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Robo Advisors as a Use Case of AI Systems: Linking Responsible Business Practices, Compliance and Outcomes

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Abstract: In this paper, we explore the workings of robo-advisors as an example of AI-based systems. We discuss the performance and challenges of robo-advice, as well as offer reflections on how and why robo-advice as part of the broader fintech and financial services sector intersects practices in AI systems, regulation and compliance. We draw attention to the implications for explainable AI, the role of humans in the loop, compliance and business practices. Our approach focuses on how the AI capabilities in robo-advisors can help to build responsible business practices and compliance elements into operating models and business processes. We explore how these interactions apply to selected use cases in the UK and discuss implications for improvements in responsible business practices, regulations and consumer/client outcomes.

Key words: AI, Robo-Advisors, Responsible Business Practices, Compliance, Consumer Outcomes

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1. Introduction

At the turn of the 2010s robo-advisors made an entry into the financial services and have evolved from basic online questionnaire tools to advanced automated systems for providing investment advice and decisions. Robo-advisory services have developed from simple standalone solutions to a well-established industry.[1] The global robo-advice industry holds assets under management (AUM) estimated at US$2trn, with an annual growth rate of 8% expected between 2024 and 2027.[2] While robo-advisors still account for a relatively small share of global AUM, which is projected to rise to over US$170trn by 2028[3], their contribution is expected to grow at a rate above global average. The expected rapid growth in robo-advisory assets is driven by the adoption of disruptive AI technologies in wealth management. The US leads the global robo-advice industry, with Germany and the UK leading in the European market. Robo-advisors have continued to expand into new geographies, evident in the growing adoption in emerging markets such as China and India.[4]

Robo Advisory services entail the deployment of automated investment solutions to make investment recommendations or decisions for clients. The idea behind robo-advisors is that investment service professionals, like their clients, are vulnerable to behavioural biases that affect investment decisions and pose the risk of financial loss to clients. For example, human advisors tend to reflect their biases and preferences in the recommendations they provide to clients.[5] The expectation is that an automated system in the form of robo-advisors can help to overcome the inherent weaknesses of human advisors and clients. Apart from the performance motive, robo-advisors offer opportunities to lower the cost and widen the reach of investment advice hence hold potential for financial inclusion. Robo-advisors also have capabilities to integrate social and environmental components into investment products through, for example, linking clients with opportunities to invest in stocks and shares that are aligned with Environment, Social and Governance (ESG) issues.

Robo Advisors work by profiling clients to understand their financial situation, investment objectives, preferences and risk appetite (risk aversion), among others. Customer profiling entails the completion of a questionnaire which elicits information on a client's financial knowledge, financial goals, and willingness and capacity to take risks or bear losses. Having profiled the client, the robo-advisor maps out the universe of potential portfolios and then matches the client with available portfolios. In addition to the allocation of funds, algorithms are also employed to track and detect changes in the allocated funds. Clients are informed of any changes and portfolios are re-balanced in line with the evolving financial conditions, risk tolerance, and investment goals of clients. In addition to client-specific information, changing market conditions and uncertainties are considered to ensure that robo-advisors re-configure portfolios and recalibrate risks to realise highest returns on investment.[6]

Robo-advisors, in some cases, are independent systems. This means that they are fully automated. In some other cases, the operating model is semi-automated, and works with human investment professionals that propose asset allocation or provide investment guidance to clients.[7] The concept of fully automated or autonomous robo-advisors

[1] See Deloitte (2016) for an overview of the evolution of rob-advisors.
[2] Statista (2024)
[3] See PwC 2024 Asset and Wealth Management Report
[4] Bianchi and Bri`ere (2023)
[5] Behavioural biases are reflected in such investment patterns as investment under-diversification and trend chasing (see D'Acunto et al., 2019).
[6] Puhle (2016) presents an in-depth description of the processes and outlooks of robo-advisors drawing on selected cases.
[7] For use cases of independent and semi-automated robo-advisors (Betterment and MarketRiders) see Schwinn and Teo (2018).

needs to be placed in context. While the operation of and interaction with a platform may be independent, human intervention applies somewhere in the system design and/or product delivery. For example, as robo-advisory services firms seek to build compliance into AI systems and products by design, legal officers/experts provide support to ensure that system operating models integrate regulatory obligations into business operations, products and services. This form of support continues alongside review of risks throughout the product life cycle.[8] Moreover, since authorisation to engage in regulated activity is granted only to legal persons, ultimate responsibility rests with the person or entity sponsoring an independent system. Thus, just as in traditional investment advice, contracts in robo-advisory services are between legal persons, and as such require the same duty of care owed to the client. The question of independence also applies to whether investment mandates are agreed with clients over which future decisions are made by robo-advisors. Where this is the case, robo-advisors have a discretionary mandate and fall within the usual regulatory framework according to the principle of technological neutrality applicable to regulated activities.

