9      | .9            | 95.2               |
| Robosave  | 6         | 1.8     | 1.8           | 97.0               |
| Robosave, Avanza<br>Auto, Lysa, Opti,<br>Nordea, Sigma, Sarwa | 1         | .3      | .3            | 97.3               |
| Robosave, Avanza<br>Auto, Sigma                               | 1         | .3      | .3            | 97.6               |
| Robosave, Lysa  | 1         | .3      | .3            | 97.9               |
| Robot binance   | 1         | .3      | .3            | 98.2               |
| Sarwa   | 2         | .6      | .6            | 98.8               |
| Sarwa, binance  | 1         | .3      | .3            | 99.1               |
| Sigma   | 1         | .3      | .3            | 99.4               |
| Sigma, Sarwa  | 2         | .6      | .6            | 100.0              |
| Total   | 334       | 100.0   | 100.0         |                    |

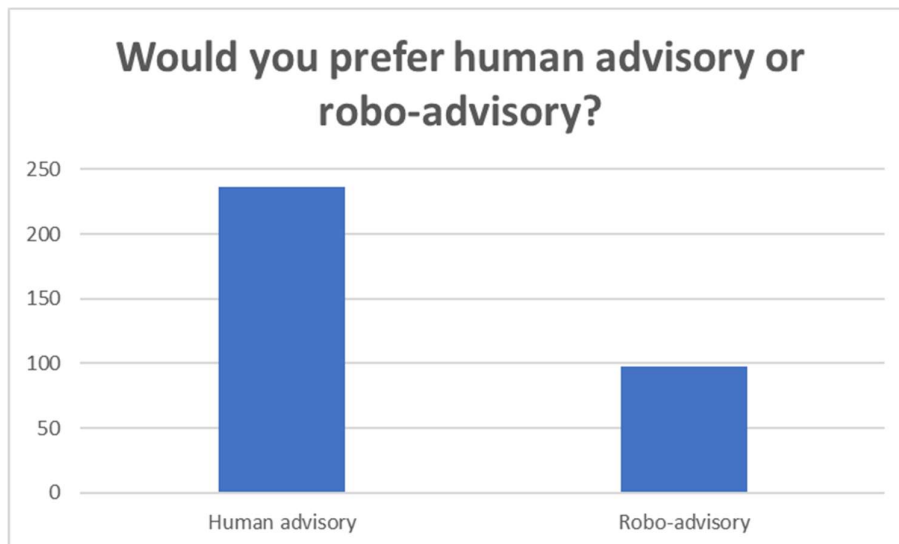
#### 4.1.16. Would you prefer human advisory or robo-advisory?

The following table compares human advising with robo-advisory services from the perspective of those who have never invested in stocks before. 71% of respondents would choose a human advice over a robo-advisory, while 29.3% of respondents would choose a robo-advisory over a human advisory.

**Table 4. 16:** Distribution of respondents by preferences of human advisory or robo-advisory

|                      | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------|-----------|---------|---------------|--------------------|
| Valid Human advisory | 236       | 70.7    | 70.7          | 70.7               |
| Robo-advisory        | 98        | 29.3    | 29.3          | 100.0              |
| Total                | 334       | 100.0   | 100.0         |                    |

**Figure 4. 12:** Distribution of respondents by preferences of human advisory or robo-advisory



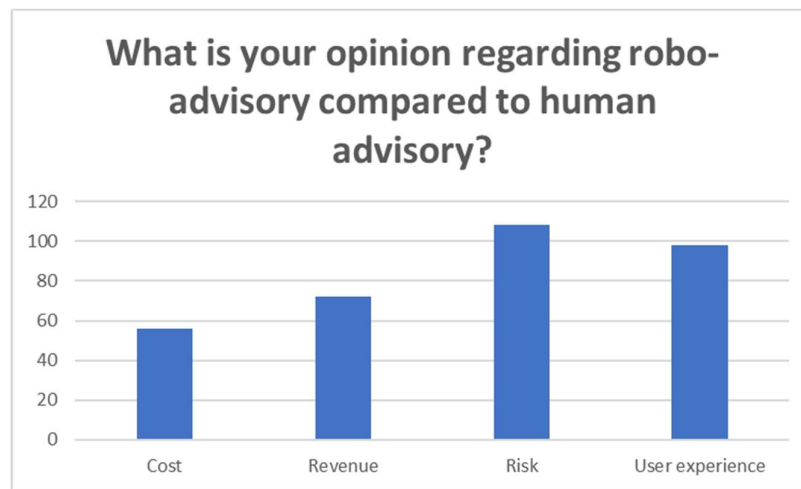
**4.1.17. What is your opinion regarding robo-advisory compared to human advisory?**

