

Robo-advisors

How do they fit in the existing EU regulatory framework, in particular with regard to investor protection?



Robo-advisors

How do they fit in the existing EU regulatory framework, in particular with regard to investor protection?

Abstract

This study analyses if and to what extent the current EU legal framework provides effective investor protection for customers of robo-advisors. It puts emphasis on structural conflicts of interests, the difficulties presented by the supervision of algorithms, and potential threats to the stability of the financial system.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the committee on Economic and Monetary Affairs (ECON).

This document was requested by the European Parliament's committee on Economic and Monetary Affairs (ECON).

AUTHOR

Prof. Dr. Philipp MAUME, Technical University of Munich, Germany

ADMINISTRATOR RESPONSIBLE

Radostina PARENTI

EDITORIAL ASSISTANT

Janetta CUJKOVA

LINGUISTIC VERSIONS

Original: EN

ABOUT THE EDITOR

Policy departments provide in-house and external expertise to support European Parliament committees and other parliamentary bodies in shaping legislation and exercising democratic scrutiny over EU internal policies.

To contact the Policy Department or to subscribe for email alert updates, please write to:

Policy Department for Economic, Scientific and Quality of Life Policies

European Parliament

L-2929 - Luxembourg

Email: Poldep-Economy-Science@ep.europa.eu

Manuscript completed: June 2021

Date of publication: June 2021

© European Union, 2021

This document is available on the internet at:

<http://www.europarl.europa.eu/supporting-analyses>

DISCLAIMER AND COPYRIGHT

The opinions expressed in this document are the sole responsibility of the authors and do not necessarily represent the official position of the European Parliament.

Reproduction and translation for non-commercial purposes are authorised, provided the source is acknowledged and the European Parliament is given prior notice and sent a copy.

For citation purposes, the publication should be referenced as: Maume, P., 2021, *Robo-Advisors: How do they fit in the existing EU regulatory framework, in particular with regard to investor protection?*, Publication for the committee on Economic and Monetary Affairs, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg.

© Cover image used under licence from Adobe Stock

CONTENTS

LIST OF FIGURES	5
LIST OF ABBREVIATIONS	6
EXECUTIVE SUMMARY	8
1. OVERVIEW AND CURRENT DEVELOPMENTS	10
1.1. Introduction to robo-advisory	10
1.2. Benefits and risks	11
1.3. Business models	11
1.3.1. The three types of robo-advisory	11
1.3.2. Investment object	13
1.3.3. Active and passive investment strategies	13
1.4. Market development	14
1.5. The investment process	16
1.6. The use of AI and machine learning	17
1.6.1. Background	17
1.6.2. The use of AI and machine learning in robo-advisory	18
1.6.3. The Commission proposal on AI Regulation	19
2. INVESTOR PROTECTION UNDER THE CURRENT EU FRAMEWORK	21
2.1. What is investor protection in the context of robo-advisory?	21
2.1.1. The concept of investor protection	21
2.1.2. Investor protection and robo-advisory	22
2.2. MiFID2 and the concept of technology neutrality	22
2.3. What is not regulated under MiFID2?	23
2.3.1. Enforcement	23
2.3.2. Other mechanisms that protect investors	24
2.4. Analysis of the MiFID2 investor protection regime	25
2.4.1. Robo-advisors as investment firms	25
2.4.2. Robo-advisors and algorithmic trading	26
2.4.3. Assessment of suitability	28
2.4.4. Conflicts of interest	31
2.4.5. Informing and warning the client	39
2.4.6. Availability of the service	41
2.5. Authorisation of the investment firm (or robo-advisor?)	42
2.5.1. Authorisation procedure in general	42
2.5.2. Adequate skill of staff and management	43

- 3. FINANCIAL STABILITY** **46**
- 3.1. Market stability and market efficiency 46
- 3.2. Great variation of investment advice 47
- 3.3. Low frequency of rebalancing 47
- 3.4. Portfolio diversification 48
- 4. CONCLUSION** **49**
- REFERENCES** **50**

LIST OF FIGURES

Figure 1:	Robo-advisors: Assets under management in million USD (world-wide)	15
Figure 2:	Robo-advisors: Users in Europe (incl. non-EU, in thousand users)	16

LIST OF ABBREVIATIONS

AI	Artificial intelligence
Art.	Article
AuM	Assets Under Management
DORA	Proposal for a Regulation on Digital Operational Resilience for the Financial Sector, 24.9.2020, COM(2020)595
ESG	Enviromental, Social, Governance
ESMA	European Securities and Markets Authority
EU	European Union
ETF	Exchange-Traded-Fund
FINRA	The Financial Industry Regulatory Authority
GDPR	Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and the free movement of such data (General Data Protection Regulation)
ICT	Information and communications technology
IFD	Directive (EU) 2019/2034 on the prudential supervision of investment firms (Investment Firms Directive)
IFR	Regulation (EU) 2019/2033 on the prudential requirements of investment firms (Investment Firms Regulation)
IOSCO	International Organization of Securities Commissions
JCESA	Joint Committee of the European Supervisory Authorities
KID	Key Information Document
MiFID2	Directive 2014/65/EU on Markets in Financial Instruments
MiFID2-DelReg	Commission Delegated Regulation (EU) 2017/565 supplementing Directive 2014/65/EU of the European Parliament and of the Council as regards

organisational requirements and operating conditions for investment firms and defined terms for the purposes of that Directive

MPT Modern Portfolio Theory

PRIIPS Packaged Retail and Insurance-Based Investment Products

PRIIPS Regulation Regulation (EU) 1286/2014 on key information documents for packaged retail and insurance-based investment products

Q&A Questions and Answers

Rec. Recital

UK United Kingdom

US United States of America

USD United States Dollar

VaR Value-at-Risk

EXECUTIVE SUMMARY

Aim

The aim of this analysis is as follows:

- to outline the nature of robo-advisors in a broad sense, including an overview of the main business models, such as (semi) automated investment advice alone or mixed models, i.e. in combination with portfolio management and/or order execution platforms/brokerage service, whether automated or not;
- to map the current robo-advisory landscape, in terms of size and trends of the market, based on available data and research;
- to give a brief overview of the potential benefits and risks brought by robo-advisors, in particular specific emerging risks and opportunities linked to the use of artificial intelligence (AI), machine learning, and Big Data, in this sector;
- to provide an analysis of how robo-advisors fit into the existing EU framework, and in particular identify key challenges with its application to robo-advisors as well as potential gaps, with a particular focus on investor protection and financial stability; and
- to provide an analysis of whether the current EU framework is sufficient to address the specific risks and challenges brought by robo-advisors or whether it needs to be reformed. If necessary and appropriate, make policy recommendations on additional measures to put in place.

Key Findings

A robo-advisor is a software that is operated by a financial intermediary. It is based on an algorithm and provided to customers online. The financial intermediary is subject to financial markets regulation. The key advantage of robo-advisory is that it can be more efficient and thus cheaper for investors, resulting in higher returns. The setup of robo-advisory leads to some specific problems, such as the standardised interaction between man and machine, the opacity of the investment process, the risk of flawed algorithms or fear of threats to financial stability.

Most modern robo-advisors provide investment advice as well as portfolio management. Human interaction with the customer is typically limited to customer care. Robo-advisors mostly invest in exchange traded funds (ETFs) and try to diversify their portfolios to mitigate investment risks. Passive robo-advisors try to change or rebalance the client's portfolio as little as possible. More complex active strategies use more sophisticated algorithms and try to "beat the market".

The robo-advisor market has grown steadily over the last years to nearly 1 trillion USD under management, but its size is still the fraction of a percent of the overall financial markets.

Many modern robo-advisors use machine learning in their software, trying to improve the yield by "training" the algorithm. More complex AI does not play an important role in robo-advisory yet. In any event, instead of regulating the use of AI in robo-advisory, it would be sensible to wait for the outcome of the latest EU initiative on the regulation of AI in general.

The EU key legislation for financial intermediaries and investor protection is the Markets in Financial Instruments Directive (MiFID2). The Directive follows the idea of technology neutral regulation, which means it applies to robo-advisors, although the concrete way of application in practice is sometimes unclear. Investment firms that operate robo-advisors may provide both investment advice and

portfolio management under the Directive. They perform algorithmic trading under Art. 17 MiFID2, which means they must take additional measures to keep the system safe and operational.

A key recommendation of this study is the introduction of a mandatory third-party audit for robo-advisors. This would demonstrate to the national regulators that the algorithm is sound and complies with the MiFID2-framework. Another option would be a strengthened private enforcement regime, which is currently not a part of MiFID2. An authorisation regime for the algorithm itself supervised by the national regulator cannot be recommended.

The rules regarding the assessment of suitability do not raise specific problems. The lack of standardisation of questions could be addressed by more concise guidance by ESMA.

Conflicts of interest are of particular concern because their disclosure rests on the idea that the other party can factor the disclosed information into their decision. This is not possible for automated algorithmic decisions. Disclosure can only be effective during the initial stage of the robo-advisory process. Thus, the algorithm should only be allowed to carry out “conflicted” decisions automatically during the rebalancing process if they are clearly in the best interest of the client (even if they are not necessarily detrimental). This mechanism needs to be implemented into the algorithm itself. Investment firms must keep records of all conflicts of interest and enable the national regulators to reproduce the decision-making process. Third-party payments are mostly banned for independent robo-advisors, whereas they are allowed (if they are not common) for non-independent robo-advisors, who then need to disclose them in the initial stage of the robo-advisory process. MiFID2 provides a suitable framework for these issues, but its application probably needs to be clarified by delegated regulation or at least by ESMA.

Another key recommendation of this study is the streamlining of the various information mechanisms, to make sure that important information is not lost between insignificant information. A possible option could be a (printed or digital) key information document (KID), similar to the one set out in the PRIIPS Regulation¹.

The fears of robo-advisors becoming a problem for financial stability are not warranted. As of today, their market penetration is much too low. Potential market inefficiencies are not comparable to risks regarding financial stability.

Robo-advisor trading is much slower than high-frequency trading. Even algorithms applying active strategies try to analyse the market in advance and do not rebalance their assets more often than every few weeks. Most of the passive robo-advisors try not to touch their portfolio at all. The risk of high-speed rebalancing by robo-advisors shaking the markets is non-existent.

The advice given and the decisions made by robo-advisors are not uniform but differ greatly. Even if the market share reached a significant level, it is very unlikely that the different algorithms would move assets in the same direction simultaneously. In addition, robo-advisors spread their assets as widely as possible. This high level of diversification also makes market imbalances unlikely because the investments are hardly ever made in one single area.

¹ Regulation (EU) 1286/2014 on key information documents for packaged retail and insurance-based investment products.

1. OVERVIEW AND CURRENT DEVELOPMENTS

KEY FINDINGS

A robo-advisor is a software that is operated by a financial intermediary. It is based on an algorithm and provided to customers online. The financial intermediary is subject to financial markets regulation. The key advantage of robo-advisory is that it can be more efficient and thus cheaper for investors, resulting in higher returns. The setup of robo-advisory leads to some specific problems, such as the standardised interaction between man and machine, the opacity of the investment process, the risk of flawed algorithms or fear of threats to financial stability.

Most modern robo-advisors provide investment advice as well as portfolio management. Human interaction with the customer is typically limited to customer care. Robo-advisors mostly invest in exchange traded funds (ETFs) and try to diversify their portfolios to mitigate investment risks. Passive robo-advisors try to change or rebalance the client's portfolio as little as possible. More complex active strategies use more sophisticated algorithms and try to "beat the market".

The robo-advisor market has grown steadily over the last years to nearly 1 trillion USD under management, but its size is still the fraction of a percent of the overall financial markets.

Many modern robo-advisors use machine learning in their software, trying to improve the yield by "training" the algorithm. More complex AI does not play an important role in robo-advisory yet. In any event, instead of regulating the use of AI in robo-advisory, it would be more sensible to wait for the outcome of the latest EU initiative on the regulation of AI in general.

1.1. Introduction to robo-advisory

Although there is no general definition, robo-advisory is commonly understood as financial investment services that are **based on algorithms and provided to customers² online**. The process is designed to operate with or without a low level of human intervention. For this reason, robo-advisory has also been referred to as "automated financial advice" or "digitised advice".

For the purposes of this analysis, two aspects need to be distinguished. The **robo-advisor** is software that interacts with the client. It does not possess any legal personality. It is not party to the financial services contract. The robo-advisor is **operated by a financial intermediary**. This could be, in non-legal terms, a start-up, a fund, or a bank. The financial intermediary is the addressee of all regulation while the robo-advisor is a mere tool to provide the investment service. Thus, for the purposes of this analysis, the term "robo-advice" only describes the software used whereas the "financial intermediary" is the business/company operating it. When discussing the MiFID2 framework in more detail³, the term "investment firm" will be used instead because this is the legal term for providers of investment services under the relevant MiFID2 Directive.

Despite its name, modern robo-"advisors" typically do not just give advice. They **combine elements** of the classical financial intermediaries. Typically, intermediaries might influence the investor's investment decision by giving recommendations (=financial advisors) or only implement the investor's investment decision on his or her behalf (=stockbrokers). Others use the investors' money and make

² The terms "client" and "customer" are used interchangeably in this analysis.

³ See below p. 22 et seqq.

independent investment decisions on their behalf (=funds managers). All these three elements can be found in modern robo-advisors⁴.

To enable a better understanding of robo-advisor in the EU, this first part of the analysis outlines the background of robo-advisory – advantages and disadvantages, business models, investment strategies processes and the use of AI and machine learning.

1.2. Benefits and risks

The main **advantage** of robo-advisors is that they do not require the involvement of human advisors, making robo-advisors more cost efficient⁵. EU-based robo-advisors charge between 0.55% and 1.65%, with a downward trend observable⁶. It is more difficult to obtain reliable data for human advisors because of the sheer number of licensed advisors across the EU and their different specialisations and business models. Historically, as a rule of thumb, human advisors charge 1-3% of the investment (or of the portfolio)⁷. Current sources estimate about 1-2%⁸ or “far above 1%”⁹. The elimination of human errors and behavioural biases could further decrease costs by avoiding inefficient investments. Software can also monitor the market permanently, adjusting the client’s portfolio as a reaction to market developments more quickly.

There are also **concerns**¹⁰. A flawed or outdated algorithm might produce results that systematically fall short of the desired investment returns. Flawed advice would then affect many investors simultaneously, potentially funnelling investors’ funds into unsuited investment vehicles, creating imbalances in the markets. Inexperienced clients might misunderstand the software’s queries, input wrong data, or misinterpret the advice given. The fact that investment strategy and advice are created by an (allegedly) unbiased and objective algorithm might also make clients overly reliant on the output provided. In addition, the investment process is highly opaque. Clients have no idea of how the algorithm exactly works or if there are other aspects influencing the decision made by the software. So, the information asymmetry between investor and markets is sometimes even bigger than in classical investment situations in which the investor is at least able to gather the necessary information by asking questions and conducting own research. If the market for robo-advice continues to grow, the potential similarity of the recommendations given by different robo-advisors might create bubbles and imbalances in the markets, raising concerns about market stability¹¹.

1.3. Business models

1.3.1. The three types of robo-advisory

Generally, there are three types of robo-advisors. The least advanced specimens do not consider the personal situation of the client, or only to a lesser extent. The “advice” given is usually generic and not tailored to the investor. The platform resembles an **online broker** that also suggests potentially attractive investments. The focus is on facilitating the purchase or sale of financial instruments, for example, shares or funds. These “first generation robos” were quite common when robo-advisors

⁴ See below p. 11.

⁵ For an overview of the potential advantages and disadvantages, see JCESA (2015), p. 16-29; Chiu (2016), p. 89–90.

⁶ Better Finance (2020), p. 42. The average costs for robo-advisors in the US appear to be significantly lower (between 0.3% and 0.5%), most likely because many of them are operated by large funds that create significant scale effects, see Kaya (2019), p. 3.

⁷ Maume (2019b), p. 628 with further references.

⁸ Neugarten (2021).

⁹ Better Finance (2020), p. 42.

¹⁰ Maume (2019b), p. 628.

¹¹ Maume (2019a), p. 38 et seq.

became popular in the mid-2010s. Today they play a minor role and hardly raise specific legal problems. Thus, they will not be considered in detail in this analysis.

On the second tier, the service offered strongly resembles the provision of **investment advice** by a typical human financial advisor (so literally “robo advice”). The software provides investment advice based on the client’s preferences and the client subsequently makes an investment decision. This can occur through the online interface provided by the investment firm, combining financial advice with online brokerage. If the contractual relationship with the client is ongoing, the software would also monitor the purchased assets and provide updates or warnings to the client.

On the third tier, the software not only gives advice, but also manages financial instruments on behalf of the client, rebalancing them to reduce drift from the original target allocation (which means, readjusting the current composition of the portfolio to match the original composition)¹². In this scenario, the robo-advisor does not need client approval for investment decisions, provided that the transaction is covered by the investment strategy chosen by the investor. This setting resembles investing into **managed investment funds**, combining all three types of financial intermediation (investment advice, broker-dealing and portfolio management). This is the most common type of robo-advisor today.

