University of Pennsylvania Carey Law School
Penn Carey Law: Legal Scholarship Repository

Faculty Scholarship at Penn Carey Law

2018

Regulating Robo Advice Across the Financial Services Industry

Tom Baker
University of Pennsylvania Carey Law School

Benedict G. C. Dellaert
Erasmus University of Rotterdam

Follow this and additional works at: https://scholarship.law.upenn.edu/faculty_scholarship

 Part of the Administrative Law Commons, Banking and Finance Law Commons, Business Law, Public Responsibility, and Ethics Commons, Computer Law Commons, Insurance Law Commons, Law and Economics Commons, Robotics Commons, Science and Technology Law Commons, Securities Law Commons, and the Technology and Innovation Commons

Repository Citation

Baker, Tom and Dellaert, Benedict G. C., "Regulating Robo Advice Across the Financial Services Industry" (2018). *Faculty Scholarship at Penn Carey Law*. 1740.
https://scholarship.law.upenn.edu/faculty_scholarship/1740

This Article is brought to you for free and open access by Penn Carey Law: Legal Scholarship Repository. It has been accepted for inclusion in Faculty Scholarship at Penn Carey Law by an authorized administrator of Penn Carey Law: Legal Scholarship Repository. For more information, please contact PennlawIR@law.upenn.edu.

Regulating Robo Advice Across the Financial Services Industry

Tom Baker & Benedict Dellaert[*]

ABSTRACT: Automated financial product advisors—"robo advisors"—are emerging across the financial services industry, helping consumers choose investments, banking products, and insurance policies. Robo advisors have the potential to lower the cost and increase the quality and transparency of financial advice for consumers. But they also pose significant new challenges for regulators who are accustomed to assessing human intermediaries. A well-designed robo advisor will be honest and competent, and it will recommend only suitable products. Because humans design and implement robo advisors, however, honesty, competence, and suitability cannot simply be assumed. Moreover, robo advisors pose new scale risks that are different in kind from the risks involved in assessing the conduct of thousands of individual actors. This Essay identifies the core components of robo advisors, key questions that regulators need to be able to answer about them, and the capacities that regulators need to develop in order to answer those questions. The benefits to developing these capacities almost certainly exceed the costs, because the same returns to scale that make an automated advisor so cost-effective lead to similar returns to scale in assessing the quality of automated advisors.

I. INTRODUCTION 714

II. ROBO ADVISORS AND FINANCIAL PRODUCT INTERMEDIARY REGULATION 719
A. POLICY JUSTIFICATIONS AND REGULATORY OBJECTIVES 721
B. ROBO ADVISORS: COMPETENCE, HONESTY, AND SUITABILITY 724
1. A Health Insurance Robo Advisor 725
i. Competence 725

[*] Baker is William Maul Measey Professor at the University of Pennsylvania Law School. Dellaert is Professor, Department of Business Economics, Marketing Section, School of Economics, Erasmus University Rotterdam. Baker is a co-founder of Picwell, a data analytics company that makes insurance robo advisors, and Dellaert is a member of the board of supervisors (Raad van Toezicht) of Independer.nl, the largest on-line insurance broker in the Netherlands. Thanks to Grace Knofczynski and Luman Yu for helpful research assistance.

ii. Honesty 725
iii. Suitability 727
2. A Home Mortgage Robo Advisor 727
i. Competence and Suitability 727
ii. Honesty 728
3. An Investment Robo Advisor 729
i. Competence 729
ii. Honesty 731
iii. Suitability 731

III. ROBO ADVISORS: NEW REGULATORY CHALLENGES 732
A. COMPONENTS OF ROBO ADVISORS THAT POSE REGULATORY CHALLENGES 733
1. Ranking or Matching Algorithms and Processes 734
2. Customer and Product Data 737
3. Choice Architecture 739
4. Information Technology Infrastructure 741
B. SCALE AND THE CONCEPT OF A REGULATORY TRAJECTORY 742

IV. CONCLUSION: BEYOND BASIC HONESTY, COMPETENCE, AND SUITABILITY 746

I. INTRODUCTION

The growth of investment robo advisors, web-based insurance exchanges, online credit comparison sites, and automated personal financial management services creates significant opportunities and risks that regulators across the financial services spectrum have yet to systematically assess, let alone address. Because of the scale that automation makes possible, these services have the potential to provide higher quality and more transparent financial advice to more people at lower cost than human financial advisors.[1] However, this potential hardly guarantees that it will be realized.