In this paper, we provide background to the workings of robo-advisors as an example of AI-based systems. We discuss the performance and challenges of robo-advice, as well as offer reflections on how and why robo-advice as part of the broader fintech and financial services sector intersects practices in AI systems, regulation and compliance. We draw attention to the implications for explainable AI, the role of humans in the loop, compliance and business practices. Our approach focuses on how the AI capabilities in robo-advisors can help to build responsible business practices and compliance elements into operating models and business processes. We explore how these interactions apply to selected use cases in the UK and discuss implications for improvements in responsible business practices, regulations and consumer/client outcomes.

2. Capabilities, Practices and Issues around Robo-Advisors

2.1 Performance of robo-advisors

Robo-advisors have recorded consistent performance over non-automated funds or conventional fund management models in asset screening, risk-adjusted returns, and growth. For example, a study demonstrates that robo-advisors outperform conventional fund management (unautomated models in fixed income and money market)[9]. In contrast to active fund management, which relies on investment professionals' research and insights into the market, passive fund management, which automatically tracks and replicates indices and asset classes based on overall market trends, is the widespread practice and key driver of growth in automated wealth management. While the passive fund management model has lower costs and market-adjusted risks, index accuracy is crucial to maintaining lower risks as tracking errors and market fluctuations can result in significant capital losses to clients.

A similar study finds the effectiveness of robo-advisors in reducing the disposition effect; the tendency of the affected investors to sell off assets at a loss. The authors find that investors who use robo-advisors are less reluctant to sell assets at a loss compared to investors without

[8] See Syed (2018) in Thomson Reuters Legal Insights for Europe for further discussion on the role of lawyers in AI/robo-advisory systems design and operation as part of Europe/UK's compliance requirements.

[9] For detailed analysis of the superior performance of robo-advisors in terms of returns and reward to value at risk ratio see Tao et al. (2021).

advice from robo-advisors.[10] The superior performance of robo-advisors is linked to the advantage of automated data collection and analysis. This improves consumer profiling, portfolio optimisation and adjustment to financial market changes, as well as clients' evolving risk tolerance.

The low cost and availability of robo-advisors mean that they have potential for farther reach. Some studies show that premium investment knowledge, which used to be within the exclusive reach of wealthy investors is penetrating less wealthy and lower income groups through robo-advisors.[11] Robo advisors have made it easier for younger investors to engage in better informed investment practices.[12] The superior returns, low cost and farther reach of robo-advisors present them as efficient and inclusive fintech platforms.

The decreasing cost of offering investment services through robo-advisors derives from technological progress and economies of scale. This is reflected in the development and adoption of digital technologies at scale, especially the increasing computing powers of AI and machine learning that ease access to financial information and insights. The propensity of younger people to adopt and experiment with new technologies also contributes to the increasing spread of robo advice seeking among young people.

2.2 Challenges of robo-advisors

One of the major issues with robo-advisors is that they hardly disclose how asset classes have been mapped. This makes the procedure of portfolio optimisation less transparent. However, selected robo-advisors including Wealthfront and Betterment are comparatively transparent as they disclose optimisation methods.[13]

Robo-advisors rely on client profiling to offer recommendations or make investment decisions. Profiling is based on individual characteristics such as financial conditions, financial goals and risk aversion. The question around risk aversion/preference is an elusive one as it is difficult to measure. A common practice in robo-advising is the use of self-reporting through questionnaires. This practice has been criticised as a simplistic approach.[14] It also increases the chance of inconsistent profiling across platforms due to the lack of standardised frameworks. This becomes even more complex as estimates are expected to be adjusted to changing individual characteristics and market conditions to ensure that clients continue to be matched with best assets.[15]

Delegating the job of recommending and/or deciding on investment on behalf of clients means that machines become a major party in investment advice. Where robots play the hitherto role of human experts in portfolio advice the question of trust that governs the relationship between parties arises. Whether clients see robo-advisors to be trustworthy depends on the quality of profiling, recommendations and decisions, as well as matters related to privacy, responsibility and accountability of the party that offers the

[10] The authors present nuanced findings. Consultations with a human-like robo-advisor resemble interactions with a natural person. Therefore, investors who prefer to be independent in making investment decisions tend to be less willing to seek advice from human-like robots even if such advice might offer a higher degree of accuracy. This gives rise to a social design element in robo-advisors increasing loss (Back et al., 2023).