Most robo-advisory services are **hybrid (or semi-automated) models** with some level of human interaction. Human advisors can provide an additional customer service element or input to the recommendations given by the robo-advisor. The human interaction can take place at any stage of the advisory process: while the client uses the tool, during the provision of advice, or as a follow-up. A recent study of Swiss robo-advisors¹³ shows that the typical possibility of making contact is by way of customer care via phone, email, or live chat. There is sometimes also the possibility to obtain investment advice in addition to customer care. However, this would not be robo-advice but regular advice. Human involvement naturally also takes place internally, for example, when a human advisor trains the algorithm in a machine-learning setup¹⁴. In all these situations, the robo-advisor plays the first violin whilst the human advisor provides supplementary services. The service offered is essentially robo-advisory.

Human advisors and robo-advisors can also be equals in a **blended**¹⁵ **model** of professional advice. This is an “unbundling” of financial services, with the robo-advisor focusing on analysis and execution of investment decisions and the human advisor responsible for strategy and overall financial planning, which can be as important as the investment decision itself. This model combines the strengths of robo-advisory and (real) human interaction.

This needs to be distinguished from the **internal use of software or investment tools**. Human financial advisors (in particular, large investment firms and funds) use software to assist them in analysis, decision-making and reporting. Sometimes software carries out orders automatically based on an algorithm. The main difference is that in these cases the software is not used for the communication between client and firm. It is merely an internal tool without any exposure to the client. Thus, they will not be discussed in this analysis.

¹² For more details, see below p. 16.

¹³ Mezzanotte (2020), p. 595.

¹⁴ See below p. 17.

¹⁵ Tedesco (2015), p. 17-19.

1.3.2. Investment object

The advice provided or investment decisions made by robo-advisors tend to be quite uniform in structure. The overwhelming majority of robo-advisors recommend investment funds, mutual funds or, even more often, **exchange traded funds** (ETFs)¹⁶. This makes sense because it matches the idea of low-cost transactions, resulting in higher returns for client and investment firm in the long run. Nowadays, more robo-advisors also offer a "sustainability option", allowing the clients to focus their investments on ESG (environmental, social, governance) goals.

The **exact composition** of the investment recommendation is determined by the level of the investor's risk-aversion, leaning either towards equity or debt instruments. The fact that robo-advisors recommend ETFs and rely on diversification strategies does not mean that they are superior or inferior to human advisors. Rather, it indicates that a different service is provided¹⁷. The focus on ETFs is not a question of the limitations of current technology but rather a cornerstone of the robo-advice business model. The approach is numbers-based. A human advisor would, to a certain extent, also rely on mathematical models. However, good human advisors would also be guided by their experience and intuition. Human advisors could follow up on rumours and apply forecasts about the future performance of certain markets or industries. Thus, human advice is more complex in some respects whereas robo-advice is more complex in others. The client needs to be aware (and needs to be made aware by the service provider) that a different approach is applied, which is a matter of transparency and disclosure¹⁸.

1.3.3. Active and passive investment strategies

A major difference between robo-advisors can be observed in how the portfolio management and rebalancing is executed after the initial investment. Overall, the strategies used are either passive or active¹⁹.

The typical **passive strategy** is called "buy-and-hold". The idea is to minimise costs and risk in order to benefit from market efficiency. The composition of the investment portfolio is based on some variation of modern portfolio theory (MPT), which is an approach on how risk-averse investors can design portfolios to maximise returns. In a passive strategy, portfolio management is usually limited to rebalancing. The idea is that by relying on mathematical models and on a high level of diversification risks can be mitigated. The big advantage is that, due to the lower level of activity, fees can be kept low.

Active strategies are more complex and involve a higher level of robo-advisor activity. In popular terms, an active strategy will try to "beat the market". These strategies are usually not new, but highly suited for automated systems. A common example²⁰, which is applied by the German market leader *Scalable*, is an active strategy based on the Value-at-Risk (VaR) metric. Its aim is to keep the overall portfolio at a predefined risk. As a result, the stock (or an ETF focusing on stocks) ratio in the robo-advisor's portfolio can change significantly with market developments because stocks are more volatile and thus riskier than bonds. As a rule of thumb, the VaR strategy results in many stocks during less volatile ("good") market times. In a market downturn, the robo-advisor needs to reduce the stock ratio quickly (which means selling shares and buying bonds). For example, the algorithm used by *Scalable*

¹⁶ Better Finance (2020), p. 23; Maume (2019a) with further references. However, this does not mean that all robo-advisors recommend the same ETFs.

¹⁷ Maume (2019b), p. 629.

¹⁸ Ibid.

¹⁹ Good overview provided by Birgmeir (2019), p. 25 et seqq.

²⁰ Another example is the so called „factor-investing“, which basically tries to sell overrated and buy underrated products before the market is able to adjust.

(applying a VaR strategy) detected high volatility in the equity markets before the Brexit referendum. It reacted by reducing the ratio of stocks in the portfolio to very low levels²¹. This was done in anticipation of a referendum affirming the Brexit, which would most likely have a negative impact on stocks. As a result, losses could be minimised and a performance well above market-average was achieved. This active approach is very suited for robo-advisors because they can react to market developments quicker than their human counterparts. It also leads to concerns that hyperactive VaR-robo-advisors might amplify market downturns as they will (like high-frequency trading software) try to sell many shares quickly. Algorithms that apply active strategies tend to be more complex than their passive counterparts, which means they are also more difficult to assess and to audit.

Active and passive strategies can also be **combined**, for example, using so-called “smart beta” strategies. Simply speaking, these combinations are usually based on a passive strategy and then enriched by active approaches. A key example would be to invest in funds that do not mirror classical markets indexes. Instead, emphasis is put on other aspects such as book value or stock volatility instead of market capitalisation. The active part is the identification and assessment of possible investment targets, depending on the investment policies. These hybrid strategies are also attractive for robo-advisors.

1.4. Market development

The history of robo-advisory began in the US. *Betterment* entered the market in 2010, the competitor *Wealthfront* followed shortly after²². In Europe, the first robo-advisors appeared in 2012/13 in the UK and in Germany.

The world-wide market is growing fast. Market size is typically indicated as “assets under management” (AuM) by robo-advisors. Between 2017 and 2020, the global robo-advisory AuM have grown from USD 297 billion (=EUR 264 billion) to USD 1,068 trillion (=EUR 0.95 trillion).²³ This is the equivalent of an annual growth of more than 50%. In the same period, the global equity markets have only grown about 8% per annum. The global robo-advisor AuM are expected to triple by the end of 2025 to about USD 2.85 trillion (=EUR 2.52 trillion)²⁴, which is the equivalent of an annual growth of about 20%. Although the AuM held by robo-advisors are growing fast, outpacing the overall market development, the growth is not exponential.

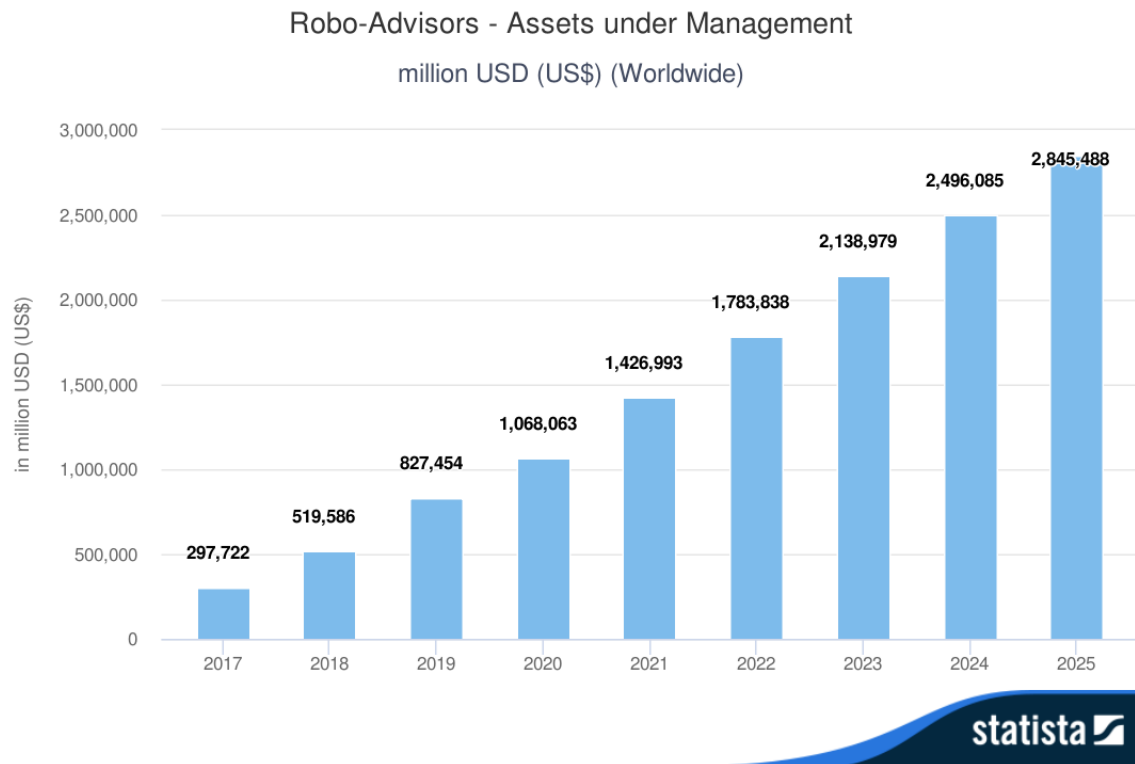
²¹ Rabener (2016).

²² For more details on history, see Maume (2019a), p. 12.

²³ See Statista, available at <http://www.statista.com>.

²⁴ See Statista, available at <http://www.statista.com>. It is difficult to make similar forecasts for the overall equity markets because of various uncertainties.

Figure 1: Robo-advisors: Assets under management in million USD (world-wide)



Source: Statista, available at <http://www.statista.com/>.

To put the current numbers into perspective: the global domestic equity (=share) market capitalisation was USD 109 trillion in 2020²⁵, which means that the market share of AuM by robo-advisors is below 1%. Thus, although the volume of AuM by robo-advisors has reached a significant size, it is still only a small fraction of the global markets. Although the market share of AuM by robo-advisors has been growing faster than the overall market, this will not change any time soon.

Today's leading robo-advisor market is the US with AuM of about USD 680 billion in 2020. The main reason is that the world's big investment firms are all based in the US, and they all started to provide robo-advisory services in the last decade and thus earlier than many of their European counterparts. The European market size is of a relatively modest AuM of USD 108 billion. The biggest national markets are the UK (USD 18 billion), Italy (USD 15 billion), France (USD 13 billion) and Germany (USD 9 billion).

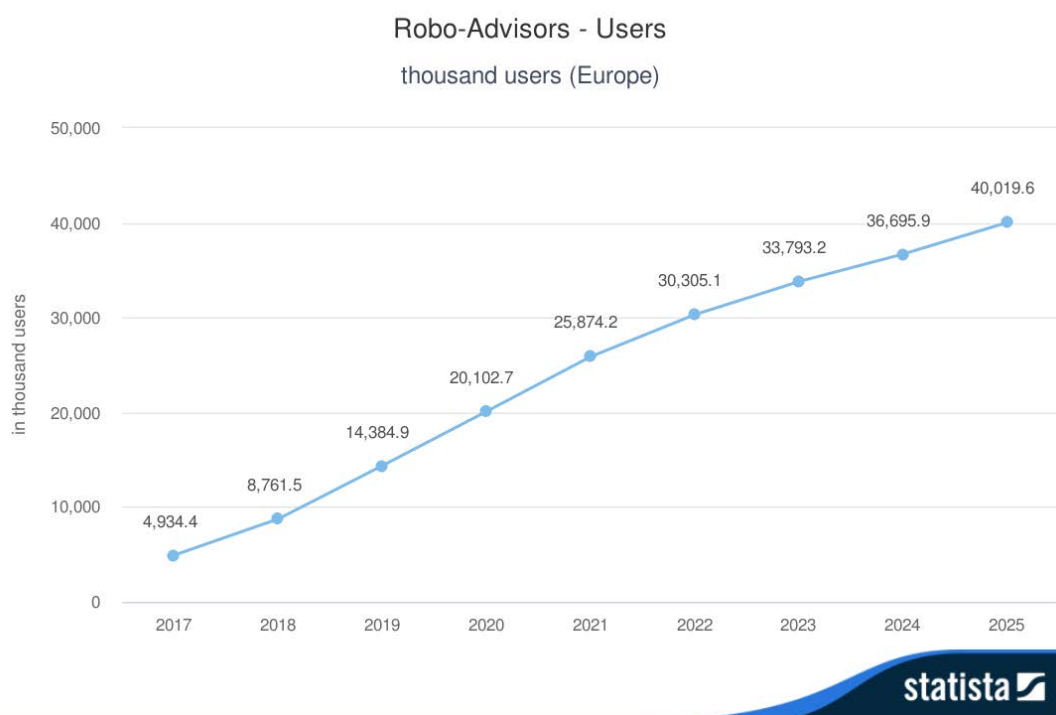
Typical clients of robo-advisors do not invest much money. The average investment globally amounted to less than USD 4,500 in 2020²⁶. In Europe (including non-EU countries), the average was slightly higher and amounted to USD 5,363 (= EUR 4,749). The number of investors using robo-advisors in Europe was 20.1 million in 2020 and is expected to double by 2025 to about 40 million²⁷.

²⁵ Further, robo-advisor tend to invest not just in equity, but also in debt instruments, as well as in ETFs relating to other asset classes. So, the market size of equity-based products forms only a part of the market that is relevant for robo-advisors.

²⁶ See Statista, available at <http://www.statista.com/>.

²⁷ Ibid.

Figure 2: Robo-advisors: Users in Europe (incl. non-EU, in thousand users)



Source: Statista, available at <http://www.statista.com>.

It is often claimed that robo-advisory attracts young and tech-affine investors. However, research from the German market claims that the typical investor is male, 48 years old and earns about EUR 54,000 p.a., which is well above the average income²⁸.

1.5. The investment process

The typical process of providing robo-advisory services can be separated into two phases. Phase one is partly comparable to the provision of financial advice by humans. The software interface asks the prospective client several **predefined questions**. These could be about age, income, family background, investment amount, investment horizon, risk-willingness, and the ability to bear losses. After this onboarding procedure, the algorithm should carry out a consistency check and a suitability assessment. The next step of phase one can be executed in different ways. Typically, the robo-advisor algorithm matches customer profile with a specific risk profile to predefined portfolios with similar risk levels. The result is then shown to the customers, usually giving them three or four different investment options. These can differ in terms of risk (in particular, the equity/debt ratio of investments), but also in “soft” aspects such as the observance of sustainability goals etc. If the client and the investment firm enter into the service agreement, the software puts together the **initial investment portfolio** by investing the customer’s money into the respective, pre-defined categories.

Phase two resembles classical funds management. The main task of the algorithm is **rebalancing**. This means that if the algorithm detects deviations from the specified asset ratio in the customer’s portfolio, the ratio is adjusted by selling or buying assets. For example, an investor’s initial portfolio contains 40% stocks and 60% bonds (40/60). Due to market developments and the changing value of the financial

²⁸ Kaya (2019), p. 3.

products, the composition of the portfolio is now 43/57. Depending on the pre-defined tolerated deviations, the portfolio is then rebalanced back to a 40/60 composition by selling equity and using that money to buy debt instruments. Importantly, this rebalancing is taking place automatically without the investor's involvement. In practice, rebalancing can be arranged in two different ways. First, it can be triggered by the software as soon as the investment ratios are outside the predefined area. Second, the rebalancing can be carried out in regular intervals, ranging from weeks to months. Operators of robo-advisors are quite silent about the **frequency of rebalancing**. Most websites emphasise that it depends on the development of the respective asset class, and on the type of investment strategy²⁹. However, industry members stated in interviews that most robo-advisors do not trade more often than every two or three weeks³⁰.

If the investor decides to **change the risk profile** subsequently, the necessary amendments for the robo-advisor are not just mere balancing, but technically a new advice, followed by the client's order to adjust the portfolio accordingly.

Another task is the **modification** of the investment options available to the software. Robo-advisors typically offer their clients a limited range of ETFs for the investment. The choice about including an ETF into the potential portfolio is mostly done based on past performance and volatility. However, the main motivation can also be to keep some investment activity "in-house", which means investing into financial products that were issued by the investment firm itself or by an affiliated entity. This can create significant conflicts of interest³¹. Serious changes can also have impact on the risk profile, requiring confirmation from the client.