1. *See* FIN. CONDUCT AUTH., FINANCIAL ADVICE MARKET REVIEW 39 (2016), https://www.fca.org.uk/publication/corporate/famr-final-report.pdf (encouraging U.K. financial services regulators to take steps to promote the development of automated financial advice to increase access to financial advice); *infra* Part III (discussing the cost-effective structure and components of robo advisors and the unique challenges regulators face); *cf.* FIN. INDUS. REGULATORY AUTH., REPORT ON DIGITAL INVESTMENT ADVICE 8–9 (2016), http://www.finra.org/sites/default/files/digital-investment-advice-report.pdf [hereinafter FINRA] (listing many good governance practices for FINRA members to employ in relation to digital investment advisors, all or most of which could also form the basis for external evaluation). *See generally* Abhijeet Sinha, *White Paper: Increasing the Efficiency and Effectiveness of Financial Advice with Robo-Advisors*, INFOSYS (2016), https://www.infosys.com/industries/financial-services/

Indeed, the emergence of robo advice does not dispense with the role *people* play in the industry. *People* design, model, program, implement, and market these automated advisors, and many automated advisors operate behind the scenes, assisting people who interact with clients and customers. The history of people taking advantage of consumers in the financial services industry is not a pretty one.[2] Setting aside fraud and other unsavory activities, the riches to be won by disrupting the financial services industry provide more than enough incentive to rush technology to market.[3] In addition, there are concerns that automation may entrench historical unfairness[4] and promote a financial services monoculture with new kinds of unfairness and a greater vulnerability to catastrophic failure than the less coordinated actions of humans working without automated advice.[5]

The challenges automated advice pose to regulators seeking to preserve the integrity of financial markets do not stop there. There are well-known privacy and security challenges that accompany the digitization of personal financial data,[6] and new regulatory challenges that are more specific to

white-papers/Documents/trend-financial-advisors-industry.pdf (demonstrating that investors can gain advice from robo advisors at much cheaper costs than the fees charged by human advisors).

2. *See, e.g.*, Daniel R. Fischel & Robert S. Stillman, *The Law and Economics of Vanishing Premium Life Insurance*, 22 DEL. J. CORP. L. 1, 1–3 (1997) (describing the vanishing premium scandal in the life insurance industry in the early 1990s); Neil Fligstein & Alexander F. Roehrkasse, *The Causes of Fraud in the Financial Crisis of 2007 to 2009: Evidence from the Mortgage-Backed Securities Industry*, 81 AM. SOC. REV. 617, 617 (2016); Michael Corkery, *Wells Fargo Fined $185 Million for Fraudulently Opening Accounts*, N.Y. TIMES (Sept. 8, 2016), http://www.nytimes.com/2016/09/09/business/dealbook/wells-fargo-fined-for-years-of-harm-to-customers.html; Matthias Rieker, *Broker Ordered to Pay More Than $1 Million in Churning Case*, WALL ST. J. (Oct. 13, 2014, 4:24 PM), http://www.wsj.com/articles/broker-ordered-to-pay-more-than-1-million-in-churning-case-1413231863.

3. *See* Thomas Philippon, *The FinTech Opportunity* 14 (Nat'l Bureau of Econ. Research, Working Paper No. 22476, 2016), http://www.nber.org/papers/w22476.pdf (discussing disruptive innovations of Fintech startups).

4. *See, e.g.*, WENDELL WALLACH & COLIN ALLEN, MORAL MACHINES: TEACHING ROBOTS RIGHT FROM WRONG 55–56 (2009) (advocating to ensure that autonomous artificial agents are created with morality); Solon Barocas & Andrew D. Selbst, *Big Data's Disparate Impact*, 104 CALIF. L. REV. 671, 677 (2016) (describing discriminatory effects of data mining); Joshua A. Kroll et al., *Accountable Algorithms*, 165 U. PA. L. REV. 633, 637–38 (2017) (noting the challenges algorithms pose for procedural regularity); Kate Crawford, *Artificial Intelligence's White Guy Problem*, N.Y. TIMES (June 25, 2016), http://www.nytimes.com/2016/06/26/opinion/sunday/artificial-intelligences-white-guy-problem.html ("Sexism, racism and other forms of discrimination are being built into the machine-learning algorithms that underlie the technology behind many 'intelligent' systems . . . .").

5. *See generally*, CATHY O'NEIL, WEAPONS OF MATH DESTRUCTION: HOW BIG DATA INCREASES INEQUALITY AND THREATENS DEMOCRACY (2016) (outlining dangers of relying on data analytics); Dario Amodei et al., Concrete Problems in AI Safety (July 25, 2016) (unpublished manuscript), https://arxiv.org/pdf/1606.06565v2.pdf (discussing "accident risk" that may emerge from the poor design of the real-world AI systems). For an effort by the tech industry to address some of these challenges, see PARTNERSHIP ON AI, https://www.partnershiponai.org (last visited Oct. 29, 2017).