[11] Low cost and ease of access alongside the acceptance of technology among young people are key drivers of inclusion in robo-advisors. See, for example, Chiu (2019). Insights from use cases across geographies, including the Asian context are founds in Schwinn and Teo (2018).

[12] Bianchi and Bri`ere (2023) report that robo-advisors typically charge lower fees than human advisors. Robo-advisors reduce fixed costs of investment advice. This helps investment advice seekers to overcome entry barriers placed by traditional financial investment providers.

[13] Bianchi and Bri`ere (2023) report that Wealthfront also discloses the approach to estimating its returns and volatilities matrices.

[14] Caspi et al. (2021) present the challenges posed by the simplistic questionnaires used by robo-advisors and their inability to address nuances in a client's financial situations.

[15] Capponi et al. (2022) point to the challenges of exposure of individual characteristics to idiosyncrasies, how timely clients provide information for profile updates and the issues of behavioural bias. Beketov et al. (2018) also report a mismatch between methods being used by robo-advisors and state-of-art techniques that can help offer better portfolio personalisation.

advice (a robot and/or its human complement). Even in the case where data quality is sound and estimates of risks and returns are expected to record insignificant errors, there may still be concerns whether clients believe that machines can act in their best interest and observe fiduciary obligations.

Considering that trust is experiential, the observed reliability and constituency in past recommendations and decisions can encourage stronger trust in robo-advisors. This applies when robo-advisors clearly outperform human experts. The latter is still preferred if there are insignificant differences in observed recommendations and investment outcomes.[16] However, in the clear case of algorithm aversion, clients would rather trust a human advisor over a robo-advisor even if the latter records superior performance. In investment decisions, trust in robo-advisors tends to improve if there is a human support system in which the human (investment) experts tinker around recommendations, consider context and make decisions.

3. Interface between Compliance, Robo-Advisory Practices, and Explainable AI

Ethical and regulatory considerations are crucial to the trustworthiness of robo-advisors. These have implications for business models, data practices and consumer protection. For example, improved data practices, through disclosure, and effective education of clients can help in encouraging adoption and reduction in the risk of harm.

Regulatory approaches strive to improve the interlinked elements of products, data practices and human capabilities building to leverage opportunities and govern the risks of robo-advisors. The product component covers aspects related to the design and alignment of financial products with investors' financial situations, preferences, vulnerabilities, and goals. For example, MiFID II specifies requirements for investment advisors to provide advice to clients. In this regard, investment firms must specify how the advice they provide meets the client's objectives and characteristics.[17] Data practices relate to algorithmic bias, transparency, data privacy and cybersecurity. In this context, toolkit disclosure approach as applicable to the EU AI Act, for example, requires the disclosure of information used in profiling clients, including making explicit disclaimers where information upon which recommendations are based is not generated by a human or machine that is familiar with the user.[18] Human capabilities building covers the competence of robo-advice providers (including workforce knowledge and skills, and management of intermediaries) and clients (financial literacy and interpretation of algorithmic recommendations) throughout robo-advisory product cycle.

In this context, there is a two-stream application of AI capabilities in robo-advisors. The first stream entails AI simplification and integration of (external) regulations, policies and internal risk governance processes, which serve as a reference frame for the robo-advisory firm to ease compliance in business conduct. The second stream focuses on AI-enabled investment advice (an assisted and/or fully automated system) that conducts client profiling, asset allocation, monitoring and rebalancing, taking into account the

[16] Parts of Bianchi and Bri`ere (2023) treat the link between trust, algorithmic aversion and robo-advisors drawing on literature.

[17] The Markets in Financial Instruments (2014) requires investment firms to provide advice in a manner that obtains the necessary information regarding the client's or potential client's knowledge and experience in the investment field relevant to the financial product or service. This must take into account the client's or potential client's financial situation including his/her/their ability to take risk or bear losses to enable the investment firm to recommend to the client or potential client the investment services and financial instruments that are suitable for him/her/them (MiFID, 2014, Article 25(2)). This process has recently been extended to clients' sustainability preferences.

[18] See Caspi et al. (2021**)** for how EU AI Act applies to generative AI.

requirements in the simplified and integrated compliance and risk governance framework. Integrating regulatory requirements, for example, in line with MiFID II (Article 25: Suitability and Appropriateness and Reporting to Clients), entails leveraging XAI to clarify the data and procedures behind algorithmic profiling and investment product recommendations. This is to ensure that clients get an understanding of whether and how portfolios and associated risks reflect their personal preferences and goals. A related obligation applies where AI systems generate information based on attributes that resemble a target client. In this case, providers of such AI systems must integrate disclosure tools that clearly inform the user/client that the information is from sources, objects and /or events that resemble the person(s). This way, providers can align the development and use of advanced solutions with regulatory requirements, for example, in line with Transparency Obligations of Certain AI Systems under Article 52 of the EU AI Act. Building disclosure tools for transparency is crucial in this regard as AI systems can be used for and are vulnerable to information manipulation, as is the case of GenAI text and images, with potential false representation and harm.

