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# **AI-Driven Robo-Advice**

**The Suitability of the EU Legal Framework to Regulate the  
Impacts of AI in Robo-Advice and Promote Financial Inclusion**

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**Master Thesis carried out in the context of the  
Master of Transnational Law  
under the supervision of Dr. Clara Martins Pereira**

**31<sup>st</sup> May 2022**



*To my grandmother.*

## **Abstract**

Robo-advisors blend the characteristics of traditional financial advisors and technology, creating an instrument that offers financial advice and portfolio management services for a fraction of the cost of human advisors, which can favor those who cannot normally access financial services. Having yet a great margin to grow, robo-advisors would benefit from the implementation of artificial intelligence into the underlying algorithms, improving their services and expanding their customer basis. However, artificial intelligence brings risks and challenges that deserve legal consideration in order to ensure that the objective of financial inclusion is not precluded.

**Key words:** robo-advice, robo-advisor, robo-advisory, artificial intelligence, financial inclusion, algorithm, automated decision-making.

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## Abbreviations

AI	Artificial Intelligence
ESMA	European Securities and Markets Authority
EU	European Union
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)
MiFID	Directive 2004/39/EC on Markets in Financial Instruments
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 organizational requirements and operating conditions for investment firms and defined terms for the purposes of that Directive
USA	United States of America
UK	United Kingdom

# I. Introduction

Robo-advisory is a technology-enabled service that presents itself as an alternative to traditional financial advisory. Notwithstanding the market share that robo-advisors have conquered over the last years, they are far from unleashing their full potential. As such, the first point of this dissertation is to explain why robo-advisors may undergo significant evolution if their algorithms are programmed with artificial intelligence, and how these future robo-advisors have the chance to be propellants of financial inclusion. The second purpose is to assess whether the legal regime currently applicable to robo-advisory within the European Union fits the changes brought by artificial intelligence.

As such, the research question explored concerns the suitability of the EU legal framework to regulate the impacts of artificial intelligence in robo-advice, while at the same time promoting the financial inclusion agenda. In other words, is the existing EU regulation sufficient to (1) overcome the challenges brought by robo-advisors programmed with artificial intelligence and (2) not baffle their opportunities, whilst (3) ensuring an inclusive access to these services? The argument defended is that prevailing regulation can be adjusted to regulate AI-driven robo-advisory, but it is not able to conquer one problem: the expanding opacity of algorithms.

This dissertation is divided in three core chapters, designed to effectively and satisfactorily answer the research question proposed. With the view to achieve this objective, the first step will be providing definitions of the main concepts used throughout this paper – robo-advisor/robo-advice, artificial intelligence, and financial inclusion -, as well as other related notions that will also be mentioned. The second phase will be reserved for the analysis of the impacts of AI-driven robo-advisor, with a special focus on its opportunities, challenges and risks. Thirdly, a thorough investigation of the current legal framework for robo-advisors in the EU (centered on MiFID2 and with reference to the recently proposed Artificial Intelligence Act) will take place, so as to evaluate if the existing regulation is appropriate to cover the opportunities, challenges and risks of AI-driven robo-advisory while promoting financial inclusion.

The approach used in this dissertation is eminently doctrinal. The articles, reports and other relevant sources studied were selected based on their scientific credibility, as well as on their usefulness for the topics under investigation.

## II. Relevant Definitions

This initial chapter will be focused on defining concepts which I deem important to adequately frame the topic here in discussion. The first notions analyzed are “robo-advisor” and “robo-advice”, which I chose to jointly examine as they are entirely linked, robo-advisor being simply the tool or software that depicts and delivers the robo-advice *per se*<sup>1</sup>. Therefore, they will be used indiscriminately throughout the text.

The second concept will be Artificial Intelligence. Although it is seemingly impossible to reach a global definition for AI, it is important to outline its main characteristics to then understand how it may possibly be applicable to robo-advice.

Finally, defining financial inclusion is crucial to perceive how it may be affected if more mechanisms are created to broaden the provision of financial services to the excluded individuals.

### 1. Robo-Advisor/Robo-Advice

Robo-advice is a one of the tools originating from Fintech, a term combining the concepts of finance and technology - ‘Financial technology’ -, and which describes the new technologies aimed at improving “the delivery and use of financial services”<sup>2</sup>. Robo-advisors emerged as a substitute to traditional financial advisors (human advisors), potentially as a form to bypass their shortcomings<sup>3</sup>. Although there are robo-advisors with different purposes<sup>4</sup>, this paper will only address investment robo-advisors. Likewise, investment robo-advisors can be divided into three categories: robo-advisors who provide advice and manage financial instruments in the name of the investor (i.e., manage investors’ portfolios) belong to the first category. The second is comprised by robo-advisors that advise an investor based on his preferences and characteristics, but the client keeps the decision and responsibility to take the investment decision. The last group concerns those robo-advisors that do not provide tailored

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<sup>1</sup> Throughout the text, ‘robo-advisory’ will be used as well.

<sup>2</sup> Definition from Julia Kagan, ‘Financial Technology – Fintech’ (*Investopedia*, 27 August 2020) <<https://www.investopedia.com/terms/f/fintech.asp>> accessed 29 December 2021.

<sup>3</sup> Francesco D’Acunto, Alberto G. Rossi, ‘Robo-Advising’ (2020) 3.

<sup>4</sup> Namely, health insurance, mortgage and investment robo-advisors, as explained in Tom Baker and Benedict G. C. Dellaert, ‘Regulating Robo Advice Across the Financial Services Industry’ (2018) Faculty Scholarship at Penn Law 725-731.

advice but only assist in the purchase and sale of financial products<sup>5</sup>. This paper will be focused on the first category, as the remaining types do not fall under our intended scope.

Over the years, robo-advice and robo-advisors have been the focus of a multitude of studies, the majority of which provided their own definitions of the concepts. Albeit different, these definitions all revolve around the same group of notions, namely those of finance, automation, portfolio<sup>6</sup> creation and absence or minimal human intervention. It easily comes to mind, as the name unveils, that robo-advisors combine the characteristics of a human financial advisor and of a robot, thus resulting in ‘robo-advisor’.

According to Lee<sup>7</sup>, robo-advice is in fact an “umbrella term” that encompasses various terms related to “online automated tools and algorithms” which assist individuals in their financial and investment decisions. In its turn, the author argues that a robo-advisor is just a category within financial advisors, with diversified levels of human intervention, and which allows for online investment and management of assets.

Day, Lin and Chen<sup>8</sup> describe robo-advisors as a “wealth management service” that “achieves algorithm-based portfolio recommendations without human planning”.

For Maume<sup>9</sup>, robo-advisors consist in “algorithm-based investment strategies that rely on a high level of diversification that strongly favors exchange-traded funds”.

Robo-advisors are disruptive instruments which assist investors in their investment decisions through the employment of algorithms. In some way, they are a representation of the renovation of finance management services, with rising resort to technologies, and they led to the creation of a new business model<sup>10</sup>.

Furthermore, the activity of robo-advisors is only possible thanks to the collection of information about the client and subsequent profile creation, usually regarding their financial situation, level of risk they are willing to take, financial knowledge, and future goals they aspire

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<sup>5</sup> Philipp Maume, ‘Regulating Robo-Advisory’ (2019) 55(1) Texas International Law Journal 13, 14 – cited Maume a (2019).

<sup>6</sup> Portfolio refers to the “allocation of investment on different types of assets on the basis of the individual investor’s circumstances and investment objectives, which assign each asset with a different weight to maximize return and minimize risk coefficient”, as in Min-Yuh Day, Jian-Ting Lin, Yuan-Chih Chen, ‘Artificial Intelligence for Conversational Robo-Advisor’ (2018) IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM) 1058.

<sup>7</sup> Joseph Lee, ‘Access to Finance for Artificial Intelligence Regulation in the Financial Services Industry’ (2019) 21 European Business Organization Law Review 6-7.

<sup>8</sup> Min-Yuh Day, Jian-Ting Lin, Yuan-Chih Chen (2018) 1057.

<sup>9</sup> Maume a (2019) 5.

<sup>10</sup> Min-Yuh Day, Tun-Kung Cheng and Jheng-Gang Li, ‘AI Robo-Advisor with Big Data Analytics for Financial Services’ (2018) IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM) 1027.

to reach with their investments<sup>11</sup>. This information is collected by means of an online questionnaire. In the EU, under MiFID, a suitability assessment was required to assess the client's level of financial knowledge. MiFID2, which came to replace MiFID, strengthened the protection of investors, especially in what concerns financial literacy. When levels of financial knowledge are low, robo-advisors should automatically reduce the client's risk exposure<sup>12</sup>.

After gathering these details, typical robo-advisors create a portfolio and automatically invest the assigned assets. Investment goals and risk aversion levels are the paramount characteristics when robo-advisors are drafting a portfolio<sup>13</sup>. However, there can also be other aspects taken into consideration during the creation of a portfolio, namely compliance with sustainability goals<sup>14</sup>.

After the initial investment phase, robo-advisors dynamically adjust the client's portfolio of assets (the so-called portfolio rebalance) to an optimal state, depending on market conditions and the investor's personal preferences and expectations<sup>15</sup>. In short, rebalance involves adjusting the portfolio when the algorithm finds that the original proposed product was altered<sup>16</sup>. As an example, if the robo-advisor initially recommended a portfolio composed by 70% bonds and 30% funds, if it detects that, due to market and financial changes, the ratio is now 75/25, it automatically sells and buys in the adequate proportion so as to comply with the defined assets percentage and the client's specific characteristics. When it comes to rebalancing frequency, different robo-advisors employ different methods; either rebalancing is carried out automatically, or it occurs in established intervals<sup>17</sup>.

Lastly, it should be noted that different robo-advisors offer distinct levels of human interaction, ranging from allowing no contact with a human employee up until hybrid models, which combine robo-advisory with traditional features of financial services. Typically, clients can ask for human intervention at any phase of the provision of services<sup>18</sup>. The fusion of robo-advisors and human employees can be quite valuable for customers who lack the necessary knowledge to understand the operation of a robo-advisor or when a relevant doubt appears. However, it must be taken into consideration that requesting the services of a human employee

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<sup>11</sup> Philip Treleaven, Jeremy Barnett, Adriano Koshiyama, 'Algorithms: Law and Regulations' (2019) 52(2) Computer, 36; Milo Bianchi, Marie Brière, 'Robo-Advising: Less AI and More XAI?' (2021) 6.

<sup>12</sup> Milo Bianchi, Marie Brière (2021) 6.

<sup>13</sup> Ibid 7.

<sup>14</sup> Philipp Maume, 'Robo-advisors: How Do They Fit in the Existing EU Regulatory Framework, in Particular with Regard to Investor Protection?: Study Requested by the ECON Committee' (2021) European Parliament 16 – cited Maume (2021).

<sup>15</sup> Min-Yuh Day, Tun-Kung Cheng and Jheng-Gang Li (2018) 1027.

<sup>16</sup> Maume (2021) 16.

<sup>17</sup> Ibid 17.

<sup>18</sup> Maume a (2019) 17, 18.

is not cost free, which is an obstacle to the low fees that are so appealing in robo-advisors and somehow dispels the target clients of these advisors.

## 2. Artificial Intelligence

After defining robo-advisors, it is important to assess how artificial intelligence may have the ability to impact or at least change our perceptions of what robo-advice is, and how it can alter its path and pave its future.

Defining AI is not an easy nor a uniform task, because this notion has been constantly and steadily acquiring new meanings over time alongside the evolution it has undergone. The first conceptualization of AI was proposed by Shannon, Minsky, Rochester and McCarthy in 1955<sup>19</sup>, where they summarized it in the following words:

“every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.”

Since then, numerous individuals have attempted to attribute a concrete sense to AI, with some authors bringing up machine learning as well. Simply put, AI is the endowment of machines “with the same thinking logic and behavioral patterns as human beings”<sup>20</sup> or, in other words, the ability of machines to emulate features which were exclusive to human beings. It has also been stated that AI allows computers to make decisions and learn without being programmed to do so<sup>21</sup>.