1.6. The use of AI and machine learning

1.6.1. Background

To understand the use of AI and machine learning in robo-advisory, the first step is to understand how algorithms work. An **algorithm** can be defined as a computational procedure that takes some value, or set of values, as input and produces some value, or set of values, as output³². In simple terms, an algorithm is the process of transforming input into output³³. In the case of a robo advisor, the first desired result is a suitable investment portfolio suggestion for the respective customer. The algorithm that is supposed to produce this result is a coded computer program which consists of individual steps, for example, one part of the code handles the first question of the questionnaire and maps the answer to the corresponding outcome³⁴.

Two essential elements of algorithms are **determinacy** (the same input yields the same result) and **determinism** (the next step in the procedure is always defined)³⁵. Thus, algorithms are static things – if two potential investors input the same personal data and risk-profile into the robo-advisor software interface, the results will be the same, and it is clear why. The same applies to subsequently rebalancing the investment portfolio.

Artificial intelligence (or AI) is one of today's buzzwords. However, there is no clear definition, and the exact elements of AI are subject to a vivid debate. Simply put, AI provides computers with the ability to

²⁹ Active vs. passive strategies, see above p. 13.

³⁰ Cf. Birgmeir (2019), p. 53.

³¹ For detailed analysis, see below p. 31 et seqq.

³² Cormen et al (2009), p. 2

³³ Birgmeir (2019), p. 29.

³⁴ Ibid.

³⁵ Knuth (1997), p. 4-6.

make decisions and learn without programming. This definition is obviously very vague. Moreover, the term “AI” is often used inaccurately for automated, predefined decision-making. For example, a robo-advisor algorithm rebalancing the client’s portfolio subject to predefined parameters has nothing to do with AI. The algorithm simply follows its predetermined structure. The European Commission has recently published a proposal for a **Regulation laying down harmonised rules on artificial intelligence**³⁶. In Art. 3, an “artificial intelligence system” is defined as software that is developed with one or more of the techniques and approaches listed in Annex I of the proposal and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with. Annex I then specifies a range of AI categories, such as (a.) machine learning, (b.) logic- and knowledge-based approaches, and (c.) statistical approaches, all of them including subcategories. Although no further explanation is given in the proposal, it appears that all possible use-cases of AI in robo-advisory would be subject to these definitions.

Machine learning is a sub-category of artificial intelligence. A supervised machine learning algorithm is fed with training data, where the output is known. After processing the input data, the algorithm comes to a conclusion. If the algorithm’s output is not correct, the processing function of the algorithms changes to improve the accuracy of the output. A **supervised** learning algorithm analyses the data and creates an inferred function. This can then be used for new examples and unknown in-/output. So, this type of machine learning is not about intelligence, but about training. A well-known example are internet search engines that automatically correct spelling mistakes in the search string (“Did you mean...?”) – if the user accepts the suggestion, the algorithm has undergone “training” for comparable situations in the future. Supervised learning is well-suited for the analysis of the quality of a potential investment, based on the available market data³⁷. The second form of machine learning called **unsupervised** machine learning is less important in the context of financial markets. An unsupervised learning algorithm is not receiving specific training data. Instead, the algorithm is working on “unlabelled” data, trying to find correlations and patterns in the data. A typical application would be the grouping or clustering of data sets – for example, for finding matches in a dating app³⁸.

1.6.2. The use of AI and machine learning in robo-advisory

As described above, the robo-advisor algorithm executes two main tasks: first, the collection of the client’s data and the suitability assessment; second, making subsequent investment decisions, mostly while rebalancing. In all these cases the application of machine learning is possible and sensible. Machine learning could be used to analyse the fundamental data of companies or financial products, for example, by examining the quarterly reports³⁹. Another application could be consistency checks looking for implausible input, when visually arranging different portfolio recommendations according to most clients’ preferences, or when finally putting together the initial portfolio. During rebalancing, major adjustments could need an internal manager’s approval, which is also some kind of training.

Unfortunately, it is difficult to ascertain the extent to which machine learning is applied to robo-advisory in practice. As a rule of thumb, investment firms tend to aggressively market the ability of their software to identify the best investment choice using modern technology. However, they stay vague regarding details and are also reluctant to disclose the functionality of the algorithm (which is understandable as they do not want to disclose business secrets). In the author’s experience machine

³⁶ European Commission (2021).

³⁷ For a more detailed explanation, see Santos (2020a).

³⁸ Ibid.

³⁹ For an interesting step-by-step analysis, see Santos (2020b).

learning is a common technique in the industry, although not all investment firms use it for their robo-advisors. This coincides with a qualitative empirical study from 2019 on the German robo-advisor market⁴⁰. Here, half of the interviewees stated that they were already using machine learning techniques or were planning to do so.

There is wide consensus that AI beyond the use of machine learning is not a relevant topic in robo-advisory yet. Only few examples are known. American robo advisor *Wealthfront* uses AI for an additional feature called "Path" which can provide answers to questions like when you can retire or which neighbourhood you can afford to live in. *Betterment* uses AI for some back-office tasks such as check processing⁴¹. It is likely that robo advisors will start using more complex AI in the future. The same can be observed in the management of ETFs. Here, US company *EquBot*, a member of IBM's Watson programme, developed an algorithm that works completely without human input and is based on big data analytics. It chooses investment options just like a person would but only with a lot more data in relation to the processing time it needs⁴². The need for AI in robo-advisory also needs to be seen in context with its use in related areas. If ETFs become more sophisticated (and thus: more profitable) regarding the assets or indices they represent, for example, by applying AI, investing in these ETFs also becomes more attractive for robo-advisors (in particular, those applying a passive strategy). Robo-advisors mostly invest in ETFs⁴³, and the market size of ETFs is much bigger than that of robo-advisory⁴⁴. In other words, the better ETFs become due to the use of AI, the smaller the incentive for robo-advisors to use much AI themselves.

1.6.3. The Commission proposal on AI Regulation

The regulation of AI is a topic that is much wider than the regulation of robo-advisory. Significantly, the European Commission has just published a proposal for harmonised rules on artificial intelligence in April 2021⁴⁵.

The proposal generally does not focus on the provision of financial services. However, it acknowledges that financial services can make use of AI systems (Rec. 80). The national authorities responsible under financial services legislation are also the responsible market surveillance authority under the proposed AI Regulation under Art. 64(4), creating a harmonised supervision system. The proposal also seeks to provide for consistency between its supervision regime and the supervision of credit institutions regulated under Directive 2013/36/EU (Capital Requirements Directive).

The proposal contains general rules on the use of AI in practice. This includes in Art. 5 prohibitions of the use of AI that deploys subliminal techniques, exploits vulnerabilities of specific groups of persons, or uses real-time remote biometric identification systems in publicly available spaces for the purpose of law enforcement. In theory, these techniques could be used in robo-advisory, but they do not present a risk specifically associated to robo-advisory.

The proposal focuses on the concept of "high-risk AI systems" (Art. 6 with Annexes II and III). These high-risk AI systems must comply with particularly strict compliance and governance requirements as set out in Chapters 2 and 3 of the proposal. High-risk AI systems are subject to scrutiny before they are put into service and throughout their lifecycle. This includes technical documentation and record-keeping requirements, and post-market monitoring and reporting requirements. So-called national market

⁴⁰ Birgmeir (2019), p. 37.

⁴¹ Konish (2018).

⁴² For further details, see Khatua (2020).

⁴³ See above p. 13.

⁴⁴ In 2020, ETFs had about USD 7.7tr AuM – in comparison to USD 1,068tr for robo-advisors, see www.statista.com.

⁴⁵ European Commission (2021).

surveillance authorities are supposed to control the market and investigate compliance with the obligations and requirements for high-risk AI systems⁴⁶. At the current stage of the draft, robo-advisors would not be considered high-risk because they are not used as safety components (cf. the use of AI in a car), the relevant MiFID2 Directive⁴⁷ is not listed in Annex II, and Annex III does not cover financial services⁴⁸.

One key idea of the proposed regulation is set out in Art. 14, which states that “high-risk AI systems shall be designed and developed in such a way ... that they can be effectively overseen by natural persons ...”. The idea is that AI systems should be transparent, explainable and documented⁴⁹. Transparency and explainability are generally considered as cornerstones of the regulation of AI⁵⁰. Even if the proposed AI rules do not fully apply to robo-advisors as at today, their principles should be taken into consideration for the interpretation of the current rules for robo-advisory, in particular regarding the MiFID2 Directive⁵¹. It would also be advisable to wait until the new AI framework is finalised before considering changes to the current robo-advisor regulation under financial services laws.

⁴⁶ European Commission (2021), p. 15.

⁴⁷ See below p. 21 et seqq.

⁴⁸ The area related to financial services is the evaluation of creditworthiness of natural persons (No. 5(b) of Annex III), which is not relevant for robo-advisory.

⁴⁹ See also Rec. 38 (relating to law enforcement by AI).

⁵⁰ See Fjeld et al (2020), p. 5; Grochowski et al (2021), p. 44.

⁵¹ See below p. 21 et seqq.

2. INVESTOR PROTECTION UNDER THE CURRENT EU FRAMEWORK

KEY FINDINGS

The EU key legislation for financial intermediaries and investor protection is the Markets in Financial Instruments Directive (MiFID2). The Directive follows the idea of technology neutral regulation, which means that it applies to robo-advisors, although the concrete way of application in practice is sometimes unclear. Investment firms that operate robo-advisors may provide both investment advice and portfolio management under the Directive. They perform algorithmic trading under Art. 17 MiFID2, which means they must take additional measures to keep the system safe and operational.

The key recommendation of this chapter is the introduction of a mandatory third-party audit for robo-advisors. This would demonstrate to the national regulators that the algorithm is sound and complies with the MiFID2 framework. Another option would be a strengthened private enforcement regime, which is currently not a part of MiFID2. An authorisation regime for the algorithm itself supervised by the national regulator cannot be recommended.

The rules regarding the assessment of suitability do not raise specific problems. The lack of standardisation of questions could be addressed by more concise guidance by ESMA.

Conflicts of Interest are of particular concern because their disclosure rests on the idea that the other party can factor the disclosed information into their decision. This is not possible for automated algorithmic decisions. Disclosure can only be effective during the initial stage of the robo-advisory process. Thus, the algorithm should only be allowed to carry out “conflicted” decisions automatically during the rebalancing process if they are clearly in the best interest of the client (even if they are not necessarily detrimental). This mechanism needs to be implemented into the algorithm itself. Investment firms must keep records of all conflicts of interest and enable the national regulators to reproduce the decision-making process. Third-party payments are mostly banned for independent robo-advisors, whereas they are allowed (if they are not common) for non-independent robo-advisors, who then need to disclose them in the initial stage of the robo-advisory process. MiFID2 provides a suitable framework for these issues, but its application probably needs to be clarified by delegated regulation or at least by ESMA.

Another key recommendation is the streamlining of the various information mechanisms, to make sure that important information is not lost between insignificant information. A possible option could be a (printed or digital) key information document (KID), similar to the one set out in the PRIIPS Regulation.

2.1. What is investor protection in the context of robo-advisory?

2.1.1. The concept of investor protection

Investor protection is a cornerstone of financial markets regulation. It is one of the three objectives of securities regulation as set out by the International Organization of Securities Commissions (IOSCO)⁵².

⁵² See IOSCO (2017), p. 3. The other two principles are the promotion of market efficiency and transparency, and the reduction of systemic risk.

The term “investor” includes customers of financial services⁵³, and thus customers of robo-advisors. Investor protection is also a key element of Directive 2014/65/EU on Markets and Financial Instruments (**MiFID2**), which is the main source of robo-advisor regulation in the EU as it sets out the authorisation and government requirements for financial services. For example, section 2 of MiFID2 (Art. 24-30) is aptly named “provisions to ensure investor protection”. In addition, MiFID2 contains various other provisions that rest on the idea of investor protection (such as organisational and general operating requirements for investment firms in Art. 9 and Art. 16). The Commission Delegated Regulation (EU) 2017/565 (**MiFID2-DelReg**) outlines further details on the application of MiFID2, highlighting the necessity of investor protection in several places⁵⁴.

However, there is no set definition of investor protection. Instead, the term describes a general concept/purpose of market regulation that has different facets. Financial markets regulation mostly follows a **disclosure-based approach**. Investor protection is achieved through a combination of disclosure obligations to reduce information asymmetries (e.g., prospectuses, disclosure of conflicts of interest, continuous disclosure obligations) and the ban of mischievous practices for market participants (e.g. market manipulation, insider dealing). The idea is that an investor is supposed to make an informed investment decision, based on reliable information on fair markets and without being unduly influenced. This can be complemented by governance rules for certain market participants⁵⁵. However, this does not change the fact that the decision made by the investor is based on the information he possesses.

2.1.2. Investor protection and robo-advisory

If the investment decision is made by or influenced by financial intermediaries (such as an advisor), the information asymmetries do not vanish, but change: the investor is not lacking information about the financial product, but about the advisors⁵⁶. Many clients will find it difficult to identify the quality of an intermediary (and therefore, robo-advisors) and to evaluate the quality of recommended financial products. They might be led to believe that they have received sophisticated advice when in truth they received a fairly unspecific output⁵⁷.

As outlined above, most modern robo-advisors do not just give advice to their clients, but also acquire the suggested assets and manage them. In this regard, investor protection is facilitated through different mechanisms. The focus is not only on the customer’s investment decision, but on how the robo-advisor carries out the customer’s orders and what he does with the customer’s assets.

As the next step, this paper will analyse these mechanisms one by one and evaluate if and to what extent they are effective in the context of robo-advisory.

2.2. MiFID2 and the concept of technology neutrality

Most of financial markets regulation is technology neutral. This means that the same set of statutory rules applies to financial services and transactions, no matter what type of technology is used⁵⁸. In other words, although the existing regulation must be applied, it needs to consider the particularities of the

⁵³ Ibid.

⁵⁴ See Rec. 31, 86 and 92 of MiFID2.DelReg.

⁵⁵ See, e.g., regarding MiFID2: Commission Delegated Directive (EU) 2017/593.

⁵⁶ Linardatos (2020), § 1, para. 14.

⁵⁷ JCESA (2015), p. 23.

⁵⁸ See e.g. European Commission (2017), pp. 4, 5, 15 (on fintech regulation in general); IOSCO (2016) According to IOSCO, most regulators follow the technology neutrality approach, see IOSCO (2016), p. 4.

respective service. MiFID2 as the main source of regulation for robo-advisors also applies the concept of technology neutrality⁵⁹.

This approach comes with advantages and disadvantages. Regulating conduct instead of regulating specific technologies creates a **comprehensive regulatory quilt**. If new technologies are used to deliver or support certain financial services that are subject to MiFID2, the established rules apply, nevertheless. As a result, the use of new technologies to provide financial services is **hardly ever unregulated**. It is also difficult to circumvent regulation unless new technology creates an utterly new kind of service that is not covered by MiFID2. However, this will hardly ever be the case.

On the other hand, a technology neutral approach can lead to **legal uncertainty** among market participants because it might be unclear how statutory rules are applied in the new, digital context. When new technologies are introduced, market participants lack experience and regulators cannot provide reliable guidance (yet). Some of the established approaches might not work appropriately in the fintech context – or not at all. Nevertheless, it is fair to say that technology neutrality has worked reasonably well so far.

In this study it is assumed that the EU will not abolish the idea of MiFID2 being technology neutral. This means that making **substantial amendments to MiFID2** regarding robo-advisors would not be in line with the overall approach taken by EU financial markets regulation. However, it would be possible to enact specific rules about robo-advisors via Delegated Regulations (by the Commission) or clarify the application of general rules to robo-advisory via guidelines and technical standards (by ESMA). This approach would also be more flexible because it would be possible to react to new market developments faster.

2.3. What is not regulated under MiFID2?

2.3.1. Enforcement

MiFID2 does not cover all aspects of the financial services regulation. In particular, the **enforcement** of rules is subject to **national laws and national regulators**. Investor protection does not mean that the investor is shielded from losses. If a failed investment is based on flawed advice, the investor must be given recourse against the advisor. Consequently, if robo-advisors fail to give proper advice, regulation needs to make sure that there are viable options for the client to seek redress, for example, through **private litigation**. Regulators also need to be able to react, either preventatively (through injunction orders or comparable mechanisms) or reactively (through fines or other forms of punishment).

Art. 67-78 MiFID2 outline the required competences and powers for national regulators (the “competent authorities”), consequences for breaches of MiFID2 (fines, loss of authorisation, etc.) and procedural rules. This results in a high level of harmonisation, but differences remain. In particular, public enforcement in the Member States is still depending on the respective national regulator’s funding, expertise, workload and political will to take action. This can result in potential shortcomings of supervision and enforcement. Even more significantly, private enforcement⁶⁰ is not regulated under MiFID2 at all and can thus vary greatly in the Member States.

⁵⁹ See expressly ESMA (2018), p. 15 para. 7: The regulatory framework and the respective ESMA guidelines “apply to all firms offering the service of investment advice and portfolio management, irrespective of the format used for the provision of these services.”

⁶⁰ Private enforcement refers to private market participants (in particular, investors) taking others to court in civil litigation.