In terms of compliance simplification and integration into robo-advice, current processes and practices can be better aligned with compliance requirements. This means deploying AI to piece together fragmented rules, guidelines and standards that apply to investment advice. These include regulatory requirements around licensing, operations, and reporting to ensure that robo- advice is streamlined to applicable regulations, obligations and actions — including proposed policies and legislations — in real time. This way, it becomes easier to detect how robo-advice processes and recommendations uphold applicable compliance, otherwise flag what and where things might go wrong, and realign operations and practices to minimise noncompliance. A recent blog[19] reflects on the perspectives of industry practitioners in the UK on the need to integrate AI into compliance to provide system-wide harmonisation of data formats, rules and standards, as well as monitoring regulatory changes to achieve compliance efficiency and fair outcomes.

Explainable AI (XAI) has a clear role to play in improving practices around information disclosure and user competence building. XAI simplifies interpretation and understanding of robo-advice by clarifying the logic behind the recommendations robo-advisors provide to clients. This has significance for disclosure and customer understanding requirements as part of robo-advisor compliance and regulation. First, XAI improves the black box practices, which apply when robo-advice recommendations are based on less transparent methods and practices. Second, improved explainability means that users gain insights into the logic and processes that produce the advice that inform their investment decisions, including how the recommendations are aligned with their preferences and goals.[20]

The capability of XAI to enhance interpretability and understanding of investment recommendations is of significance considering that most of the users are unsophisticated in terms of the technology and data practices associated with robo-advice. This is in addition to the challenge of clients' financial literacy required to scrutinise investment recommendations and/or decisions. XAI therefore serves as a tool that has potential to address the ethical and regulatory considerations around competence — including domain knowledge and financial literacy— and bias elimination or reduction. XAI-based disclosure improves transparency

[19] Based on a roundtable held with practitioners in fintech/finance sector in May 2024, Azzutti et al. (2024) offer insights that can be adapted to the context of robo-advice in working around compliance efficiency and ethical considerations.

[20] Caspi et al. (2021**)** provide literature evidence for the capabilities of XAI in this regard.

and reveals inherent bias that might have been due to deliberate action, historic beliefs, data training, and/or associated with errors in system function. This underscores the importance of algorithmic functionalities and practices that provide scope for self-check and improvement, including the human interventions needed to assess and correct the procedure — and where applicable — to take responsibility for poor processes and outcomes.[21]

4.Robo-Advisors and AI-Human Teaming

Human-in-the-loop plays a role as consumers are more likely to have developed familiarity, relationship with and trust in human advisors or human complements of robo-advisors. Even in instances where new adopters opt for robo-advice, human support is essential to make them feel more secure about interacting with robo-advisors and to navigate the uncertainties associated with AI-based investment recommendations and decisions.

In a strict sense, autonomous robo-advisors, by definition, follow a platform operating model, which does not require human intervention. As discussed earlier, human support might still be needed along the line of platform operation and client journey. Accordingly, current robo-advisory systems would tend towards hybrid operating models, depending on the provider's technological advancement, client sophistication and preferences, as well as circumstances and contexts, including the complexity (and size) of transactions and associated risks.

Recent studies demonstrate that investors opt to interact with human advisors when the financial stakes are high and outcomes uncertain. For example, one study[22] shows that when the level of involvement is high, clients prefer to consult human advisors in investment decisions. A similar study[23] finds that consumers invest more when a human-like robot provides advice compared to a non-human-like robot. This tendency is higher among investors who focus on preventing losses (prevention-focused investors) than promotion-focused consumer (focused on gains). Loss minimisation, which passes for low risk tolerance, requires a higher degree of certainty about investment outcomes.

The consideration about the sophistication of clients intersects perceptions and contexts, as well as regulatory obligations linked to making investment recommendations and decisions that are suitable and appropriate for clients' characteristics, risk preferences and goals. Robo-advisors are still at an early stage, with low familiarity among consumers. When familiarity is low, less informed consumers require subjective norms (interpretations, and opinions) based on shared experiences and existing relationships to adopt and trust robots.[24] Emotional and contextual support by human complements of robo-advisors helps to uphold compliance as it builds clients' capabilities to interpret, understand and use investment recommendations while it ensures that financial products are aligned with the characteristics and vulnerabilities of clients in line with regulatory requirements. For overall improvement in user experience, human-AI collaboration ensures the maintenance of control requirements and processes through the collection of user feedback, which helps to evaluate, correct and improve the system.[25]

[21] Kofman (2024) describes the regulatory pathways of competence, bias elimination/reduction and self-check. XAI incorporation into robo-advisory capabilities can be considered as a self-check system that enables users to know where and how the rationales and processes might be (un)suitable.