The concept of ‘algorithm’ is deeply connected to AI. It may 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 output”<sup>22</sup>. To simply put, an algorithm is trained to take data and transform it into a certain result, which will be an investment portfolio in the case of robo-

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<sup>19</sup> Claude E. Shannon, Marvin L. Minsky, Nathaniel Rochester, John McCarthy ‘A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence, August 31, 1955’ (2006) 27(4) AI Magazine 13.

<sup>20</sup> Min-Yuh Day, Jian-Ting Lin, Yuan-Chih Chen (2018) 1057.

<sup>21</sup> Philip Treleaven, Jeremy Barnett, Adriano Koshiyama (2019) 34.

<sup>22</sup> Maume (2021) 17.

advisors. The use of algorithms is already established in robo-advisory, but little AI has been employed.

In April 2021, the European Commission published a proposal for harmonized rules on artificial intelligence – the Artificial Intelligence Act<sup>23</sup> (hereinafter referred to as the Artificial Intelligence Act or the Proposal). Recital 6 of the proposal points out the necessity to define AI to ensure legal certainty. As such, the definition of AI should be rooted *on the key functional characteristics of the software, in particular the ability, for a given set of human-defined objectives, to generate outputs such as content, predictions, recommendations, or decisions which influence the environment with which the system interacts*. While this proposal’s aim is not the provision of financial services, it indeed pores over these services on recital 80. Even though the Act is only a proposal, and thereby does not have legal standing, it is a useful document that reveals the expectation of the EU regarding AI.

The Explanatory Memorandum accompanying the Proposal presents some of the advantages that come with AI: *By improving prediction, optimising operations and resource allocation, and personalising service delivery, the use of artificial intelligence can support socially and environmentally beneficial outcomes and provide key competitive advantages to companies and the European economy*<sup>24</sup>. This bold statement is ensued by the affirmation that action is *especially needed* in certain sectors, with one of them being finance. The EU later acknowledges that the *benefits of AI can also bring about new risks or negative consequences for individuals or the society*.

The first paragraph of the Explanatory Memorandum quickly summarizes one of the fundamental ideas of this paper – that AI can be used for good causes, particularly to improve services which are indispensable for the lives of people.

Machine learning is a sub-category of AI: a “method of designing algorithms that optimize automatically through experience with limited or no human interaction”<sup>25</sup>. With a large collection of training data, the algorithm learns by trial and error how to process such data and utilize it to “make intelligent future decisions”<sup>26</sup>.

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<sup>23</sup> Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts [2021] 2021/0106(COD)

<sup>24</sup> Point 1.1 of the Explanatory Memorandum accompanying the Proposal.

<sup>25</sup> Wolf-Georg Ringe, Christopher Ruof, ‘A Regulatory Sandbox for Robo Advice’ (2019) European Banking Institute Working Paper Series 2018 – no. 26 25.

<sup>26</sup> Ibid.

### 3. Financial Inclusion

Financial inclusion is a notion that has been in the spotlight in the last years. According to the World Bank, financial inclusion “means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way”<sup>27</sup>. In short, it seeks to make the participation in the financial markets of those presently excluded from the financial systems possible<sup>28</sup>, and to improve “economic growth and well-being”<sup>29</sup>.

Financial inclusion is, in this manner, a central concept for the World Bank, having been pointed as an enabler for seven of the 17 Sustainable Development Goals. Likewise, the World Bank Group views financial inclusion as a crucial tool to reduce extreme poverty, and the G20 have pledged to further financial inclusion<sup>30</sup> and encouraged the implementation of the ‘G20 High-Level Principles for Digital Financial Inclusion’, which advise countries to promote financial inclusion using digital technologies<sup>31</sup>.

Inclusive finance can therefore contribute to the improvement of the lives of the poor and disadvantage people by including them in the financial world<sup>32</sup>. The benefits of financial inclusion do not end with the low-income customers with poor access to financial services and products; welcoming these customers into financial markets will also create overall resilience to economic disturbances<sup>33</sup>.

Although access to the banking system may seem obvious and easy for the regular European and North American individual, it is not the standard elsewhere. The World Bank notes that the first step towards financial inclusion is the ability to have access to a transaction account. Although in developed countries having a bank account is the norm, there are still 1.7 billion people without access to one globally – labelled the “unbanked”. Essentially the entirety of the unbanked lives in developing countries. Women account for the majority of the

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<sup>27</sup> ‘Financial Inclusion – Overview’ (*The World Bank*, 02 October 2018)

<<https://www.worldbank.org/en/topic/financialinclusion/overview#1>> accessed 02 January 2022.

<sup>28</sup> Joseph Lee (2019) 1.

<sup>29</sup> Meng-Leong How, Sin-Mei Cheah, Aik Cheow Khor, Yong Jiet Chan, ‘Artificial Intelligence-Enhanced Predictive Insights for Advancing Financial Inclusion: A Human-Centric AI-Thinking Approach’ (2020) 4(2) *Big Data and Cognitive Computing* 1.

<sup>30</sup> ‘Baden-Baden G20 Communiqué Commits to Advance Financial Inclusion’ (GPFI, 28 March 2017)

<<https://www.gpfi.org/news/baden-baden-g20-communiqu-commits-advance-financial-inclusion>> accessed 02 January 2022.

<sup>31</sup> ‘New G20 High-Level Principles for Digital Financial Inclusion’ (GPFI, 16 September 2016)

<<https://www.gpfi.org/news/new-g20-high-level-principles-digital-financial-inclusion>> accessed 02 January 2022.

<sup>32</sup> Wensheng Dai, ‘Development and Supervision of Robo-Advisors under Digital Financial Inclusion in Complex Systems’ (2021) 2021 *Complexity* 2.

<sup>33</sup> Meng-Leong How, Sin-Mei Cheah, Aik Cheow Khor, Yong Jiet Chan (2020) 2.

unbanked. Lack of access to a bank account is directly correlated with poorer households, being out of the workforce, and low educational levels<sup>34</sup>. Financial inclusion links how access to financial services may be dependent upon their associated costs.

Following G20's thoughts, digital financial inclusion comes to the spotlight as it combines the notions of financial inclusion *per se* and of digitalization of financial products. In essence, it extends the purport and the substance of financial services with the introduction of technologies into the system, consequently also enlarging their radius of efficacy<sup>35</sup>. The goals of digital financial inclusion are then to provide easy-to-use and inexpensive financial services that may reach the previously underserved communities<sup>36</sup>. In addition, digital financial inclusion strives to weaken information asymmetries, because through digital means individuals have access to a larger pool of relevant information that supports them through their financial initiation<sup>37</sup>.

Besides the goal of helping the underprivileged population gain access to financial services, financial inclusion has another very important and critical facet. By diversifying financial services and products, it ends up satisfying the overall financial demands and needs of society and makes room for new institutions and products to develop<sup>38</sup>. Financial inclusion has, therefore, a two-sided benefit: it increases the number of individuals with access to finance and the number of available products and institutions for 'old' and 'new' customers as well.

There are other concepts that, while relevant for this topic, due to the close relation with financial inclusion will not be autonomously addressed. That is the case of the notion of advice gap, comprised by individuals who are unable to pay the price charged for financial advice or that find that it is not easy to access. This is clearly associated with people with low income or/and low level of assets. The UK's Financial Advice Market Review (FAMR) provided some meanings to advice gap, stating that it is composed of "people who wanted advice but could not get it at a price they were willing or able to pay", or that it displays the "difference between the number of people who currently seek advice, and those who would seek advice if a cheaper and less intensive process existed"<sup>39</sup>.

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<sup>34</sup> Asli Demirgüç-Kunt, Leora Klapper, Dorothe Singer, Saniya Ansar, Jake Hess, 'The Global Findex Database 2017: Measuring Financial Inclusion and the Fintech Revolution' (2018) World Bank 4-5.

<sup>35</sup> Wensheng Dai (2021) 3.

<sup>36</sup> David Mhlanga, 'Industry 4.0 in Finance: The Impact of Artificial Intelligence (AI) on Digital Financial Inclusion' (2020) 8(3) International Journal of Financial Studies 2.

<sup>37</sup> Ibid 3.

<sup>38</sup> Ibid 4.

<sup>39</sup> Financial Conduct Authority, Financial Advice Market Review (Final Report, March 2016) 24.

Fairness is a relevant concept in the realm of financial markets as well. Although hard to define, it essentially advocates that every person who wants to participate in the financial markets should be able to do so without encountering any kind of discrimination. Withal, it seeks to treat each market user in equal terms<sup>40</sup>. Ian B. Lee argues that fairness “operates as a brake upon self-interest”<sup>41</sup>, this meaning that it guides an individual’s conduct to not act in a deceitful form solely because it serves his personal interests. As a pivotal regulatory goal of financial markets<sup>42</sup>, fairness encompasses several claims which are also inherent to financial inclusion, including equal information, efficient prices, and equal bargaining power<sup>43</sup>. This similitude of goals proves that fairness and financial inclusion are interconnected. Explicitly, the broader concept of fairness comprises financial inclusion and its objectives, which are analyzed in this dissertation.

#### **4. Overview**

Focusing on how intertwining robo-advisors and AI can be a driver of financial inclusion, this paper intends to address if current regulation is prepared to support this objective. Therefore, the effects on financial inclusion will be a key point for our discussion.

Now, the investigation will be centered around the advantages and disadvantages that robo-advisors pose nowadays, and if there are sufficient legal answers to address potential issues without thwarting existing opportunities.

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<sup>40</sup> Maume a (2019) 33.

<sup>41</sup> Ian B. Lee, ‘Fairness and Insider Trading’ (2002) 2002(1) Columbia Business Law Review 141.

<sup>42</sup> Trude Myklebust, ‘Fairness and Integrity in High-Frequency Markets – A Critical Assessment of the European Regulatory Approach’ (2020) 31(1) European Business Law Review 66.

<sup>43</sup> Hersh Shefrin, Meir Statman ‘Ethics, Fairness and Efficiency in Financial Markets’ (1993) 49(6) Financial Analysts Journal 22.

### III. Impacts of Artificial Intelligence-Driven Advice

#### 1. Overview over the present and past state of affairs of Robo-Advisors

The breakthrough of robo-advisory happened in the USA in the late 2000s and was in part prompted by the financial crisis of 2008 and the increasing distrust of consumers regarding traditional financial incumbents<sup>44</sup>. While the first robo-advisor – “Betterment” – appeared in the USA in 2010, quickly followed by rival “Wealthfront”, in Europe robo-advisors only emerged a few years later (in the UK and in Germany)<sup>45</sup>. The first start-up robo-advisors were later followed by the appearance of robo-advisors developed by established banks. More recently, even a robo-advisor targeted only at female investors (Ellevest) was created<sup>46</sup>, which shows the growing specialization in the field.

Over the last years, the market for robo-advisors has grown quickly, prompted both by the entrance of old financial players in the digital world (for example, JPMorgan and Goldman Sachs<sup>47</sup>) and the increasing interest of new potential investors, especially attentive to low-cost alternatives to traditional investment. Between 2017 and 2020, the market size<sup>48</sup> for robo-advisors burst from 297 billion dollars to one trillion dollars, which reflects an annual increase of more than 50% and surpasses the global market development<sup>49</sup>. While the United States is still the main market for robo-advice, Europe and Asia are now progressing<sup>50</sup>. In 2020, more than 20 million investors used robo-advisors in Europe and there are predictions that this number will double by 2025. In spite of these substantial figures, robo-advisors still only represent a small segment of the global financial markets<sup>51</sup>. The biggest robo-advisor at the moment is Vanguard Robo-Advisors, with total assets under management of 206.6 billion dollars and more than one million clients<sup>52</sup>.

Robo-advisors are low cost and fairly easy to use, as opposed to traditional wealth management, which is expensive and exclusive<sup>53</sup>. It is the absence of human advisors that

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<sup>44</sup> Maume a (2019) 11.