The importance of this is that under general financial markets regulation theory market rules are only effective if they are **enforced properly**⁶¹. Without effective enforcement, the market outcome can even be worse than without market rules because some market participants will comply with the rules whilst others will not⁶². For robo-advisory, this is an important issue because private enforcement is particularly difficult. The reason is the use of algorithms and the resulting opacity of the investment and decision-making process⁶³. The investor only sees the result of the advice or investment process. It is usually unclear how the algorithm came to this result. But if clients are not aware that a robo-advisor was not playing by the rules (for example, by not choosing the most favourable investment for the client) and they cannot find out about it and prove it in court, then there will be hardly any private enforcement.

A review of the MiFID2 framework should consider this potential shortcoming. A potential remedy could be an increased guidance by ESMA, the prescription of specific supervision mechanisms for digital services such as robo-advisory, or even the introduction of punctual rules regarding private enforcement. However, expanding the scope of application of MiFID2 would be a huge shift in EU policy and it is questionable whether this is warranted by a specific problem such as robo-advisory.

2.3.2. Other mechanisms that protect investors

Investor protection can be improved by several measures that can be set out in various legislative acts. This can be referred to as indirect investor protection. It is not possible to cover all potential effects that EU laws might have on investors who use robo-advisors. The most relevant ones are as follows:

- Directive (EU) 2019/2034 (**Investment Firms Directive**, IFD) and Regulation (EU) 2019/2033 (**Investment Firms Regulation**, IFR) seek to improve the prudential supervision and resilience of financial intermediaries which are not systemic by virtue of their size or their interconnectedness with other financial actors (Rec. 6 IFR). This includes investment firms under MiFID2. As robo-advisors are operated by investment firms⁶⁴, the IFD/IFR rules apply to them and their operators. However, IFD and IFR are supposed to stabilise the financial system, focusing on capital requirements and risk management. This is not relevant for the purposes of this analysis.
- Regulation (EU) 2016/679 (**General Data Protection Regulation**, GDPR) seeks to protect natural persons (and thus, investors) with regard to the processing of their personal data (Art. 1 GDPR). This can be relevant for automated decision-making by the software algorithm, but it is not per se an obstacle for robo-advisory⁶⁵.
- The proposed Regulation on digital operational resilience for the financial sector (**DORA**)⁶⁶ aims to increase the security of digital financial infrastructure. Increased resilience also protects investors from data breaches or an unavailability of the service⁶⁷ and overlaps with the MiFID2-requirements for algorithmic trading⁶⁸.

⁶¹ On the necessity of effective enforcement for securities regulation see, e.g., Black (2001), pp. 834-838; Bhattacharya/Daouk (2002), p. 75; La Porta et al (2006).

⁶² Bhattacharya/Daouk (2009), p. 578.

⁶³ For more details, see above p. 11 and below p. 30 et seq.; for overview, see also Maume (2019b), p. 647 et seqq.

⁶⁴ See below p. 25.

⁶⁵ See below p. 25.

⁶⁶ European Commission (2020).

⁶⁷ See below p. 41.

⁶⁸ See below p. 26.

These topics will not be analysed in detail in this paper. However, the aforementioned aspects will be discussed briefly when they become relevant in the context of robo-advisory.

2.4. Analysis of the MiFID2 investor protection regime

2.4.1. Robo-advisors as investment firms

a. Investment advice and portfolio management

MiFID2 applies to investment firms, which provide investment services, Art. 4(1)(1) MiFID2. As discussed above⁶⁹, modern robo-advisors offer a combination of investment advice and portfolio management⁷⁰.

According to Art. 4(1)(4) MiFID2, **investment advice** “means the provision of personal recommendations to a client, either upon its request or at the initiative of the investment firm, in respect of one or more transactions relating to financial instruments”. This is the case for all robo-advisors within the meaning of this study⁷¹. The investment advice is provided during the initial contact between client and robo-advisor (phase 1). The client provides the information requested by the software interface. Based on this information, the algorithm prepares an advice and puts together a potential investment portfolio. This does not constitute a breach of **EU data protection laws**, namely Art. 21/22 GDPR⁷². These provisions set limits to the possibility of automated decision-making based on personal data. Although there has been no case law on the issue yet, it seems likely that providing investment advice and subsequently making investment decisions would classify as automated decisions that produce legal effects (see Art. 22(1) GDPR) concerning the investor. However, it is also likely that a court would find that this automated decision is necessary for the performance of the contract as set out in Art. 22(2)(a) GDPR. Investment firm could also gather the investor’s explicit consent for such an automated decision-making under Art. 22(2)(c) GDPR, which would resolve the problem anyway.

MiFID2 makes an important **distinction** between **independent investment advice** and **non-independent investment advice**. The major difference is that accepting third-party fees is strictly limited for independent investment advice (Art. 24(7) MiFID2).

In the past, it could be observed that online platforms expressly claimed that they do not provide specified advice so that they could evade stricter regulation⁷³. Such a **disclaimer** does not have any legal relevance⁷⁴. The only relevant question for the legal classification is whether investment advice under the definition in Art. 4(1)(4) MiFID2 is provided or not, not how the service is called by the financial service provider, or whether or not a disclaimer is used. With today’s more advanced robo-advisors, this does not seem to be an issue in practice anymore since it is obvious that investment advice is provided.

After the investment service agreement has been concluded, the robo-advisor focuses on rebalancing and updating the investment portfolio (phase 2)⁷⁵. Art. 4(1)(8) MiFID2 defines **portfolio management** as “managing portfolios in accordance with mandates given by clients on a discretionary client-by-

⁶⁹ See above p. 11.

⁷⁰ Art. 3 MiFID2 allows EU Member States to exempt certain person from the application of the Directive. However, this does not apply to robo-advisors because they typically hold client’s funds and do not just provide the reception and transmission of orders.

⁷¹ For details, see Maume (2019b), p. 630-633.

⁷² For details, see Hennemann/Kumkar (2020), § 13 passim.

⁷³ Maume (2019b), p. 632 with further references. For example, no suitability assessment (see below p. 28 et seqq.) is required.

⁷⁴ For details, see Maume (2019b), p. 632 et seqq.

⁷⁵ See above p. 11.

client basis where such portfolios include one or more financial instruments". This is the case for typical robo-advisors⁷⁶. The rebalancing is carried out "on a discretionary basis", but "in accordance with the mandate given by the client" (which means, as specified by the chosen risk profile). If the client wants to change the investment profile, or the investment firm needs to make major adjustments to it (for example, due to major market changes), a new investment advice is provided by the robo-advisor.

b. Consequences

As they provide investment services, all robo-advisors offering these services in the EU require authorisation from the national competent authorities under Art. 5 MiFID2, which includes skill requirements regarding its management body and personnel. The robo-advisor requires an initial capital endowment under Art. 15 MiFID2 and Art. 9 IFR. Further organisational requirements are set out in Art. 16 and Art. 17 MiFID2 (if engaging in algorithmic trading). The robo-advisor is subject to on-going supervision by the national authorities under Art. 21/22 MiFID2. According to Art. 23 MiFID2, the robo-advisor also must avoid and disclose all conflicts of interest. All services have to be provided honestly, fairly and professionally in accordance with the best interests of the client, Art. 24 MiFID2. Importantly, the robo-advisor needs to obtain all necessary information (inter alia) about the client's knowledge and risk tolerance and carry out a suitability assessment under Art. 25 MiFID2⁷⁷. Investment firms need to understand the financial products they offer or recommend, assess their compatibility with the needs to the client, and ensure that financial instruments are offered or recommended when this is in the interest of the client (Art. 25(2) MiFID2). These rules and their application to robo-advisors will be discussed in more details in the ensuing paragraphs.

2.4.2. Robo-advisors and algorithmic trading

a. Definition

Art. 17 MiFID2 contains the only exception from the principle of technology neutral regulation⁷⁸, putting **additional obligations** on investment firms that engage in algorithmic trading. As stated in Rec. 59 MiFID2, the use of trading technology has evolved significantly in the past decade and is now used extensively by market participants.

Art. 4(1)(39) MiFID2 defines algorithmic trading as "trading in financial instruments where a computer algorithm automatically determines individual parameters of orders such as whether to initiate the order, the timing, price or quantity of the order or how to manage the order after its submission, with limited or no human intervention [...]". Regarding robo-advisory, the key element is "with limited or no human interaction". The investment advice given by the software (including the suitability assessment) do not meet this definition. This is because giving advice (here: suggesting a certain investment portfolio) does not automatically result in trading activities as required by Art. 4(1)(39) MiFID2. This suggestion rather needs the investor's approval before the investment portfolio is put together. On the contrary, when **rebalancing**, the robo advisor algorithm makes independent decisions itself, initiating orders and determining the timing, price or quantity of the order – although typically limited to transactions with small impact. However, Art. 17 MiFID2 does not prescribe a threshold in terms of complexity or frequency of trading. This has also been emphasised by ESMA, stating that even a **simple algorithm** only carrying out a small number of processes qualifies as algorithmic trading⁷⁹. Art. 18 MiFID2-DelReg clarifies that a system has no or limited human interaction

⁷⁶ See also ESMA (2018), p. 4.

⁷⁷ See below p. 28.

⁷⁸ See above p. 22.

⁷⁹ ESMA (2021), p. 17 (Question 1).

where for any order or quote generation process or any process to optimise order-execution, an automated system makes decision at any of the stages of initiating, generating, routing or executing orders or quotes according to pre-determined parameters.

Although it is clear from the wording that robo-advisors (or to be more precise: the portfolio management aspect of robo-advisors) perform algorithmic trading within the meaning of Art. 4(1)(39) MiFID2, it is the author's experience that operators of (German) robo-advisors are of the opinion that there are major differences between the minor restructuring carried out by robo-advisors and the massive transactions carried out by other automated trading algorithms (in particular, high-frequency trading⁸⁰). Thus, Art. 17 MiFID2 is not perceived by investment firm staff members as an important rule for the operation of their robo-advisors in practice. This suggests that further clarification is required.

b. Consequences

According to Art. 17(1) MiFID2, investment firms that engage in algorithmic trading must follow guidelines to prevent the sending of erroneous orders or the systems otherwise functioning in a way that may create or contribute to a disorderly market. The firm must have in place **effective systems and risk controls** suitable to the business it operates to ensure its trading systems are resilient, have sufficient capacity and are subject to appropriate trading thresholds and limits. The firm also must fully test and properly monitor their systems.

Art. 17(2) MiFID2 states that an investment firm that engages in algorithmic trading must notify the authorities about it⁸¹. The competent authority may require the firm to provide **information about controls and documents** to demonstrate that the requirements as set out in Art. 17(1) MiFID2 are satisfied. This includes a description of the nature of its algorithmic trading strategies, the key compliance and risk controls and details of the testing of the systems. The provision of information can happen regularly or on an ad-hoc basis. Also, competent authorities may, at any time, request further information about the algorithmic trading and the systems used for trading. This is an important piece in the puzzle of algorithm supervision.

The investment firm must also comply with the general **organisational requirements** in Art. 16 MiFID2. For example, according to Art. 16(4) MiFID2, the firm must take all reasonable steps to ensure continuity in the performance of the service, and it shall employ appropriate and proportionate systems, resources and procedures to do so. For investment firms that rely to a high extent on technology, more emphasis needs to be put on these measures than, for example, regarding a firm that only provides classical human-based advice.

In sum, the general organisational requirements in Art. 16 MiFID2 and the specific rules for algorithmic trading in Art. 17 MiFID2 are detailed and seem well-suited to address the specific risks of algorithm-based advice and portfolio management. However, more guidance as to how they specifically apply to robo-advisors could be sensible. This would need to include, inter alia, the clarification that Art. 17 MiFID2 also applies to simple, non-sophisticated algorithms⁸². All further guidance should expressly target automated financial advice and be based on the more specific DORA⁸³ framework. It is not advisable to take further action before DORA is finalised.

⁸⁰ In the structure of Art. 17 MiFID2, however, high-frequency trading is a subset of algorithmic trading, see also Rec. 24 of MiFID2-DelReg. To the best of the author's knowledge, current robo-advisors do not perform high-frequency algorithmic trading as defined in Art. 4(1)(40) MiFID2.

⁸¹ Birgmeir (2019), p. 62.

⁸² ESMA's view that even simple algorithms can qualify as algorithmic trading (see above footnote 79) is stated in the Q&A paper on market structures and thus difficult to find.

⁸³ See p. 24.

2.4.3. Assessment of suitability

a. Background and MiFID2 regime

The cornerstone of financial advisors regulation is Art. 25 MiFID2, which sets out the assessment of suitability. This is supposed to enable the investment firm to make the best decision for the investor. If the firm does not carry out an adequate suitability assessment, enforcement action might be taken by the national regulator and/or the client.

According to Art. 25(2) MiFID2⁸⁴, investment firms that provide investment advice or portfolio management (thus, applying to robo-advisors) need to obtain the necessary information regarding:

- the client's knowledge and experience in the investment field relevant to the specific type of product;
- the client's financial situation including the ability to bear losses; and
- the client's investment objectives, including risk tolerance.

This should enable the investment firm to recommend the suitable investment. Art. 25(6) MiFID2 requires the investment firm to provide the client with a suitability reports on the service provided in a durable medium⁸⁵.

The investment firm needs to take a **holistic view**: if a package of bundled products is offered, the suitability assessment needs to consider not just the individual products, but also the bundled product. This means that even if every single product is suited for the investor, the combination of all products might not. Rec. 88 MiFID2-DelReg clarifies that non-suitability may also be caused by the frequency of the transactions, or by the overall portfolio becoming unsuitable (even if a suitable product is added).

Further details are given in Art. 54 and 55 MiFID2-DelReg. Importantly, Art. 54(1) MiFID2-DelReg states that the responsibility to undertake the suitability assessment shall **not be reduced by the use of an electronic system** in making the personal recommendation or decision to trade. In other words, it is expressly recognised by EU regulation that the suitability assessment can be carried out by a robo-advisor, and that in this case the same rules apply as for "normal" investment services.

The ESMA also published extensive guidelines on suitability requirements in 2018⁸⁶, including some recommendations on automated advice. The document is separated into 12 "general guidelines", each with "supporting guidelines". In total, and not counting guidelines regarding internal procedures, the ESMA guidelines suggest **about 20 questions**⁸⁷ that a compliant robo-advisor would need to ask.

b. Concerns about suitability assessments

There are concerns about the application of Art. 25(2) MiFID2 regarding robo-advisors in practice. The main problem is the interaction between the clients the robo-advisor's software interface. Inexperienced customers might **misunderstand** the software's queries (for example, confusing net income and gross income), **input wrong data or misinterpret advice** given⁸⁸. They might also

⁸⁴ The more lenient test of appropriateness under Art. 25(3) MiFID2 applies to singular transactions and is thus not relevant for robo-advisors.

⁸⁵ For more details on the suitability report, see below p. 41.

⁸⁶ ESMA (2018).

⁸⁷ The exact number can vary, depending on the structure of the online questionnaire.

⁸⁸ JCESA (2015), p. 18.

misjudge their financial resilience when making financial long-term commitments or underestimate their need for financial returns when they retire.

Structurally speaking, robo-advisors should be well-equipped to deal with typical investment cases. However, there are doubts whether software is able to make a comprehensive assessment of the customer's overall situation in unusual cases⁸⁹. The questions asked by the software are **pre-defined**. The system is not (or only to a certain extent) able to adapt to unexpected answers. It is also not able to detect oddities in the client's behaviour because robo-advisors cannot detect nuances in customers' communications and sentiment. This might change in the future with the increasing use of AI. However, there are no signs that such software is currently applied in the onboarding process.

Empirical research suggests that the **lack of standardisation** is problematic. A study conducted by Tertilt/Scholz in 2017⁹⁰ scrutinised 13 robo-advisors from around the globe (with a strong emphasis on the EU). They found that the number of questions asked varied greatly, ranging between 4 (!) and 27 (with a median of 10). It is hard to imagine how an investment firm wants to undertake a comprehensive suitability assessment with only four answers. This data is now a few years old (and predates the ESMA guidelines on suitability⁹¹ from May 2018), but it still highlights the problem.

Another study applied the same methodology as Tertilt/Scholz to the German market in late 2018⁹². It came to similar conclusions. This examination of 21 robo-advisors showed a range between 5 and 24 questions, again with a median of 10. This study was conducted a few months after the ESMA had issued its guidelines in May 2018. However, due to the overlap of that study and the publication of the ESMA guidelines, it is a reasonable assumption that not all investment firms had already taken notice of the publication and then found the time to make respective changes in the process.