[22] In this study, Northey et al. (2022), the level of involvement refers to intention to invest a large sum of money.

[23] The authors also find that gender preference plays a role; male robots (based on design elements) tend to improve client confidence in robots (Baek & Kim, 2023).

[24] See Belanche et al. (2019), based on empirical evidence, for the role of technology familiarity in robo-advisor adoption among customers.

[25] The importance of user feedback in improving AI systems discussed in Tsiakas & Murray-Rust (2022).

Human-AI collaboration is crucial to the provider's data risk governance process. Robo-advisors integrate clients' profiles with relevant databases to provide personalised investment advice. While this practice improves knowledge about the potential investor, it also faces the risks of revealing sensitive data, data theft and cyber-attacks. Due diligence around data security entails corporate leadership that ensures a clear definition of data access, use, sharing and retrieval. This is of especial importance where financial service providers link data from multiple sources and, in some cases, share data with third parties to offer services that match clients' profiles.

In a similar vein, technology outsourcing and data monetisation practices mean that sensitive clients' data are shared with third parties. Therefore, cybersecurity risks are distributed in a continuum or a network of rights and duties encompassing consumer-to-business and business-to-business relationships. In the case of outsourcing solutions, having humans in the loop in the governance of AI requires a delineation of the boundaries of accountability and responsibility. For example, the robo-advisor value chain includes a network of developers, programmers, robo-advice firms, regulators and clients.[26] AI leadership in robo-advisory firms entails developing and implementing corporate compliance frameworks – in line with broader market regulatory and legal requirements – that stipulate the role, relationship and accountability among actors in infrastructure, product and data networks.

5. Use Cases of UK Robo-Advisory Platforms and Services

This section maps selected platform use cases across four themes to understand how robo-advisors reflect and address issues around human support for automated services, inclusive and green products, client investment vulnerability and capital risks, and data practices and risk governance. We later reflect on the implications of the elements observed in use cases for regulatory compliance and good consumer/client outcomes.

The use cases employed in this section are to drive home the points around responsible business practices and how they tend to be incorporated in relevant UK platforms/service providers. The primary goal is to observe each of these practices as they are in robo-advisory service providers, which are among prominent platforms in the UK. There is neither an overarching intention to strictly compare nor any implicit/explicit intention to point out which platform has best/worst practices. This means that the study is less interested in whether the observed pattern(s) could be closer or differentiated, provided it explores each use case against the background of the dimensions of responsible practices of interest.

[26] For a comprehensive conceptual description of distributed risk governance system based on delineation of roles and responsibilities with relevance to robo-advice see Martin (2019) and Tóth et al. (2022). As an illustration, a data breach linked to weaknesses in system design and source codes may be linked to developers and programmers.

Table 1 | Robo-Advisory Platforms and Business Practices

Robo-Advisory Platform	Model/Degree of Automation	Inclusive and Green Components (by entry costs, product design and/or investment options)	Platform Financial Risk and Vulnerability Support	Data Practices, Risks and Governance
eToro	• Hybrid; Highly automated; minimal human interaction, through potential communication with customer support.	• Registration fee; none, though other fund management and trading costs may apply. • Initial deposit as low as US$50-10000, depending on country.	• Recognition of client behaviour, vulnerability and mechanism of disclosure and support to mitigate the risk of harm; • Advice against trading based on gut feeling, trend chasing; limiting reliance on copy trading to ensure top traders do not over influence new, less experienced ones.	• Account opening questionnaire integrated with automated sources to collect personal and financial data, insights from platform and social media use. • Third party data sharing is based on UK/EU regulatory standards. • Data sharing and storage outside of UK/EU/EEA based on Standard Contractual Clauses to mitigate the potential risk of weak regulations and compliance in third party jurisdictions. • Technical data security strategy in place (firewall, encryption, Multi-Factor Authentication). • Management dimension revolves around restricting client data access to employees with legitimate business interest.
InvestEngine	• Hybrid; Self-managed accounts on platform, clients may also opt for the advisor's team support. Client questionnaire combined with expert insights to provide client support throughout the investment life cycle.	• Free DIY account. • Low-cost managed account (around 0.44% combined cost).	• Detailed capital risk disclosure on the platform to inform investors about fluctuations and potential losses. • Fractional investment option with potential to diversify and address the risk of investment concentration.	• Client questionnaire and other automated data combined to provide service. • Sensitive data, including client health data might be collected. • Data sharing with third party aligns with UK and EU laws, including GDPR. Third party processing linked to UK/EU laws, but boundaries of risks unclear for third parties outside of the UK/EU/EEA. • Technical data security strategy (Transport Layer Security protocol and Advanced Secure Socket Layer encryption techniques) used to secure data privacy, integrity and authenticity. • Managerial dimension of data security strategy revolves around access to client data being restricted to employees, contractors and other third parties with legitimate business interest.
Moneyfarm	• Hybrid; Do-It-Yourself (DIY) trading, also offers expert support	• Free DIY account registration. • ISA account custody fee at 0.39%.	• Disclosure of risk of market volatility. Platform adds caution about investing based on projections.	• Diverse data means: integrating simple questionnaires with automated personal data collected from user devices, web activities and third-party providers.