After above question we also asked question about why people more prefer to robo-advisor rather than human advisor. They give different opinion against them from which the highest reason is risk. Risk is the major factor which effect the people decision and they choose robo-advisor as compared to human advisor. The second one is user experience with responding rate of 29.3%. Similarly, the other factors are cost, and revenue as shown in below table.

**Table 4. 17:** Distribution of respondents by robo-advisory compared to human advisory

|                 | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------------|-----------|---------|---------------|--------------------|
| Valid Cost      | 56        | 16.8    | 16.8          | 16.8               |
| Revenue         | 72        | 21.6    | 21.6          | 38.3               |
| Risk            | 108       | 32.3    | 32.3          | 70.7               |
| User experience | 98        | 29.3    | 29.3          | 100.0              |
| Total           | 334       | 100.0   | 100.0         |                    |

**Figure 4. 13:** Distribution of respondents by robo-advisory compared to human advisory



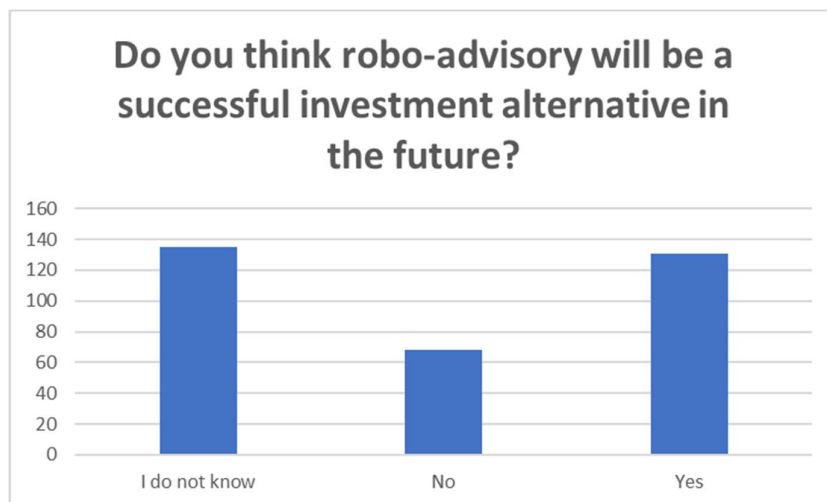
**4.1.18. Do you think robo-advisory will be a successful investment alternative in the future?**

According to the table, 39.2% of the respondents feel that robo-advisory will be a successful investing choice in the future, while 20.4% of the respondents do not believe this would be the case. At the same time, 40.4% of those who participated in the survey are unsure about whether or not robo-advisory would be effective.

**Table 4. 18:** Distribution of respondents by successful investment alternative in the future

|                     | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------------|-----------|---------|---------------|--------------------|
| Valid I do not know | 135       | 40.4    | 40.4          | 40.4               |
| No                  | 68        | 20.4    | 20.4          | 60.8               |
| Yes                 | 131       | 39.2    | 39.2          | 100.0              |
| Total               | 334       | 100.0   | 100.0         |                    |

Figure 4. 14: Distribution of respondents by successful investment alternative in the future



#### 4.1.19. How can current robo-advisory be improved?

Multiple surprising results are included in the table. Seventeen percent of investors who have never used a robo-advisor believe that the service should be free. A whole 6 percent of respondents said they would like a more transparent robo-advisor industry, yet the vast majority of these consumers had never invested in stocks or used a robo-advisor before. A large percentage of respondents (24%) who have invested in stocks before but never used a robo-advisor feel they need more education and information on robo-advisory before they make the switch. People who had never invested in the stock market or used a robo-advisor were less likely to choose "greater security option" or "recommended from acquaintances" when given the choice.