The question is if a **mandatory list of questions** that need to be asked would be sensible. This could provide additional guidance to market participants, creating a market standard. In addition, the ESMA guidance is rather bulky and difficult to handle in practice. However, we need to keep in mind that the different robo-advisors' algorithms work differently and thus need different input. Prescribing a set of questions would create a potentially unsuitable "one size fits all" corset. In addition, the surveys show that the essential questions such as investment horizon, monthly available funds, etc. are asked by nearly all robo-advisors⁹³. Therefore, an advisable course of action could be the compilation of a non-binding list of questions that the ESMA considers as the minimum for a suitability assessment.

c. Concerns about consistency

After receiving the required information from the client, the investment firm must check for consistency. In the words of Art. 54(7)(d) MiFID2-DelReg, the firm must take appropriate steps to ensure consistency of client information, such as by considering whether there are **obvious inaccuracies** in the information provided by clients. If the relationship with the client is on-going (which is the case for portfolio management and, and thus robo-advisory), the firm needs to have appropriate policies and procedures to maintain adequate and up-to-date information about the client to the extent necessary to fulfil the suitability requirements.

⁸⁹ See Fein (2016); IOSCO (2016), p. 10. Unusual cases would be settings that deviate significantly from the "standard investors". This could be high volatility of income, an unusual short investment span, high one-off payments, or constantly changing investment preferences.

⁹⁰ Tertilt/Scholz (2018).

⁹¹ ESMA (2018), pp. 35 et seqq.

⁹² Richter (2018).

⁹³ Richter (2018).

One of the aforementioned studies⁹⁴ also raised concerns about these consistency checks. The author presented the robo-advisor four different investment scenarios. One of them was a “dummy investor”, designed to identify flaws in the consistency check: a 20-year-old student, negative monthly income of EUR 2,000 (zero income, but EUR 2,000 expenses), EUR 2,000 ready for investment, willing to invest EUR 500 per month and EUR 20,000 straightaway. It is impossible to invest EUR 20,000 if only EUR 2,000 are available. Similarly, not having any income makes it impossible to invest EUR 500 per month. Despite these obvious inconsistencies, 8 out of 21 robo-advisors issued an investment advice at the end of the process⁹⁵. This suggests that not even a superficial consistency check was carried out.

It is unclear if this is a widespread problem. In any event, the rules regarding the consistency check are clear and easy to understand. Thus, this seems to be an issue that should be addressed rather through regulators taking supervisory action than regulatory reform. Ideally, consistency check should be a part of an external audit⁹⁶.

d. Allocation of liability

As outlined above, a flawed suitability assessment might lead to enforcement actions by clients or the regulator. Art. 54(1) MiFID2-DelReg states that the responsibility to undertake the suitability assessment shall lie with the investment firm even if automated systems are used. In addition, Art. 54(7) outlines, inter alia that the investment firm must ensure that:

- clients are aware of the importance of providing accurate and up-to-date information;
- all tools used are fit-for-purpose and appropriately designed; and
- the questions are likely to be understood by clients and capture an accurate reflection of the client’s objectives.

This clearly shows that any flaws and shortcomings in the interaction with the client during the suitability assessment Art. 54(1) MiFID2-DelReg are the **responsibility of the investment firm**. Arguably only the intentional provision of false information (or maybe most serious mistakes when entering the information) are the client’s responsibility. Thus, through the lens of risk-allocation, the level of investor protection is very high as misunderstandings or technical issues are the investment firm’s responsibility.

However, there are again doubts about the effectiveness of this approach in practice. The problem is the **opacity of the robo-advisory process**⁹⁷. Targeted clients will typically not have sufficient knowledge of financial market mechanics to understand the decision-making process and detect flaws in the suitability assessment. The algorithm itself is a black box⁹⁸, making scrutiny by the client virtually impossible. They have little choice but to rely on the accuracy of the robo-advisor software. It will be extremely difficult for private investors to provide conclusive evidence of an investment firm’s misconduct in civil litigation. As a result, the opacity of the robo-advice process would often allow its operator to escape liability⁹⁹. A possible approach could be to implement a **reversal of the burden of**

⁹⁴ Richter (2018), pp. 43/44.

⁹⁵ Richter (2018), pp. 50/51.

⁹⁶ For details, see p. 44.

⁹⁷ See also p. 11.

⁹⁸ Importantly, the investment firm does not have to disclose the internal mechanisms of the algorithm, see p. 40.

⁹⁹ For more details, Maume (2019b), p. 645 et seqq.

proof in civil litigation in these cases. However, this would mean extending the MiFID2 framework into the law of civil procedure, which is typically left to the Member States.¹⁰⁰

Regarding the national financial market supervision authorities, the situation is slightly different. It can be assumed that a regulator has – at least in theory – the knowledge required to assess the robo-advisor’s decision-making mechanism. However, the regulator’s staff also needs to be able to understand the way the algorithm gathers information and how it is then used in the process. This can either be done by **disclosing the algorithm** to the regulator or at least by a **detailed explanation of the decision-making process**¹⁰¹. This is in line with the idea that AI systems need to be transparent and explainable, as applied by the recent proposal for an AI regulation¹⁰².

The power to acquire this information is already prescribed by Art. 69(2) MiFID2, stating that the competent national authorities shall have the power to have access to any document or other data in any form which the authority considers could be relevant for the performance of its duties, and require the provision of information from any person and, if necessary, to summon and question a person with a view to obtaining information. This includes the delivery of the algorithm by the investment firm and the explanation of its workings. More specifically, Art. 17(2) MiFID2 states that the national regulator may require the investment firm to provide a description of its algorithmic trading strategies, details of the trading parameters and details about the necessary testing of the system. Thus, no amendment to the current framework is necessary in this regard. Clarification or guidance as suggested regarding Art. 17 MiFID2 should be sufficient¹⁰³.

2.4.4. Conflicts of interest

a. Background

Conflicts of interest are considered another main problem of the regulation of robo-advisors¹⁰⁴. One reason is that some robo-advisors are integrated into or affiliated with other firms that issue financial products (mostly banks or funds)¹⁰⁵. Three typical situations can be identified. First, several banks have established robo-advisor services **in their own name** or via a subsidiary, offering investments into their own financial products (for example, *cominvest* promoting financial products issued by *comdirect Bank AG*). In 2018, *Allianz Asset Management*, a subsidiary of *Allianz SE*, became the major shareholder of the Italian fintech *Moneyfarm*. A joint robo-advisor service was launched in 2019. In these situations, it is in the investment firm’s best interest that the clients’ money is invested in products that were issued by the investment firm itself (or its subsidiaries). In addition, incumbent banks and funds that operate robo-advisors are more likely to be in conflicts of interests than independent start-up robo-advisors¹⁰⁶. The reason is that they have more staff, offer more products, and have more ties to other market participants (for example, through distribution agreements) than a start-up.

Secondly, established funds have started **acquiring shareholdings** in successful robo-advisor firms. An example from the European market is the subsequent investments made by Blackrock in the German market leader *Scalable Capital* between 2017 and 2020¹⁰⁷. This situation might not be as

¹⁰⁰ See above p. 23

¹⁰¹ Herresthal (2020), § 9, para. 62.

¹⁰² See above p. 19.

¹⁰³ See above p. 27.

¹⁰⁴ See Ji (2017), p. 1578: “Robo-advisor conflicts are, for a number of reasons, even more concerning than human advisor conflicts.”

¹⁰⁵ For a good overview, see Herresthal (2020), § 9 paras. 2-3. In the US, such integration is the normal setup for a robo-advisor.

¹⁰⁶ Maume (2019b), p. 71; Ji (2017), p. 1574.

¹⁰⁷ Blackrock invested EUR 25m in 2017, EUR 66m in 2019 and EUR 50m in 2020, see Williams-Grut (2020) and Ricketts (2019).

obvious as the formation or acquisition of a subsidiary. However, the conflict of interest is comparable to the first situation because there is a structural link between the two entities. In both cases the shareholder has an interest in the robo-advisor choosing financial products issued by the shareholder.

Thirdly, some robo-advisors (in particular, those operated by start-ups) have entered into **marketing and distribution agreements** with banks, actively promoting the respective financial products. Similarly, such smaller investment firms that provide robo-advisory services often do not have financial service licences but **cooperate** with an incumbent financial service, using the incumbent's license for their own service¹⁰⁸. From the incumbent's perspective, this is essentially a form of outsourcing.

In all these cases, the concern is that robo-advisors could become mere distribution channels for issuers of financial products, favouring these products to the detriment of their clients. The advantage for the established funds and banks is that they gain better access to private investors. Thus, robo-advisors are often in a **structural conflict of interest**. In these situations, the underlying danger is that they will always or at least very often recommend financial products issued or marketed by affiliated entities. If the proximity between robo-advisor and issuer is caused by a mere shareholding or a distribution agreement, the existence of a conflict will typically be unclear for the investor.

However, MiFID2 focuses on **conflicts of interest caused by inducements**, in particular, third-party payments. These are directly addressed in Art. 24 MiFID2¹⁰⁹. The background is the typical remuneration model for a human financial advisor. It usually includes either fees paid by the client or/and third-party fees, which are then to be disclosed to the client. Of course, structural conflicts or interests are also possible for human advisors, especially if they are working for a bank. However, MiFID2 has the individual (or small firm) advisor in mind who is not structurally embedded in a large financial firm. The opacity of the robo-advisory setup makes an analysis difficult, but there seems to be **no publicly available evidence** of any robo-advisor receiving monetary or non-monetary benefits for recommending a certain financial product¹¹⁰. The absence of such evidence does not prove that the inducement problem does not exist for robo-advisory. However, it suggests that inducements are not or a major issue for robo-advisors. Thus, the typical problem of conflicts of interest in relation to robo-advisory is different from the "classical" situation that is envisioned by MiFID2.

This structural imbalance is amplified by two other characteristics of robo-advisory. First, investment decisions made by robo-advisors are typically considered **more independent and more objective** (for example, being strictly based on mathematical models) by clients¹¹¹. This can make clients less suspicious of potential conflicts, making them less guarded against biased investment advice¹¹². Secondly, robo-advisors **target younger investors**, and/or investors that lack experience¹¹³. These groups might lack the understanding of financial market structures and mechanisms, including an understanding for the problem behind conflicts of interest.

b. The MiFID2 conflict of interest regime

The MiFID2 regime for conflicts of interest is spread out over several provisions. As a starting point, Art. 33 MiFID2-DelReg specifies what conflicts of interests within the meaning of Art. 23 MiFID2 are. Inter

¹⁰⁸ Such a cooperation is not specific for robo-advisory, but is a typical phenomenon in the fintech sector; for more details see Maume (2017), pp. 373, 376 et seqq.

¹⁰⁹ See in more detail below p. 36.

¹¹⁰ Better Finance (2020), p. 30.

¹¹¹ Edwards (2018), p. 103.

¹¹² Herresthal (2020), § 9, para. 9; Maume (2019a), p. 71 et seq.

¹¹³ For more details, see Polyak (2015); however, empirical evidence from Germany suggests that the typical user of a robo-advisor is a middle-aged man with high income; see above p. 16.

alia, this could be a financial gain at the expense of the client (lit. a), the receipt of an inducement in the form of monetary or non-monetary benefits or services (lit. e), or the investment firm having an interest in the outcome of a service provided, which is distinct from the client's interest in this outcome (lit. b). The problems of the investment firm being a part of a corporate group is also emphasised by Art. 34(1) MiFID2, obligating the investment firm to take into account in its conflicts of interest policy the particular conflicts that result of the structure and business activities of other members of the group.

According to Art. 23(1) MiFID2, all investment firms need to take all appropriate steps to identify and to prevent or manage these conflicts of interest. Art. 16(3) MiFID2 stipulates that an investment firm needs to have in place **organisational arrangements to prevent conflicts of interest** from adversely affecting the interests of clients. This highlights the basic problem behind conflicts of interest. Being in a conflict does not mean that the ensuing decision or recommendation made by the financial service provider is bad for the client. Thus, simply banning service providers from decision-making when being in a conflict of interest is typically not a sensible policy option. For this reason, MiFID2 has established a two-step approach. If the aforementioned arrangements are not sufficient to prevent the risk of damage to the client, the investment firm is under an obligation to disclose the nature and/or sources of the conflicts. Art. 34(4) MiFID2-DelReg clarifies that **disclosure to clients is a "measure of last resort"** that shall be used only where the effective organisational arrangements are insufficient. This coincides with the general common law-based idea to avoid and disclose conflicts of interest – in this order. Art. 34(5) MiFID2-DelReg even goes one step further, stipulating that over-reliance on disclosure is considered a deficiency in the investment firm's conflict of interest policy. It also shows that although organisational arrangements should take precedence, disclosure is a viable option if necessary.

Importantly, disclosing a conflict of interest does not relieve the investment firm from the **duty to act in the client's best interest** as set out in Art. 24(1) MiFID2. This means that even if a conflict is disclosed, the advice given or the investment decision made by the investment firm still needs to be (from an ex-ante perspective) the best one for the client.

c. The limitations of disclosure regulation

As outlined above, financial markets regulation generally rests on the idea of disclosure regulation. However, there are doubts about the effectiveness of disclosure in the context of robo-advisory. **Retail customers**, in particular, seem to be unaware of the risk that such a conflict can present. For instance, in the Dutch market more than 90% of consumers do not read or read only superficially the services statement or the qualitative statement of costs¹¹⁴. In Italy, 82% of respondents of a study were convinced that advice was free (when it was not) or did not know whether the advisor is paid or not¹¹⁵. So, the effectiveness of information disclosure to retail investors is questionable in principle. However, this is a question that concerns the cornerstone of financial markets regulation and goes well beyond the issue of robo-advisory. It will not be pursued any further in this analysis.

The aim of disclosure regulation is to enable the investor to make an informed decision¹¹⁶. Disclosure can only be effective if the other party is able and can be reasonably expected to react to the information received. This is emphasised by Art. 34(4) MiFID2-DelReg, stating that the disclosure needs to be sufficient to **enable the client to take an informed decision** with respect to the investment service. Obviously, the idea of disclosure relates to the investor who makes the investment decision in phase 1 of the robo-advisory process. Here, two decisions need to be distinguished: first, the decision

¹¹⁴ See Better Finance (2020), p. 30 with further references.

¹¹⁵ Ibid.

¹¹⁶ See, e.g., Art. 23(3)(b) MiFID2: „...to enable that client to take an informed decision with respect to the service in the context of which the conflict of interest arises”.

if the investor wants to enter into a financial service agreement with the investment firm running the robo-advisor; second, the decision how much money to invest and subject to which risk profile. In an ongoing contractual relationship (such as a robo-advisor that also manages the client's funds in phase 2), the same decisions can become relevant again later: first, to commit more money or change the risk profile; second, to terminate the financial service agreement. Naturally, in the case of such an ongoing relationship, new conflicts of interest (for example, new ties to the issuer of a particular financial product) would need to be disclosed subsequently to enable the client to make an informed decision about the future of the investment.

There are also some issues specific to robo-advisors. The problem is the automated decision-making, which is at odds with the idea of making an informed decision. The **initial investment decision** (phase 1) may not raise any specific concerns¹¹⁷. The investment firm can make comprehensive disclosure through the robo-advisor before the parties enter into the financial service agreement. In simple terms, the robo-advisor needs to inform the client that it is (also) investing into conflicted financial products and what the consequences are.

However, for subsequent portfolio management services (phase 2) and changes to the initial advice (for example, changing the risk pattern etc.) the situation is different. This setting comes with three major shortcomings. First, in a typical robo-advisor/client situation, the **client has no influence** on the concrete investment decision made by the robo-advisor. This is best explained by contrasting it with the classical (human) advisor/client situation. Here, the advisor would need to disclose the conflict before the client makes his decision about which financial product to invest in. The investor can then decide whether to apply the advisor's recommendation or to reject it when making an investment. In contrast, a modern robo-advisor carries out investment decisions autonomously. The investor's influence is typically limited to choosing the appropriate risk profile at the beginning of the advice process. If the robo-advisor's investment decisions (in particular, when rebalancing) are in line with the chosen risk profile, the software does not need any further approval from the client. As a result, the established principle of "making an informed investment decision, based on prior disclosure" fails for any kind of ongoing asset management as provided by modern robo-advisors.

Second, **subsequent disclosure is not as effective** as disclosure prior to the initial investment decision. If clients get in contact with robo-advisors about making an investment, the client's mind is set on the transaction at hand. He or she is aware that they are about to decide something, and that this decision will have legal and financial consequences. If the client is informed subsequently by the investment firm, for example, that there have been structural changes and that the firm (and thus the robo-advisor) is now in a conflict of interest regarding certain products, clients will typically not have their minds set on this topic. The investor is forced to make a business decision (for example, whether to withdraw funds or change the risk profile because of the disclosed conflict) without being prepared.

Third, we need to keep in mind that there is a contractual relationship between the investor and the investment firm operating the robo-advisor. Due to the freedom of contract, the parties can **influence the obligation to disclose conflicts of interest**. The duty to avoid conflicts of interest is derived from the common law of trusts¹¹⁸. It is a part of the duty of the fiduciary duty of loyalty¹¹⁹, which first and foremost obligates the other party to act in the client's best interest (see also Art. 24(1) MiFID2). These interests are subjective, which means that the interests of the individual client determine the other

¹¹⁷ This does not take into account the criticism regarding the effectiveness of disclosure in general as outlined in the beginning of this section.

¹¹⁸ For historical background, see Maume (2016), p. 73/74, with further references.