<sup>45</sup> Maume (2021) 14.

<sup>46</sup> Gina Young, ‘Ellevest Review’ (*Investopedia*, 11 March 2022) <<https://www.investopedia.com/ellevest-review-4587894>> accessed 11 May 2022.

<sup>47</sup> In 2020, both banks announced digital wealth management services.

<sup>48</sup> Market size is reflected by assets under management by robo-advisors.

<sup>49</sup> Maume (2021) 14.

<sup>50</sup> Milo Bianchi, Marie Brière (2021) 3.

<sup>51</sup> Maume (2021) 15.

<sup>52</sup> Barbara Friedberg, ‘Top-10 Robo-Advisors By Assets Under Management’ (*Forbes Advisor*, 1 May 2022) <<https://www.forbes.com/advisor/investing/top-robo-advisors-by-aum/>> accessed 11 May 2022.

<sup>53</sup> Min-Yuh Day, Tun-Kung Cheng and Jheng-Gang Li (2018) 1027.

makes robo-advisors more cost effective. In the EU, robo-advisors typically charge between 0.55% and 1.65%<sup>54</sup>, which contrasts with the 1-3% of the investment or of the portfolio that represents human advisors' typical fees. The lower fees charged by robo-advisors are attractive to the sort of clients that they usually serve, as the average investment per client on a global scale was less than 4500 dollars in 2020<sup>55</sup>. Industry numbers reveal that the amount of assets managed by robo-advisors is scanty in comparison with all assets in financial markets and that the average client wealth is also reduced<sup>56</sup>.

Regardless of how the evolution of the robo-advisor market is perceived, the truth is that primitive robo-advisors are very different from modern robo-advisors. More recently, there has been growing interest in the upcoming of a “new” type of robo-advisor, with some authors already distinguishing these advisors based on the underlying algorithm, i.e., whether it sticks to the basics or embraces a larger set of data<sup>57</sup>. Modern robo-advisors have thus broadened the original concept of robo-advisory and may encompass some features of typical financial intermediaries<sup>58</sup>. That is, whilst AI implementation in robo-advice is still modest, there has been significant progress when it comes to the decision-making process of robo-advisors, since they base their outcomes on bigger pools of information. However, there still exists plenty of space for technological growth to create robo-advisors with more precision and that reflect the objectives proposed in this paper.

## **2. Why should Artificial Intelligence Become Part of Robo-Advisory?**

Robo-advisors seem to offer it all: they are cheap, easily accessible and have less entry barriers than their human equivalents. However, their market share is not as big as one could expect<sup>59</sup>, which makes us question the reasons why they aren't more successful. Several motives were encountered in this investigation.

In the first place, a number of problems related to portfolio creation and design. There are hesitations regarding the reliability of robo-advisors, because while they offer tailored recommendations to clients, it happens that clients with similar profiles might receive advice

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<sup>54</sup> Maume (2021) 11.

<sup>55</sup> Ibid 15.

<sup>56</sup> Thomas Philippon, 'On Fintech and Financial Inclusion' (2020) NBER Working Paper No. w26330 3.

<sup>57</sup> Milo Bianchi, Marie Brière (2021) 3, 7.

<sup>58</sup> Maume (2021) 10.

<sup>59</sup> As shown in the previous chapter.

with different asset allocations<sup>60</sup>. On the other hand, some robo-advisors may also create broad categories where they allocate users in groups depending on their willingness to take risk, age profile, goals, and a few other characteristics, which results in fundamentally different investors being advised the same portfolio, even though available categories are too broad to capture certain characteristics and preferences<sup>61</sup>. Adding to this issue, robo-advisors do not completely understand the client's financial situation, because the processes currently implemented by robo-advisors to assess clients' features are not enough to offer investment recommendations tailored to each investor's reality, which can hamper the success of the proposed portfolio<sup>62</sup>.

These circumstances may be a consequence of utilization of scarce and inadequate resources by robo-advisors. Evidence shows that they are simplistic regarding the information that they use to profile an investor and how the portfolio under construction builds on this same information<sup>63</sup>. Beyond that, they ask investors less questions than traditional advisors, and these questions are pre-determined and usually rest on a "one-size-fits-all approach". This limits the amount of data on which they rely their decisions on, which certainly narrows the potential benefits of the financial portfolios that they elaborate and does not provide a precise outline of the financial situation of investors. Withal, they are built to presume that clients with similar risk profiles will answer similarly, which may not be true<sup>64</sup>. The algorithm underlying a robo-advisor is "static"<sup>65</sup>, which means that two clients who insert the same features will in principle get the same outcome, that is, the same recommended portfolio. However, as explained in the previous paragraph, sometimes this is not the case. Acting on partial information weakens robo-advisors and consequently the quality of the advice that they give. So, the prime intention of providing investment services tailored to investors' specific needs and objectives is eventually overridden.

In what concerns the portfolio management feature of robo-advisory, it is clear that the rebalancing procedure is still very rudimentary: the robo-advisor merely follows the predefined conditions and does not take novel decisions nor absorbs additional knowledge<sup>66</sup>. This is thus an area where AI finds a vast potential to alter the performance of robo-advisors and improve their value.

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<sup>60</sup> Milo Bianchi, Marie Brière (2021) 6.

<sup>61</sup> Francesco D'Acunto, Alberto G. Rossi (2020) 23.

<sup>62</sup> Milo Bianchi, Marie Brière (2021) 7-8.

<sup>63</sup> Ibid 11.

<sup>64</sup> Prince Sarpong, 'Robo-Advisors: Exploring and Leveraging the Competition' (2020) Centre for Financial Planning Studies 7.

<sup>65</sup> Maume (2021) 17.

<sup>66</sup> Ibid 18.

Despite the evolution that robo-advisors' algorithms have gone through over the past years, they still have scanty AI applications, which may be observed in the problems raised in the preceding analysis. The underdeveloped technologies used in robo-advisors ramify in advice and portfolio management that are predetermined by the inputs provided by the client<sup>67</sup> and that do not emulate human thinking. There are, for that reason, qualities of human financial advisors that robo-advisors could potentially replicate but that, until now, are yet to be tested. Those are, among others, subjective elements like intuition and experience<sup>68</sup>, that could become great allies during the provision of advice.

The foregoing challenges have a chance of being overcome with the use of AI, which surely comes as "fresh air" to the flawed environment that has been surrounding robo-advisors and which may be utilized as a way to mitigate or even eliminate some of the shortcomings of financial advice that prevail in present times.

Up to this day, methods to deliver advice tailored to each investor are still at fault<sup>69</sup>. AI's strategic commitment is to deliver a further personalized advice based on each investor's objectives and preferences. In short, with AI comes the opportunity to advance the finance industry by offering high-value options to consumers and bringing profits to companies<sup>70</sup>. It is correct that, even though AI has been a constant presence over the past years, we have yet to see it being applied to robo-advisory to its full extent (that is, to the extent we know today). The fundamental step towards customization is to assemble as much relevant information as possible about individual characteristics and preferences<sup>71</sup>. Some robo-advisors are already making use of automated financial planning platforms that collect more information regarding clients' financial decisions which are not typically disclosed in the initial questionnaire, like borrowing and consumption. This "invisible" information (e.g., risk aversion, non-financial income, debt, shopping history, online behaviors, transaction record, ...) could be accessible to robo-advisors thanks to the incorporation of AI and data accessibility<sup>72</sup>. Besides customization, client interaction will also benefit from this collection of information. Decisively, paucity of resources and information could be resolved if financial providers used the large volume of data

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<sup>67</sup> Philipp Maume, 'Reducing Legal Uncertainty and Regulatory Arbitrage for Robo-Advice' (2019) 16(5) *European Company and Financial Law Review* 627 – cited Maume b (2019).

<sup>68</sup> Maume a (2019) 5.

<sup>69</sup> Francesco D'Acunto, Alberto G. Rossi (2020) 20-23.

<sup>70</sup> Daniel Belanche, Carlos Flavian, Luis Vicente Casaló Ariño, 'Artificial Intelligence in FinTech: understanding robo-advisors adoption among customers' (2019) 119(7) *Industrial Management and Data Systems* 2.

<sup>71</sup> Milo Bianchi, Marie Brière (2021) 20.

<sup>72</sup> *Ibid*; David Mhlanga (2020) 5.

that they currently have access to<sup>73</sup> to significantly improve screening of investors. Furthermore, AI tools could be drawn up to search for additional information, so as to gather the maximum amount of material to build a personalized efficient portfolio and manage it.

Although some recent robo-advisors use AI in their software, complex machine learning is not present in most robo-advisors at this time<sup>74</sup>. By means of recourse to machine learning, algorithms can evolve by no longer following pre-coded rules, but instead by learning by example<sup>75</sup>. Just as every other algorithm, embedding AI into robo-advisors' algorithms will imply accepting their advancement by assimilating new data that inevitably changes their behavior, which can become unpredictable. Thereby, the products produced by robo-advisors are adjusted through algorithm "training", i.e., the underlying algorithm grasps new information, assimilates it and eventually evolves in a manner that in principle would reflect enhanced results for investors.

Increased sophistication in robo-advisors might, nevertheless, come with counterbalances. More AI and more technological tools mean that, in practice, improved programming and testing will be essential. This, however, is costly and might offset or even outgrow the low charges that are usual in the market for robo-advisors, as well as the costs associated with human financial advisors<sup>76</sup>, thereby erasing a key advantage on robo-advisors' side.

### **3. Opportunities**

Now, a list of advantages of robo-advisors will be presented, paired with how they could be improved with the use of AI.

Most individuals could make better financial decisions if they tried and used robo-advisors instead of relying on traditional human advisors or on their personal discernment. Humans are biased and prone to mistakes, advisors being no exception, which means that their decisions may divert from those of a fully rational economic agent<sup>77</sup>. The mistakes of investors and advisors considerably impact general welfare and the functioning of financial markets, thus

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<sup>73</sup> Meng-Leong How, Sin-Mei Cheah, Aik Cheow Khor, Yong Jiet Chan (2020) 2.

<sup>74</sup> Maume (2021) 8.

<sup>75</sup> Philipp Hacker, 'Teaching Fairness to Artificial Intelligence: Existing and Novel Strategies Against Algorithmic Discrimination under EU Law' (2018) 55 Common Market Law Review 5.

<sup>76</sup> Maume a (2019) 20.

<sup>77</sup> Milo Bianchi, Marie Brière (2021) 4.

contributing to wealth inequality<sup>78</sup>. Having this in mind, it is evident that improving financial decision making has the potential to shift the present paradigm, this being one of the main features in robo-advisors that creates so much interest: the promise to help investors<sup>79</sup> and to contribute to wealth equilibrium on a global scale.

When investing on their own, it is common for investors to not make the best possible decisions, in comparison with the optimal decision they could take. While traditional financial advisors were often seen as a remedy to limit the impact of these mistakes, they also have their own limitations (apart from the high fees that they charge), in particular they may transmit their personal biases into the client's portfolio<sup>80</sup>. A major problem with human advisors is that they, as every other human, may reflect their own biases and beliefs into their clients' portfolios. This is a key point in which robo-advisors differ from human advisors, as the former bases its 'work' on the underlying algorithm. If the biases and beliefs are present in the robo-advisor, that means that they were previously embedded in the underlying algorithm<sup>81</sup>. An advanced algorithm will avoid errors that are common in human advisors, therefore making robo-advisors more efficient than their human equivalents and potentially converting them into enhancers of financial equality<sup>82</sup>. Using AI, it is possible to steer away the biases of advisors, making them operate towards the best interests of their clients and without conflict of interests<sup>83</sup>.

Following algorithm improvement, AI can also increase the efficiency of robo-advisory. The many advantages associated with robo-advisors do not translate into new business models, but instead on improved efficiency of prevailing services (financial advice and portfolio management)<sup>84</sup>. This is because suppressing human errors and behavioral biases can prevent detrimental investment decisions, thereby increasing efficiency in the financial markets, and reducing costs (that originate from less-than-optimal investments)<sup>85</sup>. With recourse to machine learning approaches, algorithmic models can alter their performance over time. Under those circumstances, introducing machine learning into robo-advisors will have two crucial effects: first, it will increase personalization of the services provided; and second, it will reduce or eradicate bias in decision-making processes<sup>86</sup>.