**Table 4. 19:** Distribution of respondents by current robo-advisory be improved?

|  | Frequency | Percent | Valid Percent | Cumulative Percent |
|--|-----------|---------|---------------|--------------------|
| Valid Consider personal preferences such as ethnic and moral (i.e. not investing in tobacco) | 24        | 7.2     | 7.2           | 7.2                |
| Easier to use Recommendation from acquaintances  | 18        | 5.4     | 5.4           | 12.6               |
| Free of cost   | 59        | 17.7    | 17.7          | 30.2               |
| Include more aspects regarding personal economy and risk tendency                            | 39        | 11.7    | 11.7          | 41.9               |
| More knowledge and information   | 80        | 24.0    | 24.0          | 65.9               |

|                            |     |       |       |       |
|----------------------------|-----|-------|-------|-------|
| More security options      | 48  | 14.4  | 14.4  | 80.2  |
| More transparent           | 20  | 6.0   | 6.0   | 86.2  |
| Smarter investment choices | 46  | 13.8  | 13.8  | 100.0 |
| Total                      | 334 | 100.0 | 100.0 |       |

**Figure 4. 15:** Distribution of respondents by current robo-advisory be improved.

#### 4.2. Probit model and average marginal effect - securities

The probit model's outcomes, which consider typical marginal effects. It displays the impact of the independent variables on financial securities and the significance of the findings. Only variables that are statistically significant will be discussed. The z-statistic values are used to gauge the variable coefficients' statistical significance. Coefficient z-values below the three levels of significance are indicated with stars. Table 5.20 lists how many stars are awarded for each level. The results of the probit regression demonstrate that, on a 1% significance level, being a woman reduces the likelihood of investing in securities by 18%. A bachelor's degree will make investing in securities less likely, but we cannot quantify how much because there is no discernible marginal effect.

**Table 4. 20:** Probit regression with securities as the dependent variable

| Probit Securities | Coefficient | Standard error | Z. statistics | Average Marginal effect, dy/dx |
|-------------------|-------------|----------------|---------------|--------------------------------|
| Gender            |             |                |               |                                |
| Female            | -.9745632   | .2345632       | -2.97**       | -.1874273**                    |
| Male              | (ref).      |                |               |                                |

|                   |           |          |        |            |
|-------------------|-----------|----------|--------|------------|
| Age               |           |          |        |            |
| 18-25             | -.1854562 | .5325673 | -0.42  | -.45333445 |
| 26-35             | -.1367321 | .7633262 | -0.65  | -.53421565 |
| 36-45             | -.1478853 | .5532356 | - 0.45 | -.45267221 |
| 46-55             | -.1744323 | .6773222 | -0.53  | -.64532126 |
| Above 55          | -.1684324 | .5383252 | -0.51  | -.45562226 |
| Education level   |           |          |        |            |
| Bachelor's degree | -.4367187 | .28494   | -2.06* | -.3440512  |
| High School       | .7326234  | .45232   | 1.95   | .3625722   |
| Master's degree   | .6735212  | .32167   | 2.15   | .2632622   |
| Other             | (ref)     |          |        |            |
| Monthly income    |           |          |        |            |
| 0 – 500           | .4662252  | .5433321 | 1.73   | .0743273   |
| 501 - 1,000       | .5732721  | .5623224 | 1.31   | .0853262   |
| 1,001 - 3,000     | .7583321  | .2457529 | 1.43   | .0894332   |
| 3,001 - 5,000     | .3572325  | .6562191 | 0.27   | .0247821   |
| 5,001 - 10,000    | .8532197  | .7435786 | 1.33   | .0632151   |
| More than 10,000  | .1589342  | .6387842 | 0.21   | .0462782   |
| Monthly saving    |           |          |        |            |

|   |           |          |       |           |
|---|-----------|----------|-------|-----------|
| 0 Less than 10  | .5241567  | .849648  | 1.53  | .1523211  |
| 10 – 50   | .8437251  | .786346  | 2.62  | .2437822  |
| 51 – 100  | .6421794  | .668497  | 2.21* | .1792322* |
| 101 – 500   | .8534672  | .640865  | 1.74  | .2964332  |
| 501 - 1,000   | .7589878  | .742321  | 1.95  | .1482189  |
| More than 1,000   | .6832901  | .673222  | 1.99  | .2154922  |
| <b>How much risk are you willing to take when investing in securities</b> |           |          |       |           |
| I do not want to take any risk at all                                     | -.5368215 | .2225674 | -1.73 | -.7838822 |
| I want to take high risk  | -.5673211 | .8853222 | -1.88 | -.5763437 |
| I want to take minimal risk   | .6396531  | .7437882 | 1.46  | .325721   |
| I want to take risk   | .853256   | .5678251 | 0.99  | .189349   |
| Some risk is ok   | .632725   | .3573222 | 1.78  | .468278   |
| McFadden's Pseudo R <sup>2</sup>  | 0.36236   |          |       |           |
| N   | 334       |          |       |           |