¹¹⁹ Ibid.

party's concrete duty in the respective case. For robo-advisory, this means that the parties could define in the contract what the investor's interests exactly are¹²⁰. The investor can decide to accept risks that are based on a conflict of interest¹²¹. For example, the contract between investment firm and client could state that the robo-advisor may invest into certain products that were issued by the investment firm or an affiliated entity¹²². Alternatively, the investor could agree that the robo-advisor invests into some conflicted financial products (with potentially lower yields) if the overall investment expectations are met¹²³. Through the lens of contract law such an agreement could be valid if the investment firm (and the robo-advisor) had made full disclosure about the situation and the potential benefits that they might obtain when entering into the contract. If the robo-advisor then complies with these rules, it complies with the duty of loyalty and there is no conflict of interest. Importantly, supervisory authorities would need to respect this contractual agreement if it complies with national contract laws¹²⁴.

It must be noted that this is but a line of argument from the German literature. It focuses on the German understanding of financial services law and of the interplay between contract law and supervisory law. The argument itself is at odds with the idea that supervisory law is mandatory, and its application is not subject to the parties' disposition. It is also unclear if these deliberations would apply in other Member States' contract laws. In addition, there has so far not been a decision on the issue in German courts of law. So this should be considered as a mere theory. However, it highlights again a central problem: MiFID2 does not regulate private law.

To sum up, it is questionable whether investors using robo-advisors really read disclosure statements in practice. The typical process of robo-advisory is not compatible with the idea of an investor making an investment decision based on prior disclosure. A disclosure-based legal framework is at risk of being weakened by contractual clauses – in particular, regarding structural conflicts of interest. Thus, the **policy conclusion** is that conflict of interest regulation regarding robo-advisors should **not focus on disclosure, but on organisational requirements** that prevent or mitigate conflicts of interest. Disclosure should only be the secondary, complimentary tool in this regard. Importantly, this is in line with the structure of the MiFID2 disclosure regime in general¹²⁵. Thus, no fundamental changes need to be made (provided that there are other mechanisms in place, which will be discussed subsequently).

d. Organisational requirements – programming the algorithm

The investment decision is made by the robo-advisor on behalf of the investment firm. Thus, the obligation to “take all appropriate steps to identify and to prevent or manage conflicts of interest” as set out in Art. 23(1) MiFID2 needs to be carried out **by the robo-advisor** itself. This can only happen via programming the algorithm. The key point in this regard is that organisational measures do not need to avoid conflicts of interest per se. Only conflicts that **adversely affect** the interests of the client (see Art. 23(2) and 16(3) MiFID2) need to be prevented. Is it not enough that the firm may gain a benefit if there is not also a possible disadvantage to the client (Rec. 56 MiFID2-DelReG). Distinguishing between the harmful and harmless conflicts of interests (and taking appropriate steps as a consequence) is meant by the expression “to manage conflicts of interest” in Art. 23(1) MiFID2. However, the investment firm always needs to act in the best interest of the client according to Art. 24(1) MiFID2. Thus, the issue here is not which advice to give or which investment decision to make. This is determined by Art. 24(1)

¹²⁰ Herresthal (2020), § 9, para. 55.

¹²¹ Koller (2019), § 80, paras. 14, 44.

¹²² Herresthal (2020), § 9, para. 57.

¹²³ Idem.

¹²⁴ Herresthal (2020), § 9, para. 56.

¹²⁵ See above p. 32.

MiFID2. The issue is (only) if disclosure is required – and if this is not possible, what the alternative would be.

Three different constellations can be identified. **First**, the investment decision could be **in the best interest of the client**¹²⁶ while also being beneficial for the investment firm (for example, because the respective financial product was issued by an affiliated entity). In this case, the interest of the client is not adversely affected, and the transaction can be carried out. **Second**, conversely, the investment decision could be **not the best option** for the client because the algorithm chooses another investment option that is particularly beneficial for the investment firm, thereby “overriding” the client’s interest. In this case it is obvious that the transaction has adverse effects for the client and cannot be carried out. The **third** possibility is arguably most difficult to address. Here, the robo-advisor has identified several options that are **equally beneficial** for the client. Out of these investment options the robo-advisor now chooses the one that is most beneficial for the investment firm. From a formal point of view, the interests of the client have not been adversely affected, so the transaction can be carried out. However, in practice, this could result in problems. What is the “best” option is open to interpretation. Every investment decision is made based on weighed interests. The analysis is based on factors such as price (for example, fee structure) and risk, which can only be determined by the chosen risk profile to a certain extent. The assessment can become even more complex if additional aspects such as ESG (environmental, social, governance) requirements are involved, which are by their very nature vague and subjective. As a result, many possible investments might be considered as equal. This would also leave the investment firm some leeway – if it can be argued that two investments are equal, an existing conflict of interest would not need to be disclosed. This risk is increased by the information asymmetry between client and firm that is caused by the opacity and the complexity of the algorithm. A client would hardly ever realise that a potentially detrimental conflict existed, and the client would most likely find it impossible to prove this in a court of law¹²⁷. This is a typical example of moral hazard and should be avoided. This conclusion can be backed up by the wording of MiFID2 itself. Art. 23(2) does not refer to the existence of a detrimental conflict of interest, but to the risk of damage to client interests. That means that disclosure is even required if the existence of a detrimental conflict is not certain. A risk for the client interests is sufficient. This must include investments that could be considered equal, while being open to interpretation.

Thus, the robo-advisor should only be allowed to carry out the investment decision if it is **clearly in the best interest** of the client. If there is reasonable doubt, the transaction must be stopped, and the potential conflict disclosed to the client. The decision then lies with the client. However, this scenario is not compatible with the idea that automated robo-advisors manage the client’s funds independently and efficiently. It is a reasonable assumption that clients would not want to be contacted by the robo-advisor, asking for permission to carry out the transaction in question. Thus, in practice the only viable solution for the robo-advisor is to choose only the investments that are clearly in the best interest of the client. This is in line with the idea that MiFID2 favours organisational measures over disclosure.

e. Third-party payments

The problem of payments made by third parties is directly addressed by Art. 24 MiFID2. There is no general ban on third-party fees¹²⁸, but there are various restrictions depending on the nature of the service provided. For providers of (independent) investment advice, Art. 24(7)(b) MiFID2 stipulates that

¹²⁶ As defined in the risk profile chosen by the investor.

¹²⁷ See above p. 30.

¹²⁸ It has to be noted that, for example, the Netherlands and the UK banned all remuneration from third parties, thereby exceeding the MiFID2 regime.

the investment firm shall not accept and retain fees, commissions or any monetary or non-monetary benefits paid or provided by third parties. The same is set out in Art. 24(8) MiFID2 for all types of portfolio management – whether independent or not. Thus, if robo-advisors hold themselves out as giving **independent advice** under Art. 24(4) MiFID2, an identical standard regarding third-party payments applies to phase 1 (advice) and to phase 2 (portfolio management) of the robo-advisory process. Art. 24(9) MiFID2 clarifies that a breach of these prohibitions is also a breach of the duty to prevent and manage conflicts of interest under Art. 23 MiFID2. Thus, regarding third-party payments, the general principle of “organisational requirements first, disclosure second” is replaced by an **outright ban** (with some exceptions). This leaves the investment firm two options: either, not to accept any third-party payment, or informing the client and crediting the payment to the client’s bank account. In other words – the robo-advisor can only market itself as independent if it is only the client paying, not a third party¹²⁹.

Art. 24(9) MiFID2 stipulates an **exception** from this rule. Fees, commissions and non-monetary benefits are allowed if both the following conditions are met: first, the payment or benefit is designed to enhance the quality of the relevant service to the client. Art. 11(2) of Delegated Directive (EU) 2017/593 specifies that this might be access to an extended range of suitable financial instruments. Second, it does not impair compliance with the investment firm’s duty to act honestly, fairly and professionally with the best interests of its clients. As discussed above, the best interests of the client are only respected if the robo-advisor chooses the investment that is clearly most beneficial for the client¹³⁰. In addition, a typical fee paid by a third party will hardly be necessary to enhance the quality of the relevant service. Thus, the exception is **very narrow** and will most likely not apply to typical third-party payments. In addition, the exception does not apply to phase 2 of the robo-advisory process. This is because Art. 24(9) subpara. 2 MiFID2 requires that full disclosure needs to be made prior to performing the investment service. For investment advice this is possible. However, as discussed earlier¹³¹, this is not the case for automated portfolio management. The robo-advisor would need halt the transaction and disclose the receipt of these fees. As disclosure necessarily involves the possibility for the other party to react to it, the robo-advisor would need to wait for the client’s permission to carry out the transaction. As discussed above, this is at odds with the idea of the automated robo-advisor managing the investor’s assets independently and efficiently because clients would not want to be bothered by a robo-advisor asking for permissions for investment decisions¹³². As a result, an independent robo-advisor would not be allowed to carry out transactions that trigger third-party payments (even if the exception in Art. 24(9) MiFID2 applied) if the respective conflict had not been disclosed before.

If the robo-advisors declares that it provides **non-independent advice**, the MiFID2 regime is less rigid. In this case, third-party payments are allowed in principle. According to Art. 24(4)(c) MiFID2, the client needs to be informed about all costs and associated charges, including any third-party payments. Thus, in this context the idea of “disclosure first” applies. However, for the ensuing phase 2 (portfolio management in form of rebalancing) this is not the case and the rules described in the previous paragraph apply. Thus, for any new and previously undisclosed third-party payments, the investment firm would need to make disclosure and wait for the client’s consent.

¹²⁹ See also Better Finance (2020), p. 28.

¹³⁰ See above p. 35.

¹³¹ See above p. 35 et seq.

¹³² See above p. 33 et seqq.

f. Identification and recording of conflicts of interest

The investment firm needs to set out its conflicts of interest policy in writing, Art. 34(1) MiFID2-DelReg. The applicable procedures must be specified and adopted in practice. As a necessary first step, the investment firm would need to **identify all financial products that would constitute a conflict of interest**. This would include, as outlined above, all financial products issued by the investment firm itself, by firms within the same corporate group, by entities that are connected to the firm via shareholdings or distribution agreements, or any third-party payments or comparable incentives¹³³ if the robo-advisor chooses to invest into the respective financial product. The legal basis is Art. 35 MiFID2-DelReg, which requires the investment firm to keep and update a record of the investments in which a conflict of interest entailing a risk of damage to the interest of the client has arisen or, “in the case of an ongoing activity, may arise”. This means that the record-keeping includes past transactions that constituted a conflict of interest as well as a blacklist including transactions that would constitute a conflict of interest. If required, a copy of this list would need to be handed over to the regulator for scrutiny.

In a second step, the results of the identification process would need to be **implemented into the robo-advisor’s algorithm**. In the context of robo-advisory, this means that all financial products that would constitute a conflict of interest would need to be recorded in some kind of “blacklist”. Art. 34(5) MiFID2-DelReg sets out that investment firms need to assess and periodically review the conflicts of interest policy on an at least annual basis. This does not mean that the investment firm only needs to update the conflicted financial products list once a year. Art. 34(5) MiFID2-DelReg addresses the policy in general, not the respective products. These need to be updated on a more regular basis, ideally without undue delay.

g. Summary

The analysis showed that conflicts of interest are a particular problem in the robo-advisor industry. Under the current MiFID2 regime, three situations need to be distinguished:

- If the conflict stems from a **third-party payment** and the robo-advisor is **independent**: receipt of payment is only possible subject to very narrow conditions; disclosure needs to be made in phase 1; undisclosed minor third-party payments in phase 2 need to be credited to the client’s account.
- If the conflict stems from a **third-party payment** and the robo-advisor is **non-independent**: there are no specific restrictions on receipts; disclosure needs to be made in phase 1; undisclosed third-party payments in phase 2 need to be credited to the client’s account.
- If the conflict stems from a **structural affiliation**: disclosure in phase 1 is necessary; in a subsequent conflict in phase 2 the transaction cannot be carried out.

In all these situations the advice provided, or the investment decision made, must be in the best interest of the client, which means it must be the best one available. In all these situations, the investment decision in phase 2 can be carried out if disclosure is made to the client and the decision is approved by the client.

Generally speaking, disclosure is not an effective mechanism for phase 2 of the robo-advisory process because it cannot be implemented into the automated decision-making process effectively. Thus, emphasis needs to be placed on organisational approaches. This particularity of robo-advisory is in line with the regulatory approach taken by MiFID2, so no substantive changes are required. Instead, it is

¹³³ See above p. 31.

suggested that more guidance is provided as to how to design the algorithm, for example, by the ESMA.

2.4.5. Informing and warning the client

a. General rule

The investment firm must provide comprehensive information to the client. According to Art. 24(3) MiFID2, all information (including marketing) must be fair, clear and not misleading. Art. 24(4) MiFID2 contains a list of information that needs to be conveyed to the client (for example, whether the advice is independent and the amount and composition of all costs and associated charges). Art. 24(5) MiFID2 stipulates that this information shall be provided in a comprehensible form in a manner that clients are reasonably able to understand it. These requirements are fleshed out by Art. 44 MiFID2-DelReg, which describes the requirements in much detail (including visual elements like font size).

However, there are structural problems if applied in the context of robo-advisory. Many clients do not even have a clear understanding what exactly “robo-advisor” means¹³⁴, so there is a particular need for explanation and clarification in this context. The fact that clients of robo-advisors often lack financial knowledge makes the problem worse. In addition, robo-advisors appear to tend to overemphasise potential benefits of the investment, while giving much less priority to the related risks¹³⁵.

ESMA has recognised this problem and issued extensive guidance on the issue, with special emphasis on robo-advisory¹³⁶. For example, robo-advisors need to explain the exact degree and extent of human involvement and how the client can ask for human interaction¹³⁷. To make sure that important information is not lost on screen, the ESMA also suggests design features such as pop-up boxes, or the use of interactive text or tooltips¹³⁸. Together, Art. 24 MiFID2, Art. 44 MiFID2-DelReg and the ESMA guidance should provide a **comprehensive end effective** framework.

However, the **complexity and diversity** of the information provided seems to be a problem in practice. **Streamlining** the provision of information seems to be sensible. There are essentially four different areas to cover by the robo-advisor: independence, suitability report, cost structure and conflicts of interest. The details for each area are spread throughout MiFID2 and MiFID2-DelReg. It would be advisable to compile a mandatory list of points, about which robo-advisors need to inform the clients. This list should also specify when and how (potentially even including the precise wording) the information needs to be provided. It need also be made clear that the different information should be strictly kept separate. Otherwise, it would be possible to “hide” potentially problematic disclosure such as conflicts of interest in a flood of cost calculations.

Alternatively, the list could be designed as a template that robo-advisors could use to be fully compliant with the MiFID2-requirements. This technique is already known from other areas of EU law, for example, from Annex I to Directive 2011/83/EU on consumer rights¹³⁹, or from Regulation (EU) No

¹³⁴ A survey conducted in 2018 suggested that only two thirds of investors understood the meaning of “robo-advisor”, see Mezzanotte (2020), fn. 31.

¹³⁵ Mezzanotte (2020), p. 500. The respective study focused on the Swiss market, so it is formally beyond the scope of MiFID2. However, the robo-advisor setting as well as the respective Swiss rules (in particular, the Swiss Financial Services Act, „FinSA“) are comparable.

¹³⁶ ESMA (2018).

¹³⁷ ESMA (2018), p. 20.

¹³⁸ ESMA (2018), p. 21.

¹³⁹ Annex I contains model instructions regarding the information that the business needs to provide to consumers regarding their right of withdrawal.

1286/2014 on **key information documents (KID)** for packaged retail and insurance-based investment products (PRIIPS)¹⁴⁰.

b. Independent advice

The investment firm needs to **inform** the client **whether or not** the advice is provided on an independent basis (Art. 24(4)(a)(i) MiFID2). Art. 52(1) MiFID2-DelReg specifies that investment firms must **explain** in a clear and concise way whether and why investment advice qualifies as independent or non-independent and the type and nature of the restrictions that apply. The wording (“inform”, “whether or not”, “explain”) suggests that the firm **must expressly and directly tell the client** about the nature of the advice; it is insufficient to make the information available on the website because it is unclear if the client retrieves it.

However, in practice this communication does **not seem to be clear enough**. Two studies from 2020¹⁴¹ found that although most robo-advisors present themselves as independent, the respective statement (such as “we are completely independent when it comes to product selection” or “we are guaranteed to receive no commissions and are completely independent”) is typically hidden somewhere on the website.

Thus, it is advised to clarify as to when and how this information has to be conveyed to the client. Ideally, it should be part of a comprehensive information procedure that takes place during the advice process, like as a part of a (printed or digital) key information document (KID)¹⁴².

c. Disclosing conflicts of interest

If a conflict of interest is disclosed (for example, at the start of the contractual relationship), Art. 23(3) MiFID2 requires the disclosure to be on a durable medium and to include sufficient detail to enable the client to make an informed decision with respect to the service in the context of which the conflict arises. According to Art. 34(4) MiFID2-DelReg, the disclosure must clearly state that the organisational and administrative arrangements established by the investment firm to prevent or manage conflicts are not sufficient to ensure, with reasonable confidence, that the risks of damage to the client will be prevented. The nature of the conflict needs to be described specifically.