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<sup>78</sup> Milo Bianchi, Marie Brière (2021) 5.

<sup>79</sup> Ibid.

<sup>80</sup> Francesco D'Acunto, Alberto G. Rossi (2020) 2.

<sup>81</sup> Ibid 12.

<sup>82</sup> Maume a (2019) 20.

<sup>83</sup> Prince Sarpong (2020) 3.

<sup>84</sup> Maume a (2019) 9.

<sup>85</sup> Maume (2021) 11.

<sup>86</sup> Philipp Hacker (2018) 3.

Many financial institutions already provide alternatives to traditional products by offering digital platforms, in order to increase access to their products and as a way to capture a broader range of customers<sup>87</sup>. Notwithstanding the expanding digitalization, using AI in the financial sector is still seen as potentially “dangerous”. While digital means present a set of advantages to the average consumer, winning their trust remains a hurdle<sup>88</sup>. In order to build a positive reputation among the public, AI applications should put their emphasis on the social side, paving the way to financial inclusion and aiming to close the advice gap<sup>89</sup>. In order to welcome the most disadvantage strands of population into finance, disruptive models and innovations must be employed, which definitely includes AI. The prospective impact of AI resides mostly in its ability to grow financial inclusion levels<sup>90</sup>; financial providers can use AI to understand the needs and specificities of their clients and to make sure that those are included in the decision-making processes. Financial inclusion will certainly grow with the use of AI in banking services, including robo-advisors, due to its already mentioned correlated cost-effectiveness and efficiency.

The probable clients of robo-advisory are not the same of traditional advisory. Robo-advisors appeal to people with low and medium incomes and young investors, usually drawn up by the use of online services. Historically, these individuals have stayed out of the financial industry as they are not lucrative to traditional advisors<sup>91</sup>. To further financial inclusion, financial services must offer the same quality standards irrespective of the type of clients that they are attending to, and it must be assured that the applications used in robo-advisory are not less effective than those employed by traditional advisors which offer services to wealthier clients<sup>92</sup>. Financial inclusion, however, will not grow if targeted customers are not made aware of the availability of new financial services<sup>93</sup>.

The main takeaway from this dissertation is that robo-advisors may become a genuine driver of financial inclusion. In fact, the main obstacles stopping excluded people from accessing quality advice can be mostly resolved by robo-advisors. Low-income and low-education investors are able to benefit more from robo-advisors than those who already possess financial literacy and means, because they can avail from the diversification that a robo-advisor

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<sup>87</sup> David Mhlanga (2020) 1.

<sup>88</sup> Ibid 2.

<sup>89</sup> Joseph Lee (2019) 1.

<sup>90</sup> Peterson K. Ozili, ‘Big data and artificial intelligence for financial inclusion: benefits and issues’ (2021) Artificial Intelligence Fintech, and Financial Inclusion 3.

<sup>91</sup> Maume a (2019) 20.

<sup>92</sup> Joseph Lee (2019) 9.

<sup>93</sup> Meng-Leong How, Sin-Mei Cheah, Aik Cheow Khor, Yong Jiet Chan (2020) 1-2.

entails and from the less harsh requirements to access this type of financial tool<sup>94</sup>. The central focus of robo-advisors lies therefore on customers which cannot dispose of the minimum investment level that a traditional advisor requires<sup>95</sup>. One, erasing or reducing the high fixed costs that likely drive away consumers from traditional financial advice and, two, significantly reducing the minimum amount of assets required to start the advising process, are the two characteristics that are prone to attract a larger group of consumers. However, like aforesaid, this new dive into financial inclusion is only complete if the quality of the advice provided matches that of traditional advisors; to enhance financial inclusion means to equip the “finance outsiders” with similar opportunities and assistance to those offered to the “finance insiders”.

The quality of the services can be demonstrated by the investment portfolio. A decisive aspect that distinguishes between a successful and an unsuccessful investment strategy lies in “portfolio optimization”. This is crucial for investors during the investment planning stage because it is when the allocation of assets is determined, with the objective to reach a balance between expected returns and risk tolerance<sup>96</sup>. There also is evidence that the services offered by robo-advisors are likely to improve investors’ diversification and risk-adjustment returns<sup>97</sup>. This corresponds to one of the key promises of robo-advisors, to help to precisely define each investor’s financial situation and goals. This is crucial, since the best possible portfolio allocation relies on various individual parameters, such as human capital, housing market exposure, time preference, risk and ambiguity aversion<sup>98</sup>.

While, until now, robo-advisors are employing little individualization, AI may permit the individualization parameters to grow. These levels are still so low due to the difficulty and uncertainty associated with correctly assessing investors’ individual features, which is typically done through a questionnaire where people self-evaluate<sup>99</sup>. These tests vary from robo-advisor to robo-advisor.

Furthermore, large accessibility of data may allow robo-advisors to enhance the quality of the advice given. Machine learning enables robo-advisors to analyze information regarding the investor’s credit history, employment, assets, purchasing history, even data from social media. Beyond that, the algorithm may also be programmed with data about macroeconomic

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<sup>94</sup> Milo Bianchi, Marie Brière (2021) 10.

<sup>95</sup> Dominik Jung, Verena Dorner, Florian Glaser, Stefan Morana, ‘Robo-Advisory’ (2018) 60 *Business & Information Systems Engineering* 82.

<sup>96</sup> Min-Yuh Day, Tun-Kung Cheng and Jheng-Gang Li (2018) 1027.

<sup>97</sup> Milo Bianchi, Marie Brière (2021) 9.

<sup>98</sup> *Ibid* 12.

<sup>99</sup> *Ibid* 13.

parameters, e.g., market movements and volatility of investors<sup>100</sup>. If it is possible to successfully rank and analyze various data, robo-advisors could concentrate on bettering their financial services, which in turn would impact potential customers' lives – even if the financial services do not create significant economic returns for these new customers, accessing quality services would still enhance their financial literacy and show how they are not barred from receiving such services<sup>101</sup>. On the other side, financial providers may also see their work improve by incorporating AI. Resorting to these far-reaching technologies will expose failures that were invisible to human financial advisors, allowing the relationship between the financial incumbent and its customers to be significantly superior. In short, strengthening this relationship may bring about innovative strategies<sup>102</sup> that would otherwise be difficult to reach when the customer at issue is not financially included.

Amid the abovementioned advantages, AI may as well equip investors with more freedom of choice and security. Especially, AI has the chance to aid consumers who are excluded from accessing financial services due to lack of information and/or financial knowledge. This is not, however, without difficulties; the main challenges surrounding the use of AI in finance encompass the consumers' need for AI explainability and possible risks. With respect to these challenges, one should note that finance applications, including robo-advisors, must act in the best interest of consumers and avoid any arising conflict of interests<sup>103</sup>. These issues will be further perused below.

Furthermore, assuring the fairness of algorithms is a vital target to robo-advisors as well. So far, important improvements have been undertaken to remove and understand any bias that roots the decision-making process of robo-advisors<sup>104</sup>. Nevertheless, the use of AI may pose some threats in this regard.

#### **4. Challenges and Risks**

After analyzing the main advantages and opportunities stemming from robo-advisory, it is also important to analyze the risks that may arise, particularly those caused by AI.

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<sup>100</sup> Wolf-Georg Ringe, Christopher Ruof (2019) 25.

<sup>101</sup> Most individuals are banned from accessing financial advisors because these accept mostly people with high incomes and/or high savings accounts.

<sup>102</sup> Meng-Leong How, Sin-Mei Cheah, Aik Cheow Khor, Yong Jiet Chan (2020) 3.

<sup>103</sup> Joseph Lee (2019) 6.

<sup>104</sup> Philip Treleaven, Jeremy Barnett, Adriano Koshiyama (2019) 34.

Robo-advisors are not perfect nor legal proof. To give a tangible example, Deutsche Bank's robo-advisor "Anlage Finder" was initially a flop, because of legal issues and its defective user experience<sup>105</sup>.

There is evidence that some traditional advisors adopt a "one-size-fits-all" approach when it comes to their clients' portfolios. Furthermore, some advisors put, even if unintentionally, emphasis in their own interests (for instance, because some financial products produce more commissions) and not only on their clients' interests. This corresponds to the problem of bias. The tendency seems to be to reduce attention to the investor's requests over time; while in the beginning they attend to clients' concerns, they may anyway make decisions that are somehow independent from those preferences<sup>106</sup>. Although bias is more present in traditional advisors, it still poses a risk for robo-advisors. As illustrated in Chapter III.3, if the algorithm was programmed to reflect certain biases and beliefs, then the outcomes (i.e., financial advice and portfolio management) of robo-advisors will be affected by such biases. On one side, these preconceptions may be fed into algorithms unintentionally, from stemming from simple mistakes to being products of subconscious human bias. On the other side, they may be put there deliberately, on the assumption that the algorithm designers may lack incentives to steer away from bias. This relates to financial inclusion in the purport that implementing non-discrimination and equality at the code level is limited by several angles, from a legal and technological perspective<sup>107</sup>.

Robo-advisors' weakened susceptibility to conflicts of interest with respect to their human equivalents<sup>108</sup> does not mean that they are completely free from them. This is clear in the case of robo-advisors belonging to banks or their subsidiaries, or when they are in some kind of relationship with such incumbents<sup>109110</sup>: even from an outsider view, it is feasible that these robo-advisors can be programmed to recommend specific products in favor of others, being this advice not based on market analysis and screening of investors, but rather on a particular bias. That is, a robo-advisor's software may be programmed to lean in favor of products issued by the bank which owns or is affiliated with the robo-advisor, which then raises concerns regarding the advice given. Certainly, there might exist here an information disparity

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<sup>105</sup> Dominik Jung, Verena Dorner, Florian Glaser, Stefan Morana (2018) 82.

<sup>106</sup> Milo Bianchi, Marie Brière (2021) 5.

<sup>107</sup> Philipp Hacker (2018) 4-7.

<sup>108</sup> Human financial advisors are prone to bias and to recommend products that benefit them, regardless of not being profitable for their clients, while robo-advisors' preconceptions and tendencies depend on their algorithms.

<sup>109</sup> Maume (2021) 31-32.

<sup>110</sup> For example, a financial incumbent is a shareholder of a robo-advisor's firm, or they have a cooperation agreement.

between robo-advisor and its clients, especially if one considers that robo-advisors are targeted towards inexperienced investors. Regarding financial inclusion, it is important to assess whether such conflicts of interest, if existent, are somehow impairing the objective of granting access to individuals and businesses to useful and affordable financial products and services that meet their needs.

The issue of bias has already been a problem until now, with robo-advisors' algorithms being mainly static<sup>111</sup>. However, the use of AI will empower algorithms with the capacity of evolving dynamically. In contrast to static algorithms, dynamic algorithms embody machine learning and change when exposed to new data<sup>112</sup> – not only as expected, but also unpredictably. Consequently, they present different regulatory challenges. Indeed, if future robo-advisors progressively use more data and intricate methodologies, new challenges will be found<sup>113</sup>.

In this respect, the biggest risk is the increased opacity of algorithms. More opacity means that understanding the roots of a certain decision would be complicated, therefore undermining the promises of more accountability. As such, lack of algorithm comprehension may damage the key intentions of robo-advisory under this dissertation, especially the arguments of financial inclusion.