Statistical significance levels \*z<0.05 \*\*z<0.01 \*\*\*z<0.001

If respondents save between \$51 and \$100 per month, their likelihood of making an investment in securities rises by about 17%. Furthermore, having monthly savings of more than \$100 per month improves the likelihood of investing in securities, however the increase in probability cannot be quantified because there is no discernible marginal impact. On a 5% significance level, both results are significant. It is 0.36236 for the McFadden's Pseudo R2, which gauges the goodness of fit. Due to the coefficient falling between 0.2 and 0.4, it can be concluded that our model fits the data well.

#### 4.3.Probit model and average marginal effect - robo-advisory

The probit model's outcome, including the average marginal effect, is shown in Table 5.21. It demonstrates the impact of the independent variables on robo-advisory and the significance of the findings. Only statistically significant variables will be discussed in the comments. The likelihood of using robo-advisors increases for females by about 25% and has a significant level of 1%. On a 5% significance level, respondents who describe themselves as risk averse have a 15% higher likelihood of using robo-advisory.

**Table 4. 21:** Probit regression with robo-advisory as the dependent variable

| Probit Securities | Coefficient | Standard error | Z. statistics | Average Marginal effect, dy/dx |
|-------------------|-------------|----------------|---------------|--------------------------------|
| Gender            |             |                |               |                                |
| Female            | 1.745731    | .868893        | -2.76**       | .257843**                      |
| Male              | (ref).      |                |               |                                |

|                   |           |          |        |            |
|-------------------|-----------|----------|--------|------------|
|                   |           |          |        |            |
| Age               |           |          |        |            |
| 18-25             | -.4367187 | .284944  | -1.66* | -.3440512  |
| 26-35             | .7326234  | .452327  | 1.83   | .3625722   |
| 36-45             | .6735212  | .321676  | 1.15   | .2632622   |
| 46-55             | .8583362  | .753225  | 0.96   | .3423672   |
| Above 55          | (ref)     |          |        |            |
| Education level   |           |          |        |            |
| Bachelor's degree | -.1478853 | .7633262 | -0.65  | -.45333445 |
| High School       | -.1744323 | .5532356 | -0.45  | -.53421565 |
| Master's degree   | -.1684324 | .5383252 | -0.53  | -.45267221 |
| Other             | (ref)     |          |        |            |
| Monthly income    |           |          |        |            |
| 0 – 500           | (ref)     |          |        |            |
| 501 - 1,000       | -.1367321 | .7633262 | -0.65  | -.53421565 |
| 1,001 - 3,000     | .1478853  | .5532356 | 0.47   | .05267221  |
| 3,001 - 5,000     | .1744323  | .6773222 | 0.53   | .04532126  |
| 5,001 - 10,000    | .1684324  | .5383252 | 0.51   | .04556222  |
| More than 10,000  | .4662252  | .5433321 | 0.45   | .07432738  |
| Monthly saving    |           |          |        |            |

|   |          |          |       |           |
|---|----------|----------|-------|-----------|
| 0 Less than 10  | (ref)    |          |       |           |
| 10 – 50   | .5732721 | .5623224 | 1.31  | .0853262  |
| 51 – 100  | .7583321 | .2457529 | 1.43  | .0894332  |
| 101 – 500   | .3572325 | .6562191 | 0.27  | .0247821  |
| 501 - 1,000   | .8532197 | .7435786 | 1.33  | .0632151  |
| More than 1,000   | .1589342 | .6387842 | 0.21  | .0462782  |
| <b>How much risk are you willing to take when investing in securities</b> |          |          |       |           |
| I do not want to take any risk at all                                     | .5241567 | .786346  | 1.53* | .1523211* |
| I want to take high risk  | .8437251 | .668497  | 2.62  | .2437822  |
| I want to take minimal risk   | .6421794 | .640865  | 2.21  | .1792322  |
| I want to take risk   | .8534672 | .742321  | 1.74  | .2964332  |
| Some risk is ok   | .7589878 | .673222  | 1.95  | .1482189  |
| McFadden's Pseudo R <sup>2</sup>  | 0.394782 |          |       |           |
| N   | 334      |          |       |           |
| Statistical significance levels *z<0.05 **z<0.01 ***z<0.001               |          |          |       |           |