	throughout client journey	• Managed account, expert-led accounts have additional costs. • Platform offers opportunity to invest in ESG-linked portfolios, aligned goals across pillars that address issues around workers, customers, community and environment. Allows socially responsible investing from childhood integrated into junior ISA.	• While there is no advice on specific products to subscribe to, it offers tailored advice on investment values, benefits and risks.	• Technical (encryption and secure data sharing measures) and non-technical/organisational measures (e.g. employee's restricted access to client data) put in place to ensure data privacy and security. • Data transfer/sharing with third parties in accordance with UK/EU/EEA regulatory requirements. • Privacy Shield forms the compliance reference and guide for sharing data with US partners.
Wealthify	• Hybrid; Operating model tends mainly towards robo-advisor for experts (the managed account/expert-user model).	• Free Instant and Cash ISA account registration. • Paid expert-managed account; annual Wealthify management fee and investment fees (fund fees for fund providers and market spread fees for buying and selling). • Green/ESG/ethical investing options: Operationalised through its Ethical Plan investing in stocks, shares and pension products aligned with social and environmental goals. Option for ethical investing from childhood integrated into child ISA.	• Risk disclosure statement (highlighted); also provides information about how investment is insured, and under which condition a client might (not) be eligible for compensation. • Provides a statement about unavailability of financial advice; potential investors are expected to seek advice from Independent Financial Advisers (IFAs). • Provides multiple streams of support systems for customer vulnerability across dimensions (of vulnerability) using technical/app-related support/automated, direct contact with customer support.	• Client online questionnaire combined with automated sources/web usage and analytics, third party providers including monitoring of emails and telephone communications with clients. • By default, data is stored in a server(s) based in EEA. • Data sharing with affiliates and partners outside of EEA in line with data protection laws in EEA or based on signed commitments to comply with equivalent data protection laws under relevant data protection authorities outside of EEA. • UK/EU-US data sharing in line with the Privacy Shield scheme.

5.1 Degree of automation

The robo-advisory use cases are hybrid platforms with high degree of automation and complementary human expert. The level of human interaction varies with platform and client's choice of service. For example, while eToro offers hybrid platform services, Moneyfarm and InvestEngine tend towards easier capabilities to engage with human experts, at least at the start-up phase.

The Do-It- Yourself (DIY) choice of robo-advisory services (the client-user model) means that a client interacts with the platform directly and consults automated/online market guidance to select a product and to open and manage an account. The managed account model relies on an in-house investment expert to manage an account on behalf of a client, including the discretion to make investment decisions based on information about the client investment goals and risk preferences. Therefore, in the managed account model, robo-advisors are primarily platforms for expert trading on behalf of clients, that is an expert-user model.

However, the managed account model raises questions around delegated decision making on behalf of the client. While expert account managers may have the discretion to advise and make investment choices on behalf of clients, the responsibility and burden of risk/loss generally falls on the client. This means that beyond caveat around capital risk, managed accounts need to adjust expert responsibility and liability to the level of discretion given by the client.

5.2 Financial inclusion and green practices

The robo advisory platforms and associated products have built in elements that have potentials for financial inclusion. This is reflected in the low entry cost, depending on the choice of product/service. Account registration is typically free while start-up investment amounts are low (see Table 1). While cost is relatively higher for managed accounts, the said model can be considered a mechanism for inclusion as it makes it easier for technology-averse clients and other interested investors who are occupied with pressing activities to participate in wealth management and growth opportunities by proxy.

Where an observed platform offers services to emerging markets, the entry costs (including initial deposits) are relatively higher than what obtains in the UK/EU. eToro, for example, has an initial deposit requirement as low as US$50, increasing to as high as US$10000, depending on countries. Higher entry costs may be due to robo-advisory services being a recent development, which requires more time to operate efficiently across geographies. This is in addition to potential adverse effects of regulations, cost of doing business and country risks in emerging markets. Functional alternatives are of course available such as ETFs and investment trusts listed in the home country and investing overseas.