Furthermore, heightened opacity of algorithms may have the aftermath of generating black boxes<sup>114</sup>, making the disclosure of the reasoning behind the algorithms' decisions extremely difficult. The black box problem concerns the risk of AI producing “processes and operations unknown to and uncontrolled by human beings, producing undesirable results for which, arguably, only the AI may be responsible”<sup>115</sup>. In short, it would become harder or even impossible to explain why certain decisions were taken and certain recommendations were given; black boxes cannot even be scrutinized by their developers<sup>116</sup>. The same risks attributed to AI will reflect themselves into AI-driven robo-advisors: opacity, complexity, and non-disclosure of the decision-making procedure. This may imperil financial stability and cybersecurity, and is undoubtedly a challenge to regulators, since they will not be able to examine the underlying rules and rationale to determine algorithm safety. Machine learning is definitely pivotal but comes attached to several disclosure obstacles. In the heavily regulated

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<sup>111</sup> See chapter III.2.

<sup>112</sup> Philip Treleaven, Jeremy Barnett, Adriano Koshiyama (2019) 34.

<sup>113</sup> Milo Bianchi, Marie Brière (2021) 19-20.

<sup>114</sup> Ibid 11.

<sup>115</sup> Ross P. Buckley, Dirk A. Zetsche, Douglas W. Arner, Brian W. Tang, ‘Regulating Artificial Intelligence in Finance: Putting the Human in the Loop’ (2021) 43(1) Sydney Law Journal 45.

<sup>116</sup> Prince Sarpong (2020) 3.

industry of financial services, the need for explainability regarding the decision-making process turns black boxes into a problem.

Opacity of algorithms is also an issue regarding conflicts of interest. They usually transpire between investor and advisor, in part due to the existence of high commission fee products (the advisor gets more money if they are involved in a transaction). While robo-advisors have said to be the solution to avoid said conflicts, it is also true that they can be purposely designed to favor certain products over others. Opacity of algorithms may counteract the objective of enhanced financial inclusion and even further discrimination, since disadvantaged parties will not have the capacity to explain their cases and therefore will not be able to prove their claims<sup>117</sup>, irrespective of whether the bias is intentional or unintentional. This is called information asymmetry, i.e., investors are clueless regarding the decision-making process that the algorithm follows and the existence of other aspects that are shaping the services. Thus, the problem of information asymmetry may be bigger than in traditional investment settings<sup>118</sup>.

Succinctly, robo-advisors have similar risks as other financial innovations that use AI. They all compound in one final danger: that instead of being used as a driver of financial well-being, they end up being misused<sup>119</sup>. For instance, it can be tough to find decent data, i.e., unbiased data. If the algorithms are fed poor quality information, then their decision-making may increase discrimination<sup>120</sup>.

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<sup>117</sup> Maume b (2019) 648.

<sup>118</sup> Maume (2021) 11.

<sup>119</sup> Milo Bianchi, Marie Brière (2021) 12.

<sup>120</sup> Philipp Hacker (2018) 5, 17.

## IV. The Legal Framework Supporting Robo-Advisors

### 1. Analysis of MiFID2

The legal framework of robo-advisors in the European Union is centered around MiFID2. Several questions arise in this regard.

#### 1.1. Are robo-advisors investment firms under the meaning of MiFID2?

Article 1 MiFID2 establishes that the Directive applies to *investment firms, market operators, and third-country firms providing investment services or performing investment activities*. Here, a fundamental query emerges: are robo-advisors investment firms and hence subject to MiFID2?

To be considered an investment firm under the MiFID2 framework, in accordance with article 4(1)(2) and Annex I, Section A of the Directive, a robo-advisor must either perform investment advice or portfolio management<sup>121</sup>. This issue is relevant in so far as the designation as investment firms will place robo-advisors under the purview of MiFID2. If one concludes that robo-advisors do not provide such services, their regulatory regime will be uncertain; if, on the contrary, they prove to fall into those categories, they will be under some considerable legal obligations. The provision of investment advice or portfolio management is “function-based”, which means that those requirements apply to all entities that comply with them, regardless of performance by a person or an algorithm<sup>122</sup>. Since algorithmic execution is not an impediment to deliver those services, robo-advisors will be subject to MiFID2 as long as they do not fall within the exceptions of article 3(1), which grants member-states the possibility of exempting certain persons from the obligations of the Directive. Not holding funds of clients is the first requirement<sup>123</sup> that a firm must comply with to allow its member-state to disapply the Directive; being a mere receiver and transmitter of orders is the second<sup>124</sup>. Robo-advisors usually hold clients’ assets and are not mere receivers and transmitters of orders<sup>125</sup>. All in all, this article does not exempt robo-advisors from the application of MiFID2, since they do not meet the required precepts.

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<sup>121</sup> Wolf-Georg Ringe, Christopher Ruof (2019) 29.

<sup>122</sup> Ibid 29-30.

<sup>123</sup> Article 3(1)(a).

<sup>124</sup> Article 3(1)(b).

<sup>125</sup> Maume (2021) 25.

To corroborate the last point, ESMA issued a few principles regarding the suitability requirements of MiFID2<sup>126</sup> where it accords that the notion of robo-advice comprises both the provision of investment advice and the subsequent portfolio management. This dissertation follows ESMA's instructions, thereby treating robo-advisors' regulatory framework as parallel to that of investment firms, that is, assuming robo-advisors are currently under the duties imposed by MiFID2.

Moreover, MiFID2Del-Reg openly embraces robo-advisory as being subject to its regulation, since recital 86 stipulates the responsibility of investment firms *where investment advice or portfolio management services are provided in whole or in part through an automated or semi-automated system*. As such, it rests no doubt that robo-advisors are under the obligations set out in MiFID2.

Looking at the question from another perspective, in practical terms a robo-advisor is just a software, it is not a legal person, nor it is part of the financial services contract between the financial incumbent and the customer<sup>127</sup>. According to MAUME, the financial firm or intermediary operating the robo-advisor is the one subject to the regulatory and legal framework which concerns financial services, whereas the robo-advisor is a mere instrument to deliver said financial services, such as any other tool employed for that purpose. What truly distinguishes a robo-advisor from other software-based tools is that, while the former is the main means of communication between the firm and the consumer, the latter are not employed in this external relationship but are simply an internal instrument not accessible to the customer<sup>128</sup>.

There is a divergence here that brings us back to the initial query: are robo-advisors investment firms, or simply a tool utilized by investment firms? Although both schools of thought present insightful arguments, this dissertation follows the first claim that robo-advisors are investment firms. Whatever the final standpoint of regulatory authorities may be, it rests assured that MiFID2 is applicable<sup>129</sup> and the main source of regulation for robo-advisors operating in the European Union nowadays.

A consequential question materializes after determining that robo-advisors are investment firms under the meaning provided by MiFID2, and that is whether they just give investment advice, only engage in portfolio management activities, or perform a combination of both. That is to say, if the robo-advisors give investment advice and leave the investment

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<sup>126</sup> European Securities and Markets Authority, Guidelines on Certain Aspects of the MiFID II Suitability Requirements (Final Report, 06 November 2018).

<sup>127</sup> Maume (2021) 10.

<sup>128</sup> Ibid 12.

<sup>129</sup> Maume a (2019) 16.

itself for the client to apply and manage, if they exclusively practice ensuing portfolio management, or offer the two services. To answer this question, it is worth noting that there are two significant moments in robo-advisors' course of action that have to be itemized. The first moment occurs when the client decides if he wants to be in a contractual relationship with the robo-advisor, i.e., whether he wants to be the recipient of financial services. Afterwards, he chooses the amount of money to invest, and a risk profile is subsequently generated based on the answers given to the questionnaire. The second moment coincides with the portfolio management services and adjustments to the initial provision of advice (first moment)<sup>130</sup>.

The division between investment advice and portfolio management is a problem for the application of MiFID2, because the exemption provided for in aforementioned article 3 is only at the disposal of firms offering investment advice<sup>131132</sup>. Nevertheless, it was already perused how robo-advisors perform both activities – they give investment advice and subsequently manage clients' assets – and, as such, they should conform to MiFID2's regulatory framework. Under the Directive, robo-advisors are allowed to offer both investment advice and portfolio management<sup>133</sup>.

The answer to this consequential question will affect how the rules pertaining to disclosure obligations established by MiFID2 are applied.

## **1.2. Does AI present challenges so different so as to justify the creation of a new regulatory framework?**

The core point of MiFID2 is that it advocates for technology-neutral regulation. In essence, technological neutrality implies that the laws and regulations which apply to financial services and transactions remain the same, irrespective of the technological techniques used to execute them<sup>134</sup>. This is especially relevant regarding the authorization that must be awarded by national authorities prior to the provision of investment services<sup>135</sup>. In respect to robo-

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<sup>130</sup> Maume (2021) 33-34.

<sup>131</sup> Wolf-Georg Ringe, Christopher Ruof (2019) 29-30.

<sup>132</sup> Article 3(1)(b) reads that “Member States may choose not to apply this Directive to any persons for which they are the home Member State, provided that the activities of those persons are authorised and regulated at national level and those persons: (b) are not allowed to provide any investment service except the reception and transmission of orders in transferable securities and units in collective investment undertakings and/or the provision of investment advice in relation to such financial instruments”.

<sup>133</sup> Maume (2021) 8.

<sup>134</sup> Ibid 22.

<sup>135</sup> Article 5(1) MiFID2.

advisors, this means that the available services (provision of advice and portfolio management) need to be authorized, but the technologies used will not be a cause for concerns nor detrimental to get the authorization<sup>136</sup>.

In practical terms, technological neutrality could lead to the conclusion that every innovation introduced in a robo-advisor would never be unregulated, because the same pre-established rules will nonetheless be suitable to the new technologies as a result of technology neutrality. However, it is not complicated to envisage how consistently applying old rules to forthcoming technologies may result in legal uncertainty<sup>137</sup>, mostly owing to the possible inadequacy of those rules regarding novel technologies.

Our conclusion that MiFID2 should regulate robo-advisors does not mean, however, that it is a consensual opinion. Notwithstanding the principles of technological neutrality, the rules enshrined in the Directive were not created having robo-advisors as standards and may as such not be ideal to serve them adequately. In other words, there is still regulatory uncertainty among robo-advisors, making it hard to fit new kinds of financial advice or hybrid technologies into the current regulatory patchwork<sup>138</sup>.

The truth is that MiFID2 constitutes a reworking of MiFID<sup>139</sup>, adopted in 2004 when it was hard to envisage the technological leap the world would take, and hence represents an outdated philosophy towards financial services. The revision of MiFID was meant to consolidate investor protection and make financial markets more efficient, resilient and transparent. However, even though the goal of MiFID2 was to be technologically neutral, some rules are still clearly grounded on human interaction<sup>140</sup>.

In our view, the fact that robo-advisors offer standards of quality and risk similar to human advisors<sup>141</sup> justifies that they shouldn't be subject to higher standards than those enacted for human advisors. To put it another way, if traditional advisors can, for example, provide financial services that later prove to be detrimental<sup>142</sup> to the investor's goals and situation, an obligation over robo-advisors to permanently act without flaws shall not be imposed. Therefore, enforcing more restrictive obligations over robo-advisory than traditional advisory is not justifiable, and policymakers must not regulate based on what they believe is the best or the

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<sup>136</sup> Maume (2021) 42.

<sup>137</sup> Ibid 23.

<sup>138</sup> Wolf-Georg Ringe, Christopher Ruof (2019) 31.

<sup>139</sup> Maume a (2019) 35.

<sup>140</sup> Wolf-Georg Ringe, Christopher Ruof (2019) 28, 35.

<sup>141</sup> Maume a (2019) 5.

<sup>142</sup> As long as the bad services weren't provided intentionally.

worst service<sup>143</sup>. If new regulatory standards are to be enacted, they should address the particular issues revealed by robo-advisory, and not touch upon reframed concerns of traditional advisory.

### **1.3. How to circumvent the issues of bias and opacity**

We will now assess if the risks of increasing bias and opacity of algorithms, including the major problem posed by the existence of black boxes, are sufficiently regulated by MiFID2 in a way that favors financial inclusion.