## 4.4. Analysis of Qualitative Data

### 4.4.1. Analysis of the research interview

Research interviews were conducted, as was mentioned before, with persons who worked in various sectors of the financial industry and were familiar with robo-advisory or had utilized it in their workplaces. Across Turkey and UAE, in the city of Istanbul and Dubai, a total of 4 interviews were conducted. The findings, analysis, and conclusions reached from this study will mostly be based on the information provided by the interviewees.

Each interview question falls under one of five categories; topic 1 is entitled "Traditional financial counsellor is superior than robo-advisor, theme 2 is based on Benefits and drawbacks of robo-advisory, theme 3 is based on performance of Organizations by Robo advisor and forth theme is based on future of financial market. The interviews have been given the letters A,B,C and D.

### 4.4.2. Theme 1: Traditional financial advisor is better than Robo-Advisor

The significance of Traditional financial adviser from the respondents' viewpoints was the first topic of discussion. The goal of this investigation was to address the issue of how much of an impact robo advisors have on the financial sector. All of those who were questioned had something to say about the subject at hand.

#### 4.4.2.1. Interviews Respondents

- **Respondent A**, who works as a trader in stock market and don't use Augmented reality in their business. According to respondent A, they have a plan to create their own robot for a limit value not accessible for customers because they think robots are not viable for all types of customers. When we asked a traditional financial advisor could perform better than a robot? He said yes because humans are able to learn in every minute but robots need humans to be developed. He also said humans have different thinking then robots, they can't think like humans and humans have better decisions then robots.
- **Respondent B**, who is Investment Manager in an Islamic Bank. They used new technologies because they think it help increase investment. He believed

on full automation because it save on many expenses such as salaries and bonuses, as well as the speed of performance and giving results that will increase revenue and fame, provided that the full automation is accurate at a very high rate. He totally against the statement of respondent A.

- **Respondent C**, who is Senior Database Administrator in Albaraka Turk Bank. He is dealing with internal and external clients to obey all their banking requirements in the conditions applied by the central banking system and Islamic sharia laws. They used AR technology in different fields to speed up the processes and save timing rather than doing it manually in an old fashion manner such as Robotics and FAST money transfer and many banking workflows. Moreover, he said robots perform much faster and contribute with many flows that couldn't a traditional financial employee achieve it. However, robots alone can't proceed without the main instructions that have been fed by financial advisors.
- **Respondent D**, senior software engineer at Sarwa, a financial trading and robo-advisory FinTech platform, based in Dubai. Their services are available through our website as well as iOS and Android mobile apps. They didn't implement AR at Sarwa but they have a robo-advisory platform that provides financial advisory to thier users and automates financial investments in the stock market on their behalf. They also use a lot of automation systems in Sarwa to automate a lot of our internal processes. He said robots can sometimes fail to do what human can, especially if a task requires some level of creativity. However, robots are good mainly for automating routine tasks that doesn't consume a high level of creativity or intelligence.

#### **4.4.3. Theme 2: Benefits and drawbacks of robo-advisory**

In the second theme, we spoke about the advantages and disadvantages that customers face from the rob-advisory.

##### **4.4.3.1.Interviews Respondents**

Respondents A, give his opinion about the advantages of Robo-advisor as he said it help you and give you a lot of advises and make your performance better but he

also mentioned some drawbacks as robot might crash or get hacked and that's not for its own benefits.

According to respondent B, Robots save many expenses such as salaries and bonuses, as well as the speed of performance and giving results that will increase revenue and fame, provided that the full automation is accurate at a very high rate.

Respondents C also give some benefits and drawbacks of using Robo-advisor as he said it is save time saving mechanism, have consistency and persistently. But there are also some drawbacks it need a lot of reviews and enhance, changed by technology modification and always reviewed by advisors.