Apart from entry cost and user support, green investment opportunities form another element of sustainable practices embedded in robo-advisory products. For example, Moneyfarm provides opportunities to invest in companies and sectors that align their products, business processes and activities with environment, social and governance issues (ESG). This offers scope to align client investment choice with issues around workers' rights, consumer protection, community/social responsibility and environmentally friendly innovation. In the EU, the recent extension of MiFID II to include sustainability preferences in financial advice and discretionary fund management will extend this pattern. Apart from holding the robo-advisory service provider to its promise of sustainable practices, green investing has potential to drive the growth of portfolios aligned with social and environmental good, which motivates companies seeking green investors to improve practices around sustainability compliance.

5.3 Client vulnerability and capital risks

The financial inclusion and broader sustainability elements of robo advisors also carry some risks. Investment portfolio management is a technical domain. This means that operating a robo-advisory account exposes investors to the risks of vast and interconnected markets, including fluctuations in regions that are different from that in which the account currency is held. This is especially important for DIY clients who are more likely to lack the expertise to understand market trends, interdependencies and potential shocks capable of financial harm. Risks are associated with multiple sources, for example, tracking errors, where the performance of selected portfolios differs significantly from actual returns due to inaccurate indexing (overestimated expected returns).

Other risks include investment concentration and trend chasing, as well as regulatory and market shocks, including in a distant market different from that in which a client trading currency is held. The observed robo-advisory platforms highlight these challenges in risk disclosure statements to signal potential market fluctuations and capital risk to investors.

Mechanisms for addressing risks, though these do not guarantee protection from loss, include portfolio diversification, restricted proportion of investment based on copying, and continuous portfolio rebalancing. Etoro, for example, limits the percentage of total trading capital that a client can invest in copying trending/star investors. InvestEngine offers opportunities for fractional investing. These serve as a strategy to encourage protection of vulnerable clients who may be over-influenced by trend chasing and inclined towards asset concentration.

5.4 Data practices and risks

Robo advisory service firms strive to maintain due diligence and follow similar technical and management procedures to address challenges of data privacy and security. Data practices around client data collection (hybrid sources, which integrate online questionnaires and advanced automated sources), processing and sharing with third parties, including partners, intermediaries and public authorities, have similar approaches. These entail mainly secure data exchange protocols and encryption strategies, and governance of internal (employee) and external (contractor and other third party) access to client data.

The shared approach to the development and/or deployment of technical strategies to data protection and security is expected for some reasons. First, technological solutions are replicable with minor tweaks. Second, where solutions are developed by third party suppliers, technology sourcing tends to be concentrated. For example, a Bank of England and FCA report on AI development and deployment in the UK financial services sector shows that a small percentage of third-party firms implement most of all AI solutions[27]. Accordingly, this in addition to the practice of lawful technology replication, means that characteristics are expected to recur across platforms. Third, firms that operate in the same sector and regulatory environment are likely to exposed to similar technological solutions and the same technical compliance requirements.

While technical solutions tend to be similar, management practices and culture offer robo advisory firms unique leverage to distinguish themselves in how data privacy and security concerns are addressed. This relates to, for example, the effectiveness of coordination of data sharing and the extent to which the robo advisory firm takes responsibility and liability in the event of a data breach. This tends to currently fall back on the client where there is

[27] See Bank of England and Financial Conduct Authority (2024). Artificial intelligence in the UK financial services – 2024.

no guarantee of privacy and security or a clear commitment to internalised liability. Firms do however commit to using Privacy Shield[28] and Standard Contractual Clauses (SCCs)[29] in compliance with UK/EU/EEA laws when transferring personal data outside of these jurisdictions.

6. Conclusions and Reflections

In this paper, we set out to examine how robo-advisors can build responsible practices and compliance elements into product offerings and business processes across the value chain to deliver sustainable business outcomes. We drew on UK use cases to illustrate and understand the working of the platforms and their implications for responsible business practices in robo-advisory services, with potential extension to the broader financial services and fintech sector. This section reflects on the implications of the observed pattern of robo-advisory platform operating models and practices for responsible business outcomes. It also highlights the role of coordination in leveraging opportunities and addressing the risks associated with activities of rob-advisors.

Platforms and cross-cutting business practices

The use cases have cross cutting operating models, technical and managerial aspects of security observed, with little contextual variations. Technologies, products and standard practices tend to be shared across providers. Perhaps, this is linked to the standardised/strictly structured operations of financial services, replicability of the associated technologies and compliance with regulatory requirements under the same authorities.