First and foremost, it should be accounted that MiFID2 places a great emphasis on investor protection, which does not mean that customers are protected from bearing any losses<sup>144</sup>. Although the Directive does not provide a clear definition of investor protection, the underlying idea is that investment decisions should be taken on an informed basis, centered around consistent market information and free of external (i.e., from financial advisors or financial firms) harmful advice<sup>145</sup>. If the advice provided eventually results in financial harm, the investor should have the chance to seek redress against the advisor. In the case of robo-advisors, defective recommendations should allow clients to effectively challenge the advisor. In what concerns financial inclusion, the possibility of acting against the advisor is particularly important. In addition to the lack of trust in financial services that may accompany the financial excluded, in their situation a detrimental investment not solely means the loss of a significant amount of their wealth, but, in reality, it may correspond to a massive retreat in their financial stability and well-being, whose aftermath could be the withdrawn of all of their assets from robo-advisory altogether. Consequently, simple forms of seeking recourse for failed investments should be explained to robo-advisor's clients, as a way to foment their involvement in the investment process and further equip them with financial wisdom.

Investor protection is also reflected on the “disclosure-based approach” of financial markets regulation. This approach intends to reduce information asymmetries, such as those stemming from conflicts of interest, and to outlaw practices that are detrimental to investors, such as market manipulation and insider dealing<sup>146</sup>. The disclosure-based approach could be, in principle, of important application in the field of robo-advisory, especially when one thinks

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<sup>143</sup> Maume a (2019) 36-37.

<sup>144</sup> Maume (2021) 23.

<sup>145</sup> Ibid 22.

<sup>146</sup> Ibid.

of the prime difficulty that is directly dealing with a machine and not being able to assess the quality of the financial advice<sup>147</sup>. As previously pointed, one of the main issues arising from robo-advisors is the possibility of the underlying algorithm turning into a black box or, at least, reaching a moment where it becomes difficult to cognize what generated a certain choice/outcome. Following this line of thought, a disclosure-centered approach would transform a robo-advisor's algorithm into a trustful ally, allowing both investors and financial participants to effortlessly analyze its decisions and assess their legality.

This idea easily partners up with financial inclusion. If the robo-advisor's industry adopts the disclosure-based approach and actively endeavors to explain the decision-making process of their robo-advisors, the current financial excluded individuals will have incentives to adhere to robo-advisory as they will feel it as a safe, reliable, and economically sensible option in comparison with traditional advisors.

However, it is also clear that the investor protection concept and disclosure-based approach present in MiFID2 may not be so accessible to apply when AI is part of the robo-advisor's software, as it may unpredictably evolve, which could render the advice unlawful and not promote the financial inclusion agenda.

The problem is twofold. From one perspective, full disclosure of robo-advisory processes does not seem to be realistic. Beyond the obvious intellectual property problems associated with algorithm design, there are severe doubts whether investors can understand the code that constitutes an algorithm. From the other standpoint, lack of algorithm disclosure can enlarge the problems arising from opaque algorithms if proper enforcement rules are absent. Under MiFID2, public enforcement of financial regulation belongs to national regulators. The different resources and distinct realities of member-states influence the work of national regulators, leading to contrasts in supervision and enforcement between states.<sup>148</sup> Enforcement is especially relevant in the case of robo-advisors to ensure that the disclosure-based approach is implemented and to remove any possibility of creating unjust algorithms. These differences between national regulators can create unfair practices between robo-advisors established in different member-states.

The problem of opacity of robo-advisors' underlying algorithms can find a solution if national regulators have access to the algorithm or an explanation of the decision-making process is provided by financial firms, which complies with the AI proposal's view that AI should be transparent and explainable, and which will be perused below. MiFID2 already

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<sup>147</sup> Ibid.

<sup>148</sup> Ibid 23.

covers this acquisition of information, when states in article 69(2) that national authorities may access *any document or other data in any form which (...) could be relevant for the performance of its duties*<sup>149</sup> and may *require or demand the provision of information from any person and if necessary to summon and question a person with a view to obtaining information*<sup>150</sup>, which seems to encompass the disclosing and clarification of algorithms. Notwithstanding the aforementioned difficulties associated with full disclosure of algorithms, handing over an explanation of the decision-making process, although far from perfect, seems to be a sensible option to overcome the issues of bias and opacity.

#### **1.4. Data shortage and conflicts of interest**

Article 25 of MiFID2 ('Assessment of suitability and appropriateness and reporting to clients') is a fundamental principle for robo-advisor's regulation and a potential provision to serve as a basis to augment robo-advisor's target audience and further enhance worldwide financial inclusion. The suitability assessment is mandatory for financial institutions to attest they are taking the best route for each investor<sup>151</sup>.

Paragraph 1 of article 25 prescribes that investment firms must *ensure and demonstrate to competent authorities on request that **natural persons** giving investment advice or information about financial instruments, investment services or ancillary services to clients on behalf of the investment firm possess the necessary knowledge and competence to fulfil their obligations*. Although the definitions of robo-advisors differ based on them being AI-imbedded or not or more or less advanced, they are not natural persons, and this article explicitly refers to 'natural persons'. This provision may, nevertheless, apply to hybrid robo-advisors<sup>152</sup>. Anyhow, it can be argued that robo-advisors can be equated to human advisors for the purposes of application of MiFID2. This simply denotes that robo-advisors must be equipped with the skills which are mandatory for human advisors<sup>153</sup>, i.e., they have the necessary knowledge and competence to act in financial markets. These features are obviously directed towards the algorithms when it comes to robo-advisors: software shall be prepared to give advice and

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<sup>149</sup> Point (a).

<sup>150</sup> Point (b).

<sup>151</sup> Maume (2021) 28.

<sup>152</sup> See chapter II. 1 of this paper.

<sup>153</sup> Maume (2021) 43.

manage the assets of investors, in accordance with the regulatory framework established in MiFID2.

Paragraph 2 of article 25 determines the following:

*When providing investment advice or portfolio management the investment firm shall obtain the necessary information regarding the client's or potential client's knowledge and experience in the investment field relevant to the specific type of product or service, that person's financial situation including his ability to bear losses, and his investment objectives including his risk tolerance so as to **enable the investment firm to recommend to the client or potential client the investment services and financial instruments that are suitable for him and, in particular, are in accordance with his risk tolerance and ability to bear losses.***

*Member States shall ensure that where an investment firm provides investment advice recommending a package of services or products bundled pursuant to Article 24(11)<sup>154</sup>, the overall bundled package is suitable.*

This paragraph entails that firms that operate robo-advisors are obliged to collect information on the investor's knowledge and experience as regards the investment products, his financial state, and the goals he plans to achieve through those investments. This responsibility is also necessary towards potential clients. The crucial intention of this clause is certifying that investment firms act in the best interest of each client, making recommendations that conform to their personal risk profile and which match their "their personal needs, characteristics and objectives"<sup>155</sup>.

In relation with this provision, article 54, paragraph 1 of MiFID2-DelReg determines that:

*Where investment advice or portfolio management services are provided in whole or in part through an automated or semi-automated system, the*

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<sup>154</sup> Article 24 of MiFID 2 ('General principles and information to clients'), paragraph 11 lays down principles regarding financial packages, i.e., investment services which are jointly offered with another service or product, prescribing a set of obligations that the investment firm must abide by, including descriptive and price disclosing obligations and information about the differentiated risks between the package and its separate components.

<sup>155</sup> As present in recital 71 of MiFID2.

*responsibility to undertake the suitability assessment shall lie with the investment firm providing the service and shall not be reduced by the use of an electronic system in making the personal recommendation or decision to trade.*

This section clarifies how article 25(2) is applicable to robo-advisors, as it explicitly declares that even if the advice or portfolio management are handled (even if only partially) by an electronic system, the level of accuracy of the suitability assessment shall meet the same requirements as if the advice or portfolio management were being provided by a human advisor.

The exigencies of articles 25(2) and 54(1) do not meet similar standards of rigorousness in robo-advisors, since most of these are still very rudimentary in understanding their (potential) clients' characteristics, wishes and demands. What we propose to tackle this issue is that introducing AI in robo-advisors' algorithms will enable financial institutions to retain a far larger collection of data pertaining to their customers, allowing them to better analyze the applicable variables and present a preliminary investment portfolio that is highly personalized and more adequate to each individual investor, and that detaches itself from the current standardized versions<sup>156</sup>. The reference to bundled products guarantees that the suitability assessment encompasses the package as a whole, ensuring that it is indeed appropriate for the investor and not just that its constituent assets are individually suitable<sup>157</sup>.

On the one hand, using AI applications to gather more information regarding the attributes referred in paragraph 2 of article 25 will ensure that the material assembled from robo-advisor's investors is precise and genuinely reflects each customer's financial reality. On the other hand, improved algorithms could also assemble other types of data which, even though seem unimportant to develop a valuable investment portfolio at first sight, in fact reveal to be significant in the process of creating a custom-built and effective advice package. The type of data here mentioned is already exploited by other industries and economic activities, including stores, social media platforms, and virtually every business that operates with the internet and maintains contact with the public. If these figures are being profited by other activities, which reasons may justify the fact that they are not being put to good use in banking and finance, allowing these firms to boost the quality of the products they deliver? Combining the impositions of article 25(2) with the compilation of other facts would provide a route to have a thorough comprehension of the customer, letting robo-advisors offer tailor-made, suitable

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<sup>156</sup> Wolf-Georg Ringe, Christopher Ruof (2019) 25-26.

<sup>157</sup> Maume (2021) 28.

investment portfolios. Furthermore, it is also foreseeable that using AI to explore more information and increase the expertise about the investor's standing (not only concerning his financial position, but other aspects as well) will create a portfolio that, beyond being more personalized and appropriate to a certain client, also produces superior results financial-wise and upgrades the economic situation of the investor. Such possibility will likely have the consequent effect of retaining such investor as a client of robo-advisors' services.

A problem that undermines robo-advisors and that evolves from the use of simple questionnaires to conduct the suitability assessment is the inability of the investor to understand and accurately answer the questions asked. Individuals with low levels of financial knowledge and/or with scarce financial resources are likely to misinterpret the initial surveys or to wrongly estimate some of the queries, including significant points such as the level of risk they can bear<sup>158</sup>. Furthermore, standard questions do not allow robo-advisors to adapt to different investors' situations when they are inconsistent in their answers or if their replies significantly fluctuate from the usual responses. If we are looking to grow robo-advisors' scope of clients to welcome those who are financial underserved, then the current suitability assessments need to undergo several changes to attest that they are collecting correct information. If the inputs are not truthful and accurate, then the software will give out amiss advice. This is yet another area where AI can be particularly helpful.

That is why, in our viewpoint, AI has potential to change robo-advisors' adherence in the general public, in specific near more disadvantage populations, converting them into a valuable and desired instrument. The shortage of knowledge that today hovers over robo-advisors' algorithms<sup>159</sup> and which constitutes one of the causes of their seemingly unsuccess has the prospect of being weakened with the help of AI. This includes the modern robo-advisors that by this time employ practices that make use of a bigger batch of information, because regardless of having access to more inputs when preparing the advice, the output is still not as sound and beneficial as it could be if AI was to be implemented in their algorithm. The key premise here is that robo-advisors should use a combination of data and AI to provide a more precise, convenient and faster product to the client<sup>160</sup>.

Accordingly, a mixture of using more data and integrating AI would help robo-advisors to fulfil the suitability assessment prescribed in MiFID2. If standard surveys are still the primary

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<sup>158</sup> Maume (2021) 28-29.

<sup>159</sup> Most robo-advisors base their proposed investments in answers given by their clients in initial questionnaires, as seen in chapter II.1 of this paper.

<sup>160</sup> Wolf-Georg Ringe, Christopher Ruof (2019) 26.

method used to measure a client's *knowledge and experience in the investment field relevant to the specific type of product or service*, his *financial situation including his ability to bear losses*, and his *investment objectives including his risk tolerance*, the suitability test undertaken by robo-advisors will continue to be insufficient to satisfactorily suggest investments that effectively balance an individual investor's objectives and his personal financial terms. This being said, it becomes evident that incorporating AI systems in robo-advisors is a very feasible solution in order for them to become drivers of financial inclusion.