Respondent D said it reducing the operational cost and there won't be any need to pay financial advisor's salaries. It is increasing the level of intelligence. An automated system can be maintained and improved over time. But he also said software systems are not bullet-proof. They fail sometimes, and when they fail, they do badly. To build a system that does what a financial advisor does, you need many software engineers, and software engineers are very expensive to hire.

#### **4.4.4. Theme 3: Performance of Organizations by Robo advisor**

In the third theme, we spoke about the performance of organization through robo-advisor.

##### **4.4.4.1. Interviews Respondents**

According to respondents A, the performance of the organizations is not achieved by the robot because it really need a lot of work and updates daily.

Respondent B said performance of the organizations is highly **exceed the expectations** achieved by using robot.

Respondents C said once the robot is designed and applied successfully it exceeds all expectations and works perfectly.

According to respondent D, the performance of organization depends on how the robot is built. If it's poorly designed and built, it will underperform. If it's properly

designed, built, and most importantly, maintained, then it will meet expectations. Exceeding expectations is rare, because can either work as expected, or break.

#### **4.4.5. Theme 4: Future of Robo-advisory in Financial Market**

Concerning the fourth theme, "The Future of Robo-advisory in Financial Market," the experts were questioned about their perspectives on this topic. This question was posed in an effort to get a better understanding of the upcoming developments in robo as well as the degree to which financial are prepared to adapt to these shifts in the industry.

##### **4.4.5.1. Interviews Respondents**

When we asked from respondent A, do you think a person needs a financial adviser? When can the robot not be a solution for an investor? And in 15 years, will it be the same?

Now when do you think a person needs a financial adviser? When can the robot not be a solution for an investor? And in 15 years, will it be the same? He answered that at the very beginning a financial advisor is needed when a crisis happen robots are bad thing to have or investors, no it will not be the same the technology keeps developing.

According to respondent B, now companies still need a financial advisor. But I don't think it will be necessary in the next fifteen years.

Respondent C said, yes, it's required a financial advisor according to changes in the market and technologies that serve clients' needs but after 15 years might be finical automation can be advanced more.

According to respondent D, the person needs a financial advisor when the cost of hiring the financial advisor is lower than the returns gained by the financial advice itself. This highly varies between regions, but for the most part, this is limited to the top 1% of a society. He also said 15 years is a short time for the financial industry. Unfortunately, the financial industry in general, and banks in specific, are very slow with technology transformation, and when they decide to integrate a technology, it's always to make more money rather than to improve their business efficiency. Hence,

it will take more time to see that happening. He also comments full automation is not possible, because many aspects of the financial markets are tightly related to government regulatory procedures, and governments are not always happy with integrating technologies into their systems of operation. There will always be that one government that doesn't like credit cards, or doesn't trust the stock market, or too scared from opening their systems to "high risk" nationalities. Hence, a human intervention in the decision-making is always needed. However, it can be minimized over time.



## **Chapter 5: Discussion and Conclusion**

### **5.1.Conclusion**

This thesis seeks to determine whether robo-advisory has been adopted in Turkey and the United Arab Emirates, as well as what attitudes consumers have toward it in relation to their financial markets. We also aim to find out which character qualities and behavioural characteristics influence investor' investing choices. Primary information was gathered through a survey to answer these research questions. Hopefully, something has been done to further a relatively young field of study. Robo-advisory is a relatively innovation on the Turkey and UAE financial market, and its users have not embraced it in great numbers. The investor attitudes toward robo-advisory may be the cause of these outcomes.

Robo-advisory is still in an early stage where further development and adoption are required for general consumer adoption. Customers in the Turkey and UAE financial industry are asking for transparency and more information on robo-advisory in order to accept this innovation. Gender and education are the two major personal characteristics that influence an investor decision to buy stocks. No matter if a person invests in securities, their monthly savings have a big impact. There are several personality traits and behavioural factors that can significantly influence whether or not someone chooses to use a robo-advisor to make investment decisions.

On the other side, robo-advisors benefit service providers by cutting costs, expanding their clientele, generating consistent revenue via management fees, improving service quality, and making it simpler to keep tabs on business processes and transactions. However, there are obstacles that service providers must overcome as well while providing these services. There is a large cost associated with the service, and it is uncertain whether consumers would embrace the automated features. With the use of AI in investment advice services, a target audience for these services can be identified, and the most appropriate model for organising them may be determined.