For the initial agreement between investment firm and client this means that the robo-advisor needs to specifically list all affiliations with issuers of financial products (be it through shareholdings or distribution contracts), regarding which financial products a conflict could (not: would) arise. Art. 23(2) does not refer to the existence of a detrimental conflict of interest, but to the risk of damage to client interests. That means that disclosure is required even if the existence of a detrimental conflict is not certain. A risk for the client interests is sufficient. Thus, in cases of doubt, disclosure is required.

In addition, the investment firm would need to implement a mechanism that only allows the robo-advisor to invest into these financial products if this investment is the best decision for the client. This mechanism would need to be explained to the client in detail.

d. Disclosing the algorithm?

The elephant in the room is of course if the investment firm must disclose the algorithm to the client or at least give a detailed description of its mode of operation. This could be particularly relevant in preparation of a potential lawsuit. Only disclosure of the algorithm would give the client a fighting

¹⁴⁰ See also Better Finance (2020), p. 72 (also suggesting a solution similar to the PRIIPS KID regime for robo-advisors).

¹⁴¹ Better Finance (2020), p. 31 (for the EU market); Mezzanotte (2020), p. 501 (for Switzerland).

¹⁴² See above p. 39.

chance to prove his or her case (i.e. that the investment firm provided flawed advice through the robo-advisor) in a court of law. However, although there is an obligation to disclose this information to the national regulator¹⁴³, there is no such obligation towards clients prescribed under MiFID2.

Although no general statement can be made about the different national contract laws, such a disclosure obligation is very unlikely to exist¹⁴⁴ as there is no general disclosure principle under contract law. Moreover, the algorithm is protected as a trade secret subject to Art. 2 of Directive (EU) 2016/943, protecting the interest of the trade secret holder to keep the information undisclosed – unless required by national courts or administrative authorities to do so. Any disclosure obligation towards clients would be contrary to the basic idea of know-how protection. It would also jeopardise the investment firm's business case because the algorithm is the key element of the robo-advisor. Thus, implementing a disclosure obligation (whether into MiFID2 or other EU legislation) is not convincing. It is preferable to address the existing information asymmetry between client and investment firm through other means, for example, by a reversal of the burden of proof in the civil court¹⁴⁵.

e. Suitability report

A particular case of client information is the suitability report. Art. 25(6) MiFID2 requires the investment firm to provide the client with adequate reports on the service provided in a durable medium. This **periodic reporting** applies to all kinds of investment service and thus, for example, to the provision of portfolio management. This means that the robo-advisor needs to provide periodic reports to the investor about portfolio development (including costs).

For investment advice the requirements are stricter. In this case, a suitability statement in a durable medium is required, specifying the advice given and how that advice meets the preferences, objectives and other characteristics of the retail client. This statement needs to be given **before** the respective transaction is made. The statement can be provided after the transaction only if the following two conditions are met: first, the client has consented to receiving the statement without undue delay after the conclusion of the transaction; second, the investment firm has given the client the option of delaying the transaction in order to receive the statement in advance. Although this might appear like a problem in the automated robo-advisory process, a closer look shows that this is not the case. The specific requirements for investment advice relate to phase 1 of the robo-advisor service, namely the design of the portfolio according to the client's investment preferences. In the case of robo-advisory, this can be referred to as **initial suitability reporting** before the investment portfolio is put together, but not to continuous rebalancing (because the latter is not investment advice). Thus, the robo-advisor does not need to produce and send a suitability statement each time a transaction is carried out in phase 2 (for example, the ratio between debt and equity investments is readjusted or funds are invested into a new financial product for the first time). These transactions are covered by the original planning of the client's portfolio. Only if major changes that are not covered by the original advice (for example, a major restructuring) are made, a new (initial) suitability report needs to be produced.

2.4.6. Availability of the service

Investment firms need to act in the best interest of their clients (Art. 24(1) MiFID2). They also need to take all reasonable steps to ensure continuity and regularity in the performance of investment services and activities, with appropriate systems and resources (Art. 16(4) MiFID2). In this regard, there might be a problem in practice. Reportedly, some robo-advisors were unavailable during market turbulences.

¹⁴³ See above p. 27 and p. 30.

¹⁴⁴ For German law, see Herresthal (2020), § 9, para. 60.

¹⁴⁵ See above p. 30.

For example, the US firm *Betterment* suspended trading in 2016 after a plunge of market prices in the wake of the Brexit referendum. This was supposed to “shield” their clients from the volatile turn in the markets¹⁴⁶. On 5 February 2018, when the Dow Jones lost nearly 5% in one day, the online services of *Betterment* and *Wealthfront* were unavailable to customers for “a short period of time”¹⁴⁷. Similar rumours spread regarding European robo-advisors.

This does not seem to be a serious problem requiring legislative action. It is not even specifically a problem of robo-advisory as this can also happen to brokerage and related services. Potential shortcomings will probably be addressed by the upcoming DORA regime¹⁴⁸, especially business continuity arrangements regarding Information and Communications Technology (ICT) related incidents. Further shortcomings in the availability of service can already be addressed under the current framework, be it by a regulator acting or private investors commencing litigation if they could not sell their assets quickly enough.

2.5. Authorisation of the investment firm (or robo-advisor?)

2.5.1. Authorisation procedure in general

Investment firms require authorisation from the national regulator (the “competent authority”) under Art. 5(1) MiFID2. This authorisation needs to be granted in advance (Art. 7(1) MiFID2), which means that the respective investment service cannot be provided before authorisation is granted. The main condition for authorisation is compliance with various requirements, for example, regarding the management body under Art. 9 MiFID2, or meeting initial capital endowments subject to Art. 9 IFR¹⁴⁹. Art. 21(1) MiFID2 emphasises that investment firms need to meet the conditions for initial authorisation. The authorisation can be withdrawn under Art. 8 MiFID2, for example, if false statements have been made or if the conditions under which the authorisation was granted are no longer met.

This raises a conceptual question. Do robo-advisors require authorisation, or is it the investment firm operating it? This is not just a question of semantics. In the former case, an applicant would need to convince the regulator that the robo-advisor is able to give competent advice. This would obviously provide investor protection on a high level. In the latter case, the applicant would (only) need to demonstrate that they are able to operate a robo-advisor.

The authorisation requirement in Art. 5(1) MiFID2 relates to the “provision of investment services” as a regular occupation or business on a professional basis. This means that it is not the investment firm that needs to be authorised, but the investment service(s) offered. If new/additional services are offered, this requires a new authorisation. This makes sense because providing investment advice is not the same as operating an organised trading facility, for example. In the context of robo-advisory, this means that the services offered (that is, investment advice plus portfolio management) need to be authorised. However, MiFID2 does not prescribe how these services must be performed and it does not set out special procedures for certain technologies (technology neutrality). We also need to consider that offering financial services is protected by the freedom of occupation under Art. 15 of the Charter of Fundamental Rights of the European Union. Thus, in the absence of a specific legal basis, national regulators cannot reject an application for application solely on the basis that it is provided through a

¹⁴⁶ Malito (2016).

¹⁴⁷ Bloomberg News (2018).

¹⁴⁸ European Commission (2020).

¹⁴⁹ The latter does not seem to be a specific problem in the context of robo-advisory and will not be discussed any further.

robo-advisor. Instead, the assessment needs to be based on the general criteria as set out (in particular) in Art. 9 MiFID2.

This does not rule out the possibility of the regulator assessing the algorithm if there are concerns of market stability¹⁵⁰. Rec. 37 of MiFID2 emphasises that the authorisation regime is also supposed to protect the stability of the financial system. According to Art. 9(3)(b), the investment firm's policies and activities need to include appropriate stress testing. If there are concrete concerns about market stability, the regulator can take respective action. However, this is not yet the case¹⁵¹ and thus cannot be the basis for an ex-ante assessment of the software and the algorithm used.

2.5.2. Adequate skill of staff and management

a. Lack of standardisation

MiFID2 obligates investment firms to have staff that is adequately skilled. According to Art. 9(4) MiFID2 and Art. 91(1) of Directive 2013/36/EU, the members of the management body shall at all times be of sufficiently good repute and possess sufficient knowledge, skills and experience to perform their duties. In addition, the overall composition of the management body shall reflect an adequately broad range of experience. Similarly, the management body must define, approve and oversee the organisation of the firm, including the skills, knowledge or expertise (Art. 9(3)(a) MiFID2). Specifically for investment advice, the investment firms need to ensure that natural persons giving advice possess the necessary knowledge and competence to fulfil their obligations under Art. 24/25 (see Art. 25(1) MiFID2).

In essence, the robo-advisor should be treated under MiFID2 **like a human employee**. In both cases, the investment firm is the responsible principal, and in both cases, the quality of the service provided depends on the employee/robo-advisor. That does not make the robo-advisor a legal subject. However, in the context of MiFID2 the parallel between employee and robo-advisor is accurate¹⁵². The logical precondition for this approach is that the investment firm needs to make sure that it also has staff members who have the skills to ensure that the robo-advisor has the necessary skills as set out in the previous paragraph.

The practical problem is that, in contrast to human advisors, there are **no standards for robo-advisors** that the regulator could rely on. For managers/employees, the necessary skills could be demonstrated by a respective education (apprenticeship, university), by work experience in the field or by continued training in the course of employment. However, for robo-advisors and the underlying algorithms no comparable standards exist. For the moment, this leaves two possibilities: first, the regulator could conduct an own assessment of the algorithm; second, the skill requirements could be applied to the persons responsible for the robo-advisor (not to the robo-advisor himself).

b. Direct licensing: assessing the algorithm

An assessment of the algorithm by the regulator is not realistic. The regulator would need to engage in a hands-on assessment, potentially involving tests of the functionality of the robo-advisor. This is expensive and requires significant staff resources. This might be particularly difficult for regulators in smaller Member States.

¹⁵⁰ Maume (2019b), p. 635.

¹⁵¹ See below p. 46 et seqq.

¹⁵² The irony is that the origin of the word "robot" (compare, for example, the Russian рабoра) refers to labour or even slave labour. The term was first used in a dystopian play by Czech writer Karel Čapek in 1920.

In addition, any assessment (in particular, rejects) would also be a serious intrusion into market mechanics because basically public authorities would decide what is a “good” or “bad” advice or service. This is not the role of a regulator¹⁵³. Such an assessment would even create liability issues: if a government body audits and approves of an algorithm and this algorithm then makes “wrong” investment decisions, the government itself might make itself liable. Even worse, the effect on the markets (in particular, the investment firm) would be irreversible.

Moreover, algorithms undergo evolution. It is correct that the result of an algorithm-based advice process is predetermined. However, software engineers continuously modify the algorithm to make it more efficient¹⁵⁴. Besides, modern algorithms often have self-learning capabilities¹⁵⁵. Strictly speaking, the regulator would need to approve any major changes before it could be implemented. This would be unrealistic even if regulators had the required resources to carry out such ongoing supervision (which they typically do not).

c. Indirect licensing: assessing staff members

Instead, it would be plausible to require the staff members responsible for the robo-advisor to have the necessary skills¹⁵⁶. Art. 9(3)(a) MiFID2 is a viable legal basis, as it states that the management body define, approve and oversee:

“...the organisation of the firm for the provision of investment services and activities and ancillary services, including the skills, knowledge and expertise required by personnel, the resources, the procedures and the arrangements for the provision of services and activities, taking into account the nature, scale and complexity of its business and all the requirements the firm has to comply with”.

This broad wording gives the regulators wide discretion as to which organisational elements they require from the investment firm that is applying for authorisation.

The ensuing question is which persons would be included in this assessment, and what the applicable standards are. This should be separated into two areas. On the **financial level**, this would include the person(s) setting out the overall policies for the robo-advisor. It would also need to include the person who monitors the robo-advisor internally and is (if implemented in the algorithm) involved in the decision-making process. On the **technical level**, this would need to include the staff member(s) responsible for supervision and amending the algorithm (including external service providers if certain tasks are outsourced, see Art. 16(5) MiFID2). The firm’s internal arrangements, which also need to be assessed in the authorisation process, would need to consider specific risks arising from robo-advice. As stated, no standards have been developed in this regard yet. Thus, it is advised that guidance for national regulators is provided on the EU level (for example, by the ESMA).

d. Mandatory auditing

Another option would be mandatory auditing. The idea is that a specialised third-party tests the algorithm according to market standards. Third-party auditing is an established approach to ensure or to demonstrate compliance. It is particularly useful in emerging markets that lack clear and predictable rules¹⁵⁷. Third-party auditing is already a common mechanism in the robo-advisor market¹⁵⁸. During the

¹⁵³ Maume (2019a), p. 77 et seqq.

¹⁵⁴ Maume (2019b), p. 634.

¹⁵⁵ See above p. 18.

¹⁵⁶ Dieckmann (2020), § 8, para. 40.43.

¹⁵⁷ For example, issuers of blockchain-based tokens use external audits to demonstrate that the programming of the underlying smart-contracts is safe and in line with market standards.

¹⁵⁸ Birgmeir (2019), p. 60.

yearly audit at investment firms, auditors test the functioning of the algorithms usually by undertaking a black-box testing¹⁵⁹. The results of these audits can be presented to the regulator to establish the functionality of the robo-advisor interface.

However, such a mechanism is not set out in MiFID2 yet. An external audit would result in costs for the investment firm. These would be higher than to produce documents that explain the workings of the algorithm to the regulator, which can already be done under Art. 69(2) and Art. 17(2) MiFID2. Thus, a respective legal basis for the regulator would be required. Of course, an investment firm can already have a third-party audit carried out under the current framework. However, this would be on a voluntary basis and it is not clear if and to what extent this is accepted by the national regulators.

In a second step, a uniform set of test areas would need to be defined. This could include suitability assessments (including consistency checks), the disclosure of conflicts of interest (before entering into the agreement) and the management system for conflicts of interest that arise subsequently, the algorithm's reaction to market changes or necessary rebalancing, etc. The quality of the advice itself should not be assessed because this would constitute a major intrusion into a basic market mechanism: competition should be based upon the price and the quality of the service, not on an assessment by public authorities.

¹⁵⁹ Black-box-testing describes a test of the functionality without scrutinising the internal workings.

3. FINANCIAL STABILITY

KEY FINDINGS

The fears of robo-advisors becoming a problem for financial stability are not warranted. As of today, their market penetration is much too low. Potential market inefficiencies are not comparable to risks regarding financial stability.

Robo-advisor trading is much slower than high-frequency trading. Even algorithms applying active strategies try to analyse the market in advance and do not rebalance their assets more often than every few weeks. Most of the passive robo-advisors try not to touch their portfolio at all. The risk of high-speed rebalancing by robo-advisors shaking the markets is non-existent.

The advice given and the decisions made by robo-advisors may focus on ETFs in practice. However, the concrete ETFs chosen for investment can differ greatly. Even if the market share reached a significant level, it is very unlikely that the different algorithms would move assets in the same direction simultaneously. In addition, robo-advisors spread their assets as wide as possible. This high level of diversification also makes market imbalances unlikely because the investments are hardly ever made in one single area.

Another key concern regarding robo-advisor is that they could be a threat to financial stability. The idea is that investments might be funnelled into assets that would not be well-suited for the respective investors. This would be particularly problematic if the robo-advisors tend to come to the same (or at least: highly similar) conclusions in their analyses. A potential consequence would be market imbalances and a threat to the stability of the financial system. However, as the analysis will show, this is not the case for various reasons.

3.1. Market stability and market efficiency

There is a significant **difference between financial stability and market efficiency**. Financial stability describes to what extent the financial system (the financial markets and the financial institutions) is resistant to economic shocks and is fit to smoothly fulfil its basic functions: the intermediation of financial funds, management of risks and the arrangement of payments. A key to protect financial stability is the reduction or prevention of systemic risks (e.g. through large banks).

However, systemic risk is not a key concern of the MiFID2 regime, but primarily of banking regulation. In contrast, market efficiency refers to the degree to which the market price reflects all relevant information. While problems of financial stability pose a threat to the financial system as such, problems of market efficiencies “only” lead to decreased returns for investors and issuers. As stated above, the AuM of robo-advisors are less than 0.1% of all assets in the financial markets¹⁶⁰. Even if all robo-advisors moved their investment into a certain direction simultaneously (which is not realistic), the impact on the markets would be negligible. It would be a shortcoming of market efficiency, resulting in distorted returns of investment for some market participants. This is highly undesirable, but not a systemic problem. Given today’s growth rates, it will arguably take decades until robo-advisory reaches a level where it could raise systemic issues.

¹⁶⁰ See above p. 14.