Beyond ensuring that the information provided is enough and precise and enables the provision of advice, robo-advisors must conduct a consistency test. This is supported by article 54(7)(d) of MiFID2-DelReg:

*Investment firms shall take reasonable steps to ensure that the information collected about their clients or potential clients is reliable.*

*This shall include, but shall not be limited to, the following:*

*(...)*

*d) taking steps, as appropriate, to ensure the consistency of client information, such as by considering whether there are obvious inaccuracies in the information provided by clients.*

This legal provision also makes reference to firms with an “on-going relationship with the client”, where the information on the investor must be properly updated to reflect possible changes and to fulfil the suitability assessment of MiFID2. Portfolio management carried out by robo-advisors is an example of this “on-going relationship”.

MiFID2 discourses over ‘Conflicts of interest’ in article 23, stating that

*Member States shall require investment firms to take **all appropriate steps to identify and to prevent or manage conflicts of interest** between themselves, including their managers, employees and tied agents, or any person directly or indirectly linked to them by control and their clients or between one client and another that arise in the course of providing any investment and ancillary services, or combinations thereof, including those caused by the receipt of inducements from third parties or by the investment firm's own remuneration and other incentive structures.*

This provision is transparent in making the prevention and management of conflicts of interest within financial firms mandatory. Moreover, article 16(3) of MiFID2 asserts that firms *shall maintain and operate effective organisational and administrative arrangements with a view to taking all reasonable steps designed to prevent conflicts of interest (...) from adversely affecting the interests of clients*. A new standard is here introduced: conflicts of interest may exist, but they must not affect the interests of clients. This easier model recognizes that, while erasing all conflicts of interest would be senseless and avowedly impossible, measures may be taken to guarantee that they do not negatively impact investors' interests. The regulation of conflicts of interest in robo-advisors is, therefore, smoothed with article 16(3).

If conflicts of interest were to be removed altogether, it could be challenging to align robo-advisors' promise of changing investment markets by providing cheaper and accessible investment services with an absolute independence from any financial incumbents.

In the case that the aforementioned measures are not enough to certify that *risks of damage to client interests will be prevented*, firms are under an obligation to inform investors about the nature and/or sources of conflicts of interests and their endeavors to alleviate those dangers<sup>161</sup>. This disclosure must be clear and explain the conflicts of interest that could arise in relation to the specific investor, the risks that he may incur due to such conflicts, as well as the actions taken to relieve those risks. In any event, this is a *measure of last resort*, whose principal purpose is to allow the investor to make an informed decision<sup>162</sup>. In robo-advisory, this means giving clients a list of affiliations with issuers of financial products that could spark a conflict of interest that entail a risk for the interests of those clients<sup>163</sup>. In any event, these articles reiterate the primacy of investors' interests and choices when receiving investment advice and related services, a commitment that we believe must be fully fetched by robo-advisors. In other words, these policies do not exempt robo-advisors from acting in the investor's best interest and from giving the best possible advice and applying the best possible investment decision. Thus, robo-advisors should be programmed to ensure that the interests of the clients are the foundation for every decision that is executed regarding their assets<sup>164</sup>.

In its turn, article 33 MiFID2-DelReg deepens this concept and establishes *minimum criteria* to appraise the presence of conflicts of interest, providing a list of situations that can give rise to such conflicts. It considers the possibilities of the advisor or firm being monetarily

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<sup>161</sup> Article 23(2) MiFID2.

<sup>162</sup> Article 34(4) MiFID2-DelReg.

<sup>163</sup> Maume (2021) 40.

<sup>164</sup> Ibid 33, 40.

benefited at the expenses of the client, of them having a different interest in the outcome of the services provided (including the interests of other clients), of carrying the same business as the client, and of receiving an inducement from a third party with respect to the investment services delivered to the client in question. Additionally, article 35 of the Delegated Regulation lays out how firms must record the conflicts of interest, including future conflicts when an ongoing service is at stake, apt to harm the interests of investors. This record should be embedded into robo-advisors' algorithms<sup>165</sup>, with the view to make sure that similar conflicts of interest are not repeated.

The actions adopted to prevent conflicts of interest from harming investors' interests, including the "last resort measure", shall be employed not only during the initial provision of advice, but also on the portfolio management that follows<sup>166</sup>, so as to keep the investor informed and fully aware of the manners in which his money is being handled. The obligation to disclose set out in article 23(2) MiFID2 might, however, be an obstacle to one of the central characteristics of robo-advisors: their automatism. After the preliminary survey designed to know the client's goals and estimated risk profile, the algorithm will conduct investment decisions autonomously, waiving the investor's acquiescence to every decision<sup>167</sup>. The main advantages of robo-advisors (in particular, their inexpensiveness) do not match with the typical client/advisor relationship, since it is impossible to keep the all features of a traditional advisor at the lower costs and accessibility of a robo-advisor. Adding more AI to robo-advisors' software may, nonetheless, secure investors that maneuvers of their assets have a broader basis of knowledge on their situation and the changes it might endure over time.

MiFID2 does not prescribe exceptions to the disclosure rule. In spite of the fact that it only comes into action after all the other measures have been implemented, MiFID2 is not supportive of the idea that this measure cannot be applied to robo-advisors. But, as defended, a full disclosure obligation might conflict with the essence of robo-advisors.

## **1.5. Financial Knowledge**

Although this dissertation argues that robo-advisors may positively impact financial inclusion on a global scale, it is recognized that in order to deliver their services to the

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<sup>165</sup> Ibid 38.

<sup>166</sup> Ibid 34.

<sup>167</sup> Ibid.

“outsiders” of the financial systems (either because they are unbanked, have low availability of funds, have low financial literacy, ...) and effectively make room for the aforesaid positive impact, robo-advisors must inform their current and potential clients in a manner that must be *fair, clear and not misleading*<sup>168</sup> and which enables them to reasonably *understand the nature and risks of the investment service and of the specific type of financial instrument that is being offered and, consequently, to take investment decisions on an informed basis*<sup>169</sup>. Transmitting this information does not constitute an issue for robo-advisors, as there isn’t an impediment for it to be conveyed through online platforms. Nevertheless, the only possible way to take a step closer in the direction of broader financial inclusion is to guarantee that the explanations provided are truly comprehensible and, more than that, understood by each investor. This is not an easy task, as the investors that usually resort to robo-advisors are not financially proficient. Furthermore, more than granting the “outsiders” a first participation in investment markets, robo-advisors should strive to keep them as clients. The wisest path to ensure this continuity is to be *fair, clear and not misleading*, equally informing investors on the risks and on the benefits of the proposed investments, i.e., not masquerading the potential hazards of investing with the many pluses that come with robo-advice.

Apart from being informed about the dangers and advantages of robo-advisors, investors should be elucidated on the “*exact degree and extent of human involvement*” and the possibility to ask for human assistance when interacting with a robo-advisor, and on the fact that the data they pass onto the robo-advisor is going to be utilized to create a certain portfolio<sup>170</sup>. Furthermore, ESMA advises that the sources of information selected to yield the investment services and an explanation on the adjustment of client’s information (i.e., when his individual situation changes and demands a portfolio rearrangement) should be presented as well. In our view, ESMA’s recommendations pave the way for an increasing use of AI in robo-advisors, provided that investors are clearly and explicitly aware of said use and how it can influence the provision of financial services.

Notwithstanding the non-mandatory status of ESMA’s guidelines<sup>171</sup>, they provide clear and useful guidance that robo-advisors should abide by and that are consistent with the ultimate aim of promoting inclusivity in finance. Indeed, financial inclusion cannot simply consider the

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<sup>168</sup> Article 24(3) MiFID2 and article 44 MiFID2 Del-Reg.

<sup>169</sup> Article 24(5) MiFID2.

<sup>170</sup> European Securities and Markets Authority (Final Report, 06 November 2018) 6-7.

<sup>171</sup> Except for the obligations set out in MiFID2, which are mandatory, as dictated in European Securities and Markets Authority (Final Report, 06 November 2018) 4.

economic factors of access to finance, but also the need to equip new entrants of the market with sufficient knowledge to understand the investments they will be partaking in.

Including knowledge in the financial inclusion discourse cannot entail, however, any algorithm revelation, as explored in previous question 1.3. Aside from the intellectual property issues that it could pose, advanced AI-rich algorithms can be nearly incomprehensible. In this sense, in case there is apprehension regarding the lawfulness of an algorithm, disclosing it to a client is not a sensible possibility. Rather, compliance with the remaining of robo-advisors regulation might be capable to ensure that an advisor's decision does not incur in any kind of unfair conduct. Nonetheless, as aforesaid MiFID2 already prescribes an obligation to disclose the algorithm to the national regulator in article 69(2) MiFID2<sup>172173</sup>, which resolves potential issues when there is mistrust that an algorithm is endorsing in illicit decision-making. Whether this is enough to halt sophisticated algorithms is still ambiguous. Anyhow, robo-advisors cannot be subject to more obligations than human advisors.

The report required by MiFID2 in article 25(6) is another manifestation of the disclosure-based approach and intends to thoroughly keep the investors informed about the financial services provided and the associated costs. In what concerns the initial provision of advice, the investor must receive a suitability report describing the advice and how it observes his personal preferences, objectives, and characteristics. The last subparagraph of article 25(6) indicates that a periodic report must be presented when portfolio management is provided or when there is a periodic assessment of suitability; the periodic report is bound by the same rules as the initial report, that is, it shall include an explanation on how the investments aligns with the client's preferences, objectives, and characteristics. This is challenging in the context of robo-advisory, as rebalancing of portfolio happens at a very high-speed, following automated orders. If, on the one hand, one considers that periodic reports are subject to the same rules as the initial report, especially if they must be presented before transactions are made<sup>174</sup>, it would not be viable to apply this requirement to robo-advisors. On the other hand, if one reckons that the requirements of periodic reports differ from those of the initial report, in a manner that the former shall not be presented every time a transaction is carried out or rebalancing happens, this

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<sup>172</sup> This article prescribes that national authorities (a) have access to any document or other data in any form which the competent authority considers could be relevant for the performance of its duties and receive or take a copy of it, and (b) require or demand the provision of information from any person and if necessary to summon and question a person with a view to obtaining information.

<sup>173</sup> Maume (2021) 31.

<sup>174</sup> Article 25(6), second subparagraph.

provision could apply to robo-advice<sup>175</sup>. This is in line with the second subparagraph of the article, which grants the possibility of providing an ulterior report, when the agreement between investor and advisor is concluded *using a means of distance communication* and certain conditions are met<sup>176</sup>, which is unquestionably the case of robo-advisors.

## 1.6. Proposed solutions

Even though MiFID2 may be adequate to seize some of the issues posed by AI-driven robo-advisory, opacity of algorithms is still difficult to defeat. More AI in robo-advisors' algorithms will enfold an ability to self-learn and change the patterns and outcomes that they produce. How may regulation address these changes? The continuous evolution of algorithms does not tune in with a systematic oversight of their software. That would require a constant vigilance over the algorithm – which is able to change within seconds -, which in turn would demand vast human resources, that regulators are often lacking<sup>177</sup>.

The promise of market efficiency conveyed by robo-advisors connects with their lower costs as opposed to other advisors. Generally, low fees would allow more participants into the market<sup>178</sup>, which is in line with the preposition of increased financial inclusion. Although this idea appears to be logical, it must be coupled with effective regulation. Subjecting robo-advisors and traditional advisors to the same regulatory rules will eventually destabilize the markets, as those rules were designed having obsolete mechanisms in mind. Thereby, applying the same rules for both could produce the opposite effect of increased efficiency<sup>179</sup>. As intermediaries between investors and financial markets, robo-advisors contribute to market development<sup>180</sup> as well, which instantiates why their regulatory structure is so relevant and should be set on secure grounds.

There are other proposed alternatives to tackle this issue, namely conducting assessment of employees and imposing a third-party auditing<sup>181</sup>. Beginning with the first option, however

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<sup>175</sup> Maume agrees with this view, stating that “the robo-advisor does not need to produce and send a suitability statement each time a transaction is carried out”, in Maume (2021) 41.