The purpose of this study to identify the attitudes of consumers towards robo-advisory on the Turkish financial market. The finding compares human advising with robo-advisory services from the perspective of those who have never invested in stocks

before. 71% of respondents would choose a human advice over a robo-advisory, while 29.3% of respondents would choose a robo-advisory over a human advisory. The finding also shows the recommendation for robo-advisor how it can be improved 17% percent of investors who have never used a robo-advisor believe that the service should be free. A whole 6 percent of respondents said they would like a more transparent robo-advisor industry, yet the vast majority of these consumers had never invested in stocks or used a robo-advisor before. A large percentage of respondents (24%) who have invested in stocks before but never used a robo-advisor feel they need more education and information on robo-advisory before they make the switch.

Regarding the question regarding what reason are face by robo-advisory as compared to human advisory. According to findings risk is the major factor which effect the people decision and they choose robo-advisor as compared to human advisor. The second one is user experience with responding rate of 29.3%. Similarly, the findings also show personal traits on consumer's decision and service provider to invest in securities and via a robo-advisor.

The regression results, which consider typical marginal effects. It displays the impact of the independent variables on financial securities and the significance of the findings. Only variables that are statistically significant will be discussed. The z-statistic values are used to gauge the variable coefficients' statistical significance. Coefficient z-values below the three levels of significance are indicated with stars. The results of the probit regression demonstrate that, on a 1% significance level, being a woman reduces the likelihood of investing in securities by 18%. A bachelor's degree will make investing in securities less likely, but we cannot quantify how much because there is no discernible marginal effect. This thesis seeks to determine whether robo-advisory has been adopted in Turkey and the United Arab Emirates, as well as what attitudes consumers have toward it in relation to their financial markets. We also aim to find out which character qualities and behavioural characteristics influence investor' investing choices. Primary information was gathered through a survey to answer these research questions. Hopefully, something has been done to further a relatively young field of study. Robo-advisory is a relatively innovation on the Turkey and UAE financial market, and its users have not embraced it in great numbers. The investor attitudes toward robo-advisory may be the cause of these outcomes.

## 5.2.Recommendation

Customers are showing a growing interest in socially responsible and environmentally sustainable investment. This indicates that decision-making about investments takes into consideration behavioural aspects. Information is collected on the company's policies and practises pertaining to each of these characteristics (van Duuren, Plantinga, & Scholtens, 2016). After that, this information is gathered and evaluated in order to build a diversified portfolio. In robo-advisory systems, these issues must be taken into consideration while constructing the portfolio for the clientele and the providers of the service so that the clientele may have an option to make investments in accordance with their own preferences. Turkey and the United Arab Emirates have already released the next generation of the automated investment adviser (robo-advisor), which includes an expanded range of investment opportunities. Customers that have a strong interest in socially responsible investment have a newly available option to consider. Under this approach, on the one hand, certain businesses and sectors are not included in the portfolio, and on the other hand, particularly high-scoring businesses regarding responsibility and sustainability are sought out and included to the portfolio.

In addition, this study provides several recommendations aimed at business professionals and financial counsellors. Managers often have two primary alternatives available to them. The development of a reliable risk profiling model should be the priority for companies that manage money. The robotic advising companies need to focus more on the extensive expandability of the counsel they provide to their customers, which will allow them to accommodate the peripheral activity of believability (Edwards, 2018). The most important step, even though it is also one of the most time-consuming, would be to categorise and construct clusters on the basis of investor profiles, risk tolerance, and risk assessments across the various parts of society. It is possible for businesses to bring in outside researchers that have experience in the field of behavioural economics in order to assist them in developing a consulting service that may assist in addressing the behavioural bias of investors. Thirdly, regarding the knowledge of investors, the government need to take measures to educate the general public about the automated investing alternatives that are available.

### **5.3.Future Research**

While conducting the thesis research, we came across several other intriguing research areas. It has not been possible to explore more areas at this time, but we would like to suggest some topics for future research. For example, it could be interesting to look at how adoption has evolved in the US from a business perspective. This thesis was developed by examining the consumer's point of view, and it would be intriguing to look at the robo-advisory providers' perspectives on consumer adoption and how they could be able to better meet customers' demands to spur adoption.



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