The observed platforms tend to follow standard procedures to ensure beneficial products, including integrating social and environmental considerations into product design and trading. Benefits such as tax-free dividends of ISA and SIPP (self-invested personal pension) investing have potentials for financial inclusion and wealth growth. Apart from providing scope for additional income to offset rising household cost of living, these can offer opportunities for advancing into higher investment bands and/or even financing own small and medium enterprises (SMEs). While robo-advisory services are opening opportunities for financial inclusion, the activities require wider geographical spread. Inclusion in terms of geography and level of economic development remains restricted due to geographical concentration of the activities of robo-advisory platforms and relatively higher cost of participation in emerging markets, if a platform is available.

Considering the similarities in technologies, product offerings and compliance, the client's ability to use the platforms, draw out benefits and appreciate investment risks is crucial to responsible business and client outcomes. This is especially so as robo advisors are decoupled from financial literacy advice, which is expected to come from other sources, for example, Independent Financial Advisors (IFAs). Expert-managed robo-advisory accounts

[28] Privacy Shield is an arrangement between the EU and US, which requires companies to commit to obligations on how data is processed when personal data of European individuals is transferred to US. The US Department of Commerce and Federal Trade Commission monitor companies' compliance with the required reporting and commitments. The US Department of Commerce and FTC coordinate with relevant European Data Protection Authorities in providing oversight under Privacy Shield. Under the arrangement, US public authorities also commit to data safeguards and transparency when they access data on European individuals on grounds of national security. European citizens have the right to raise complaints regarding how their data is accessed. The EU-US Data Privacy Framework is now in place to address the concerns about the EU-US Privacy Shield.

[29] Standard Contractual Clauses (SCCs) are model clauses that govern the exchange of data when EU/EEA institutions and bodies transfer data to controllers or processors in third countries. It holds both the sending (exporting) and receiving (importing) parties to the obligations of personal data protection in line with GDPR. While Data controllers, processors or providers outside of the UK/EU/EEA are not subject to GDPR, SCCs serve as mechanisms for bridging data protection standards with third countries. For elaborations on SCCs see reference in the bibliography section.

allow the client to work around technical challenges of platform use and understanding of market trends. The expert-managed robo-advisor model shifts agency and gives greater discretion to the professional account manager. This requires stronger trust from the client and the investment manager/advisor's commitment to the duty of care.

The platforms provide insights into how elements of privacy and security are addressed. It is unclear how issues around algorithmic bias are addressed from technical and managerial approaches, except to the extent that personalisation (based on rich client data) might help to provide insights and product offerings that match clients' needs and circumstances.

Cross-border partnerships and data sharing are an important part of innovation in AI and rob-advisors, but these form a significant source of risk. The blurred lines in third party data sharing make it difficult for robo-advisory service providers to internalise the responsibility of potential data breaches. In the case of potential data breaches, explanations are linked to the complex robo-advisory services value chain, especially activities outside of the immediate jurisdiction of investment platform providers.

Coordinating to leverage platform benefits and govern risks

Understanding market values, investment risks and client data sharing as part of service delivery, as well as a thorough understanding of the privacy and security risks involved will take more than the supply side (robo advice providers) offering products that are innovative. This means leveraging AI technologies to provide support while also encouraging human engagement to offer basic financial and data security literacy programmes built into investment advice.

Robo advisors are not primarily meant for providing advice aimed at financial literacy so coordination with financial advice partners to integrate such programmes into product and trading is one approach. Regulatory authorities also have a key role to play by using instruments that encourage literacy programmes (financial and data/ cybersecurity) in robo advisory product design and delivery, especially where robo-advisors are oriented towards a client-user operating model of platform and trading. The client-user model carries a higher risk of harm due to limited domain knowledge.

While the observed platforms tend to follow standard procedures to ensure beneficial products, including integrating social and environmental considerations into product design and trading, two key challenges are observed. Risk disclosure is clear but often exists in the form of box-ticking caveats, with risk and responsibility externalised by providers and framed to be internalised by clients. This practice challenges the essence and working of fiduciary duty, which expert investment managers or platform providers owe the client.

In a similar vein, while clear technical and managerial mechanisms of governing data privacy and security are in place, especially for internal processes, the major risk around data practices lies in the value chain, which requires cross-border coordination around data practices. Third party data sharing outside of the UK/EU/EU relies on model contractual clauses, often ending with caveats that pass a clear message of no security guarantee. It is impossible for a single firm to guarantee data privacy and security across the robo-advisory value chain. Stronger external coordination, assurance and commitment to identifying third party responsibility, risks and liability that take the final burden away from the client are crucial to engendering trust, social acceptance of robo-advisors and deterring non-compliance in the value chain.

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