<sup>176</sup> The conditions dictate that (a) the client has to consent to receiving the suitability statement without undue delay after the conclusion of the transaction, and (b) the investment firm has to give the client the option of delaying the transaction in order to receive the statement on suitability in advance.

<sup>177</sup> Maume (2021) 43-44.

<sup>178</sup> Maume a (2019) 34.

<sup>179</sup> Ibid.

<sup>180</sup> Ibid 13.

<sup>181</sup> Maume (2021) 20.

rigorous the assessment might be, it still only addresses the competences of individuals who work for the investment firm, and not the algorithm itself. While it is evident that a competent and experienced staff is credible to deliver an efficient, complying algorithm, it is not necessarily a cause-effect relationship. Observable characteristics such as education or training do not exempt employees from making mistakes and certainly do not refrain them from programming in a way that doesn't comply with regulatory requisites. Accordingly, if testing of algorithms would rely solely on evaluation of employees, there would not exist guarantees that they were not coded in a way that stifles financial inclusion.

Second, we are left with the possibility of third-party auditing, which is applied to verify compliance and that is frequent in the robo-advisor market<sup>182</sup>. Albeit it can be used as an instrument to demonstrate to national regulators that the algorithm is safe and complies with the Directive's context, it imposes costs that can be ruinous for some robo-advisors. In any event, this mechanism is not established in MiFID2, and thus national authorities cannot demand such an audit.

This analysis ends with the assumption that the only option left for the control of AI-embedded algorithms, and which already exists is article 69(2) 'Supervisory Powers'. Howsoever, even if one admits that this option is viable, it is impossible to ignore that future developments will render this article inadequate. The current regulatory framework does not answer properly to the issue of black boxes, nor tries to provide transitory solutions.

In the end, financial services can take one of two paths. One, they can ignore the vast advantages that AI could bring to robo-advisory and the benefits that the combination of the two could lodge to inclusive finance. Or, second, they can battle for the adoption of a new regulatory framework that, beyond adopting a technology-neutral approach, truly recognizes that new sophisticated technologies cannot continue to be neglected in the financial services domain.

As such, it is in the interest of both investment firms, investors, and regulators to encourage the drafting of a new regulatory framework that truly accommodates robo-advisory, so as to stimulate a culture of "investor protection, fairness and market efficiency"<sup>183</sup> when this type of advice is under concern. In our view, MAUME is correct in assuming that these goals may only be genuinely achieved if there is coordination between the EU and the Member States,

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<sup>182</sup> Maume (2021) 44 citing Katharina Birgmeir, 'Regulating Robo Adviser Algorithms: Possible, Sensible, Necessary?' (2019), M.Sc. thesis at TUM School of Management, available at <<https://mediatum.ub.tum.de/doc/1612912/1612912.pdf>> 60

<sup>183</sup> Maume b (2019) 638.

and between national regulators, since the complexity and dimension of financial markets demand a European approach that is uniformly applied throughout its members.

The call for a new legal regime does not imply that the inherent principle of technological neutrality of MiFID2 shouldn't be appraised. It constitutes in fact a valuable foundation that we believe should ground future regulations. The future of technology and in particular of AI is unpredictable, which could outdate any future law almost automatically. Therefore, future regulations should continue to strive to follow a neutral approach, whilst having a close look at technology.

## 2. Artificial Intelligence Proposal

After carefully perusing MiFID2's regulatory framework, we will now briefly analyze the new EU Artificial Intelligence Proposal, enacted in April 2021. Albeit it is not yet a mandatory law, it sets the Union's outlook on AI and creates a foundation for future regulation. As such, we will succinctly assess whether the problems posed by AI-driven robo-advisory find a solution in this proposal.

That being said, the critical issues that we encountered in previous chapters of this paper are identified by the Proposal as well. In the Explanatory Memorandum, there is reference to the need of addressing the concerns of *opacity, complexity, bias, a certain degree of unpredictability and partially autonomous behaviour of certain AI systems*<sup>184</sup>.

Article 6 and Annex III of the Proposal lay out which AI systems are to be considered high-risk, i.e., *AI systems that pose significant risks to the health and safety or fundamental rights of persons*<sup>185</sup>, which shall comply with a list of mandatory requirements and undergo ex-ante conformity assessment procedures in order to be authorized within the EU<sup>186</sup>, and which are under the obligations set out in Chapter 2 of the proposal. Robo-advice is not explicitly stated as high-risk by Annex III, which, however labels credit scoring as such. Nevertheless, AI-driven robo-advice could still be categorized as high-risk if it met the two characteristics established in article 6:

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<sup>184</sup> Paragraph 5 of Point 1.1. of the Explanatory Memorandum accompanying the Proposal.

<sup>185</sup> Paragraph 9 of Point 1.1. of the Explanatory Memorandum accompanying the Proposal.

<sup>186</sup> Point 5.2.3. High-Risk AI Systems of Explanatory Memorandum accompanying the Proposal.

- (a) *the AI system is intended to be used as a safety component of a product, or is itself a product, covered by the Union harmonisation legislation listed in Annex II;*
- (b) *the product whose safety component is the AI system, or the AI system itself as a product, is required to undergo a third-party conformity assessment with a view to the placing on the market or putting into service of that product pursuant to the Union harmonisation legislation listed in Annex II.*

Further clarification is needed regarding the categorization (or lack of it) of AI-driven robo-advisory as high-risk. As stated in Point 5.2.3. of the Explanatory Memorandum accompanying the Proposal, classifying an AI system as high-risk depends on its *intended purpose*. The use of AI in robo-advisors and credit scoring poses, in our view, similar risks and purposes and therefore it is hard to explain why the Proposal only directly labeled credit scoring as high-risk. Nevertheless, it explicitly grants the Commission the possibility of expanding the list of high-risk AI systems, since the list presented only foresees some AI systems *whose risks have already materialised or are likely to materialise in the near future*<sup>187</sup>.

Although it is discussable whether AI applied to robo-advisors could be considered high-risk, falling into the categories established in Annex III of the Proposal, articles 13 and 14 establish important ideas for the regulation of AI<sup>188</sup>. Article 13 touches upon transparency of the operation of high-risk AI systems, that should be *sufficiently transparent to enable users to interpret the system's output and use it appropriately*<sup>189</sup>. In turn, article 14 refers to the requirement of human oversight, with paragraph one laying down that *High-risk AI systems shall be designed and developed in such a way, including with appropriate human-machine interface tools, that they can be effectively overseen by natural persons during the period in which the AI system is in use*. Both articles depict relevant rules which may be looked at as prohibitions of black-box algorithms. If a human cannot understand the decision-making process that a certain AI system is following, it is possible to argue that it does not comply with the applicable laws and, therefore, its use must be banned.

This view is further developed in paragraph 2 of article 14, when it states that *Human oversight shall aim at preventing or minimising the risks to health, safety or fundamental rights that may emerge when a high-risk AI system is used*. The Proposal specifically included threats to fundamental rights in its bubble of protection, which demonstrates that AI may impact, not

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<sup>187</sup> Point 5.2.3., paragraph 3 of Explanatory Memorandum accompanying the Proposal.

<sup>188</sup> Maume (2021) 20.

<sup>189</sup> Paragraph 1 of Article 13 of the Proposal.

only the safety of our bodies and other corporeal things, but also our rights and duties. Following this reasoning, the application of AI to robo-advisors shall contemplate rules to enforce equal treatment of investors, regardless of their income, age, gender, origins, ... Although this Proposal does not explicitly target robo-advisors, its standards have to be present, with the view to certify that the future developments of robo-advisory comply with possible upcoming regulations.

The problem of bias is considered in article 5, which sets a number of prohibitions, including the prohibition of *an AI system that exploits any of the vulnerabilities of a specific group of persons due to their age, physical or mental disability*<sup>190</sup>. Regardless of the broad reach of this provision, it may be seen as broad enough to enfold prejudice against groups which are generally neglected by the financial industry. Furthermore, article 15(3), third subparagraph openly addresses the same problem, stating that development of AI shall *ensure that possibly biased outputs due to outputs used as an input for future operations ('feedback loops') are duly addressed with appropriate mitigation measures*.

Other relevant provisions of the proposal which are in harmony with current robo-advisory regulation enclose article 11 (Technical Documentation) and article 12 (Record-keeping).

A key principle that should ground AI and that is present in the foregoing provisions is that, above all, it should be explainable<sup>191</sup>, i.e., a certain recommendation or allocation should be able to be explained to whoever is impacted by its outcomes, especially to the investor it concerns. While full transparency of the algorithm may not be the ideal objective, disclosing which variables could lead the algorithm to deteriorate its operation and informing investors about possible constraints are vital goals to achieve customization of financial advice. As what concerns data protection legislation, this transparency requirement aligns with the GDPR's general "right to explanation", which albeit not explicitly articulated, is present throughout the whole document and here relates to the right of investors to inquire about the logic involved in algorithmic decisions affecting them.

On one last note, AI-driven robo-advice should support the global goal of the EU of *being a global leader in the development of secure, trustworthy and ethical artificial intelligence*<sup>192</sup>.

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<sup>190</sup> Article 5, paragraph 1, point (b) of the Artificial Intelligence Act.

<sup>191</sup> Milo Bianchi, Marie Brière (2021), 19-20.

<sup>192</sup> Third paragraph of the Explanatory Memorandum accompanying the Proposal.

## V. Conclusion

Innovations break previous ideas and boundaries, transform the way firms create and deliver products and services<sup>193</sup>. At the same time, innovation brings regulatory and legal challenges that should be addressed.

The impacts that AI may bring forth to robo-advisory are not scanty, nor negligible, and as such deserve to be properly regulated. In addition to benefiting financial firms, using AI in robo-advisors allows them to provide better services and to have a larger customer portfolio, comprising those who were previously excluded<sup>194</sup>. The main purpose of this dissertation was to anticipate the near future and evaluate whether existing financial regulation, namely MiFID2 (applicable to robo-advisors today) provides a sufficient basis to accommodate the opportunities brought by AI-driven robo-advisors and, if so, whether it is able to prevent accompanying risks.

Albeit built with a neutral approach towards technology, MiFID2 is still very conventional and turned to traditional services, which leads to the conclusion that it may not be suitable to overcome some of the issues that are possible to identify now, especially those of growing opacity and black boxes.

In this regard, the AI Proposal contains some relevant insights over these problems and provides a good foundation not only for regulators, but also for algorithm designers, which now have a legal starting point to ensure that they are developing a future-proof product. Nonetheless, not classifying robo-advisory as high-risk appears illogical if its hazards are duly considered. In any case, there is a chance that robo-advisory is included in the list if this proposal ever becomes a regulation.

What is truly relevant is that future regulation of AI-driven robo-advisory appropriately balances the risks and opportunities of AI, i.e., addressing the risks and problems without *constraining or hindering technological development or otherwise disproportionately increasing the cost of placing AI solutions on the market*<sup>195</sup>. Regulation of AI should not be so limiting that it eventually blocks all its advantages, and not so liberal that it fosters unacceptable situations. An equilibrium is the goal.

As what regards robo-advisors, future AI regulations should take into consideration existing financial legislation. If MiFID2 continues to be applicable, then AI rules should not be

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<sup>193</sup> Thomas Philippon (2020) 2.

<sup>194</sup> Joseph Lee (2019) 15.

<sup>195</sup> Paragraph 8 of the Explanatory Memorandum accompanying the Proposal.

in contradiction with it. The ideal solution would be, however, a new financial legal framework devised while taking AI into account, but with the aim to become future-proof, that is, to not become obsolete within a short amount of time – which is not straightforward if one acknowledges the fast-paced development of AI. In any case, future legislation should be aligned with the objectives of market safety, investor protection and market integrity<sup>196</sup>. Furthermore, financial inclusion should become a target for regulators and policymakers. If the regulation of AI points access to finance as an essential goal, the merits of robo-advisors will certainly be recognized, and their success will broach.

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<sup>196</sup> Joseph Lee (2019) 15.

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