3.2. Great variation of investment advice

In addition, robo-advisors do not tend to act uniformly to market developments. The idea that robo-advisors act in similar ways because they follow predetermined patterns is inaccurate. There are **various investment strategies** and various ways to pursue them. As outlined above, three basic strategies exist: first, passive strategies that involve as little trading as possible, second, active strategies that try to anticipate the markets (e.g. selling before a crash) and third, active strategies that try to act in an anticyclical way (e.g. buying when it is cheap). This results in fundamentally different order patterns. The algorithm is the key asset of the investment firm operating the robo-advisor. It is a precious business secret, and the investment firms spend substantive money on development and subsequent training. This also applies to the selection of financial products that are available for investment. All these aspects can vary significantly between different robo-advisors.

This is best illustrated by several **black-box studies**. In all these studies, identical user profiles were fed into the robo-advisor websites and the results then compared. In a recent study, 14 platforms throughout Europe were compared¹⁶¹. The researchers expected for a relatively risk-averse user profile (“baby boomer”) a suggested equity allocation between 35% and 75%. However, the variance was much bigger because 8 out of the 14 platforms were outside this margin. The suggestions even ranged between 9% and 95%. A German study from 2018, also using a risk-averse profile (“teacher”), identified a range between 0 and 70% (at a median of 30.5%)¹⁶². A FINRA study from 2015 on the US market identified a range between 51% and 90% equity allocation for a hypothetical 27-year-old investor¹⁶³. These studies do not allow any conclusions about the quality of the advice given¹⁶⁴, but they indicate a great variance in the advice given. This is a very strong argument against the argument that robo-advisors’ advice could be too uniform and thus create market imbalances.

3.3. Low frequency of rebalancing

Moreover, there seems to be a common **misunderstanding between robo-advisory and high-frequency trading**. This is fuelled by inaccurate headlines such as “Did robot algorithms trigger market plunge?”¹⁶⁵. As outlined above, robo-advisors carry out rebalancing in different frequencies. However, this is a question of days, weeks or often months¹⁶⁶, whereas high-frequency trades take place in seconds or a fraction thereof. This has nothing to do with fears of a new “flash crash” as it happened in 2010¹⁶⁷. Increasing the frequency of robo-advisor trades (which might move them closer to high-frequency trading) is at odds with the basic idea of robo-advisory, namely efficiency. Trading incurs costs, which means increasing the trading frequency needs to be justified by increased returns. Even for robo-advisors applying active strategies, increasing trading frequency is only efficient to a certain extent. Thus, the idea of a robo advisor rebalancing so quickly to market developments that market operators, regulators or the investment firm cannot react is unrealistic.

¹⁶¹ Better Finance (2020), pp. 60-61.

¹⁶² Richter (2018), pp. 53-54.

¹⁶³ FINRA (2016), pp. 2-4.

¹⁶⁴ Even a 95% equity allocation can make sense if the investment period is long enough and the rebalancing mechanism is effective.

¹⁶⁵ BBC News (2018).

¹⁶⁶ See above p. 16.

¹⁶⁷ See for details, US Securities and Exchanges Commission (2020), passim.

3.4. Portfolio diversification

Another argument against systemic risk is the portfolio structure. Most robo-advisors invest in ETFs and similar assets. According to Statista, there were 7,602 ETFs world-wide in 2020¹⁶⁸. **Portfolio diversification** is a key element, so robo-advisors try to spread out their investments as far as possible. For example, the portfolio of German robo-advisor *Kapilendo* supposedly includes more than 10,000 different assets (!) from more than 80 countries¹⁶⁹. The purpose is to minimise investor risks as suggested by modern portfolio theory. This also means that portfolio adjustments are necessary less often and that such adjustments are of minor volume each. The impact on particular stocks, potentially creating market imbalances, is low.

¹⁶⁸ See Statista, available at <https://www.statista.com/>.

¹⁶⁹ Brokervergleich (2021).

4. CONCLUSION

The analysis has shown that, all in all, MiFID2 provides a suitable framework for the protection of investors using robo-advisors in the EU. The following points can be highlighted:

- A key recommendation is the introduction of a mandatory third-party audit for robo-advisors¹⁷⁰. This would demonstrate to the national regulators that the algorithm is sound and complies with the MiFID2-framework. An authorisation regime for the algorithm itself supervised by the national regulator cannot be recommended.
- An additional possibility would be a strengthened private enforcement regime¹⁷¹. Private enforcement is currently not covered by MiFID2.
- Structural conflicts are a particular concern for the use of robo-advisors¹⁷². The problem is that disclosure of conflicts of interest rests on the idea that the other party can factor the disclosed information into their decision. This is not possible for automated algorithmic decisions. The algorithm should only be allowed to carry out “conflicted” decisions automatically during the rebalancing process if they are clearly in the best interest of the client (even if the decisions are not necessarily detrimental for the client). MiFID2 provides a suitable framework for these issues, but its application should be clarified by delegated regulation, or at least by ESMA.
- Further improvements could be achieved by the streamlining of the various information mechanisms, to make sure that important information is not lost between insignificant information¹⁷³. A possible option could be a (printed or digital) key information document (KID), like the one set out in the PRIIPS Regulation.
- The fears of robo-advisors becoming a problem for financial stability are not warranted. As of today, their market penetration is much too low. The automated rebalancing takes place relatively slowly, in particular in comparison to the more problematic high-frequency trading. As robo-advisors spread their assets as wide as possible, it is very unlikely that they create market imbalances or threats to the stability of the financial system.
- The Commission proposal for a regulation of artificial intelligence does not apply to robo-advisors¹⁷⁴. However, the principles and approaches laid out in the proposal can provide guidance for amendments of the current regulation of robo-advisory. Divergences between the regulation of AI and the regulation of robo-advisors should be avoided.

¹⁷⁰ See above p. 44.

¹⁷¹ See above p. 30.

¹⁷² See above p. 31.

¹⁷³ See above p. 39.

¹⁷⁴ See above p. 19.

REFERENCES

- BBC News, *Did robot algorithms trigger market plunge?*, (6 February 2018), available at <https://www.bbc.com/news/business-42959755>.
- Better Finance, *Robo-Advice 5.0: Can Consumers Trust Robots?* (December 2020), available at <https://betterfinance.eu/wp-content/uploads/Robo-Advice-Report-2020-25012021.pdf>.
- Bhattacharya, U., Daouk H., *The World Price of Insider Trading*, (2002), *Journal of Finance*, Vol.57, No.1. pp. 75-108.
- Birgmeir, K., *Regulating Robo Adviser Algorithms: Possible, Sensible, Necessary?* (20 May 2019), M.Sc. thesis at TUM School of Management, available at <https://mediatum.ub.tum.de/doc/1612912/1612912.pdf>.
- Black, B., *The Legal and Institutional Preconditions for Strong Securities Markets*, (2001) *UCLA Law Review*, Vol. 48, pp. 781-855.
- Bloomberg News, *Robo-adviser websites crashed as market slid*, (5 February 2018), available at <https://www.investmentnews.com/robo-adviser-websites-crashed-as-market-slid-73344>.
- Brokervergleich.de, *Kapilendo Vermögensverwaltung – Test und Erfahrungen*, (3 May 2021), available at <https://www.brokervergleich.de/kapilendo-vermoegensverwaltung/>.
- Chiu, I., *Fintech and Disruptive Business Models in Financial Products, Intermediation and Markets – Policy Implications for Financial Regulators*, *Journal of Technology Law & Policy* 21 (2016), pp. 55–112.
- Cormen, T. H., Leiserson, C. E., Rivest, R. L., Stein, C. (2009), *Introduction to Algorithms*, (3rd ed.).
- Dieckmann, A., *Zuverlässigkeit des Anlageberaters nach § 87 WpHG*, in: Linardatos, D. (ed.), *Rechtshandbuch Robo-Advice* (Verlag C.H. Beck, 2020).
- Edwards, B. P., *The Rise of Automated Investment Advice: Can Robo-Advisors Rescue the Retail Market?*, (2018) *Chicago-Kent Law Review*, Vol. 93, Nr. 1, pp. 97-111, available at <https://scholarship.kentlaw.iit.edu/cklawreview/vol93/iss1/3/>.
- European Commission, *A more competitive and innovative European financial sector* (Consultation Document, 2017), available at https://ec.europa.eu/info/sites/info/files/2017-fintech-consultation-document_en_0.pdf.
- European Commission, *Proposal for a Regulation of the European Parliament and of the Council on digital operational resilience for the financial sector and amending Regulations (EC) No 1060/2009, (EU) No 648/2012, (EU) No 600/2014 and (EU) No 909/2014* (COM (2020) 595 final, 24 September 2020),, available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0595>; cited European Commission (2020).
- European Commission, *Proposal for a Regulation of the European Parliament and the Council laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain union legislative acts*, (COM (2021) 206 final, 21 April 2021), available at <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELLAR:e0649735-a372-11eb-9585-01aa75ed71a1>; cited European Commission (2021).
- European Securities and Markets Authority, *Final Report – Guidelines on Certain Aspects of the MiFiD II Suitability Requirements*, (ESMA35-43-869, 28 May 2018), available at <https://www.esma.europa.eu/file/48488/download?token=2diDTVyq>.

- European Securities and Markets Authority, *Questions and Answers on MIFID II and MiFIR market structure topics*, (last updated 6 April 2021), available at https://www.esma.europa.eu/sites/default/files/library/esma70-872942901-38_qas_markets_structures_issues.pdf.
- Fein, M. L., *FINRA's Report on Robo-Advisors: Fiduciary Implications*, (1 April 2016), available at <https://ssrn.com/abstract=2768295>.
- FINRA, *Report on Digital Investment Advice*, (March 2016) available at <https://www.finra.org/sites/default/files/digital-investment-advice-report.pdf>.
- Fjeld, J. et al, *Principled Artificial Intelligence: Mapping Consensus in Ethical and Rights-based Approaches to Principles for AI*, (Berkman Klein Center for Internet & Society, Harvard Law School, 2020), available at <https://dash.harvard.edu/handle/1/42160420>.
- Grochowski, M. et al, *Algorithmic Transparency and Explainability for EU Consumer Protection: Unwrapping the Regulatory Premises*, (2021) *Critical Analysis of Law*, Vol. 8, Nr.1, pp. 43-63.
- Hennemann, M. and Kumkar, L., *Robo-Advice und automatisierte Entscheidungen im Einzelfall*, in: Linardatos, D. (ed.), *Rechtshandbuch Robo-Advice* (Verlag C.H. Beck, 2020).
- Herresthal, C., *Vertriebsbezogene Interessenskonflikte beim Robo Advisor*, in: Linardatos, D. (ed.), *Rechtshandbuch Robo-Advice* (Verlag C.H. Beck, 2020).
- International Organization of Securities Commissions, *Update to the Report on the IOSCO Automated Advice Tools Survey – Final Report*, (File No. FR15/2016), available at <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD552.pdf>.
- International Organization of Securities Commissions, *Objectives and Principles of Securities Regulation* (May 2017), available at <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD561.pdf>.
- Ji, M., *Are Robots Good Fiduciaries?*, *Columbia Law Review*, Vol. 117, Nr. 6, pp. 1543-1584 (2017), available at <https://columbialawreview.org/content/are-robots-good-fiduciaries-regulating-robot-advisors-under-the-investment-advisers-act-of-1940-2/>.
- Joint Committee of the European Supervisory Authorities (JCESA), *Joint Committee Discussion Paper on automation in financial advice*, (No. JC 2015-080, 4 December 2015), pp. 16-29, available at https://www.esma.europa.eu/sites/default/files/library/jc_2015_080_discussion_paper_on_automation_in_financial_advice.pdf.
- Kaya, O., *Deutsche Robo-Advisors – Schnelles Wachstum, solide Performance, hohe Kosten*, (DB Research, 21 February 2019), available at https://www.dbresearch.de/PROD/RPS_DE-PROD/PROD000000000488059/Deutsche_Robo-Advisors%3A_Schnelles_Wachstum%2C_solide.pdf.
- Khatua, C., *What is AI and what does it have to do with my portfolio?*, (EquBot, 19 October 2020), available at <https://equbot.com/what-is-ai-and-what-does-it-have-to-do-with-my-portfolio/#>.
- Koller, I., in: Assmann, H.D., Schneider, U., Mülbart, P. (eds.), *Wertpapierhandelsrecht* (7th ed., 2019).
- Knuth, D., *Art of Computer Programming, Volume 1: Fundamental Algorithms* (3rd ed., 1997).
- Konish, L., *Firms like Morgan Stanley are using artificial intelligence to manage clients' money* (CNBC, 20 October 2018), available at <https://www.cnbc.com/2018/10/19/-artificial-intelligence-is-changing-how-investors-money-is-managed.html?qsearchterm=konish%20artificial>.

- La Porta, R. et al, *What Works in Securities Laws?*, (2006) *Journal of Finance*, Vo. 61, Nr. 1, pp. 1-32.
- Linardatos, D., *Technische und rechtliche Grundlagen*, in: Linardatos, D. (ed.), *Rechtshandbuch Robo-Advice* (Verlag C.H. Beck, 2020).
- Malito, A., *Betterment's move to halt trading following Brexit vote sparks controversy* (Investment News, 5 July 2016), available at <https://www.investmentnews.com/betterments-move-to-halt-trading-following-brexit-vote-sparks-controversy-68234>.
- Maume, P., *Conflicts of Interest and Disclosure under Company Law*, (2016) 16 *Journal of Corporate Law Studies* 255.
- Maume, P., *In Uncharted Territory – Banking Supervision meets Fintech*, *Corporate Finance* (2017), Vol. 11-12, pp. 373-378, available at <https://www.ssrn.com/abstract=3051837>.
- Maume, P., *Regulating Robo-Advisory*, (2019) *Texas International Law Journal*, Vol.55, Nr.1, pp. 49-87; cited Maume (2019a).
- Maume, P., *Reducing Legal Uncertainty and Regulatory Arbitrage for Robo-Advice*, (2019) *European Company and Financial Law Review (ECFR)*, Vol. 16, pp. 622-651; cited Maume (2019b).
- Mezzanotte, F. E., *An examination into the investor protection properties of robo-advisory services in Switzerland*, (2020) *Capital Markets Law Journal*, Vol.15, pp. 489-508.
- Neugarten, J., *What Fees Do Financial Advisors Charge?* (Investopedia, 23 May 2021), available at <https://www.investopedia.com/ask/answers/091815/what-fees-do-financial-advisors-charge.asp>.
- Polyak, I., *Millenials and robo-advisors: A match made in heaven?* (CNBC, 22 June 2015), available at <https://www.cnbc.com/2015/06/21/millennials-and-robo-advisors-a-match-made-in-heaven.html>.
- Rabener, E., *Brexit Highlights Need for Risk Management When Investing* (1 July 2016), available at <https://uk.scalable.capital/investment-strategy/brexit-need-for-risk-management-investing>.
- Richter, C., *MiFID2 – Geeignetheitsprüfung bei Robo-Advisory: Rechtliche und praktische Umsetzung* (12 October 2018), M.Sc. thesis at TUM School of Management, available at <https://mediatum.ub.tum.de/doc/1612913/1612913.pdf>.
- Ricketts, D., *BlackRock helps Scalable Capital edge funding past € 66m*, (5 August 2019), available at <https://www.fnlondon.com/articles/blackrock-helps-scalable-capital-edge-funding-past-e66m-20190805>.
- Santos, M., *Supervised vs Unsupervised Machine Learning* (25 May 2020), available at <https://towardsdatascience.com/supervised-vs-unsupervised-machine-learning-ae895afc57f>; cited Santos (2020a).
- Santos, M., *Teaching a Machine to Trade Stocks like Warren Buffett, Part I*, (12 January 2020), available at <https://medium.com/swlh/teaching-a-machine-to-trade-stocks-like-warren-buffett-part-i-445849b208c6>; cited Santos (2020b).
- Tedesco, D., *Robo-Adviser? Creating the Blended Adviser Experience*, *Journal of Financial Planning* Vol. 28, p.17 (2015).
- US Securities and Exchange Commission, *Findings Regarding the Market Events of May 6 2010* (30 September 2010), available at <https://www.sec.gov/files/marketevents-report.pdf>.

- Williams-Grut, O., *BlackRock doubles down on Scalable Capital as fintech raises € 50m*, (22 July 2020), available at <https://uk.finance.yahoo.com/news/scalable-capital-series-d-50-million-funding-blackrock-holtzbrinck-ventures-tengelmann-ventures-110349145.html>.

This study analyses if and to what extent the current EU legal framework provides effective investor protection for customers of robo-advisors. It puts emphasis on structural conflicts of interests, the difficulties presented by the supervision of algorithms, and potential threats to the stability of the financial system.

This document was provided by the Policy Department for Economic, Scientific and Quality of Life Policies at the request of the committee on Economic and Monetary Affairs (ECON).

PE 662.928
IP/A/ECON/2021-01

Print ISBN 978-92-846-8301-7 | doi:10.2861/7328 | QA-09-21-242-EN-C
PDF ISBN 978-92-846-8302-4 | doi:10.2861/88874 | QA-09-21-242-EN-N