6. *See, e.g.*, Rick Swedloff, *Risk Classification's Big Data (R)evolution*, 21 CONN. INS. L.J. 339, 339 (2014) (noting that "big data raises novel privacy concerns"); Press Release, N.Y. State Dep't of Fin. Servs., Governor Cuomo Announces Proposal of First-in-the-Nation Cybersecurity

automated advice. These include developing the capacities to assess: the algorithms and data incorporated in the automated advisors; choice architecture through which the advice is presented and acted upon; underlying information technology infrastructures; and downside risk from the scale that automation makes possible. Developing these capacities will require financial service authorities—the paradigmatic expert administrative agencies—to invest in new kinds of expertise. Our research and experience suggests that the areas of expertise needed include data science, computer science, behavioral economics, and psychology, to name just a few.[7]

The benefits to developing these capacities almost certainly exceed the costs because the same returns to scale that make an automated advisor cost-effective lead to similar returns to scale in assessing the quality of automated advisors. An expert administrative agency is well situated to realize those returns to scale. Moreover, the potential solvency and systemic risks posed by hundreds of thousands, or even millions, of consumers choosing their financial products based on the same or similar models are sufficiently large and different in kind from those traditionally posed by consumer financial product intermediaries that some regulatory attention is justified on those grounds alone.[8]

At the same time, however, it is important not to overreact by setting a higher bar for automated advisors than for human advisors. For now, the standard against which automated advisors should be compared is that of humans, whom we know are much less than perfect.[9] Although a large body of research in diverse fields demonstrates that even simple algorithms regularly outperform humans in the kinds of tasks that robo advisors perform,[10] and, thus, it may be appropriate to hold automated advisors to a

---

Regulation to Protect Consumers and Financial Institutions (Sept. 13, 2016), http://www.dfs.ny.gov/about/press/pr1609131.htm.

7. *See, e.g.*, Benedict G.C. Dellaert & Gerald Häubl, *Searching in Choice Mode: Consumer Decision Processes in Product Search with Recommendations*, 49 J. MARKETING RES. 277, 285–86 (2012); Eric J. Johnson et al., *Can Consumers Make Affordable Care Affordable? The Value of Choice Architecture*, 8 PLOS ONE 1, 2 (2013) (studying impact of variations in choice architecture on health insurance choice); Benedict Dellaert et al., Sorted Partitioned Sets as Personalized Choice Architecture, (unpublished paper) (on file with author).

8. *See infra* Part III.

9. For a summary of research regarding the imperfections of human advisors see Philippon, *supra* note 3, at 18.

10. *See, e.g.*, Berkeley J. Dietvorst et al., *Algorithm Aversion: People Erroneously Avoid Algorithms After Seeing Them Err*, 144 J. EXPERIMENTAL PSYCHOL. 114, 118 (2014) (showing that algorithms outperform human forecasters in future predictions); William M. Grove et al., *Clinical Versus Mechanical Prediction: A Meta-Analysis*, 12 PSYCHOL. ASSESSMENT 19, 25 (2000) (noting that mechanical prediction is as accurate or more accurate than the clinical prediction); William M. Grove & Paul E. Meehl, *Comparative Efficiency of Informal (Subjective, Impressionistic) and Formal (Mechanical, Algorithmic) Prediction Procedures: The Clinical–Statistical Controversy*, 2 PSYCHOL., PUB. POL'Y, & L. 293, 299–315 (responding to commonly heard objections to algorithmic procedures).

super-human standard *someday*, their market share is too small and regulators have too much to learn to do so today.[11]

Our goal in this Essay is to open a discussion within legal and financial services scholarship that invites the participation of those with expertise in other relevant disciplines. As automated advisors grow in scale, protecting the integrity of financial markets will require the kind of cross-disciplinary cooperation that regularly occurs in the domains of health and environmental regulation. The lawyers, economists, and behavioral scientists already involved in financial services regulation will need to understand enough about computer and data science to craft and apply new regulatory strategies, and the computer and data scientists at the forefront of the innovation will need to understand enough about legal structures and ways of thinking to help make the new regulatory strategies sensible.

This assessment is a pressing need for the financial services authorities, and it also presents an opportunity to explore the challenges and opportunities that automated advice presents more broadly.[12] This opportunity arises from the substantial legal, economic, and historical authority that financial services regulators already have to guide their actions, along with an array of regulatory tools to employ.[13] Thus, automated consumer financial product advice provides a good case study as automation extends into consumer markets. Though not everything we learn from this case study will apply in other contexts, such as automated advice about cars, homes, and vacations, there are similar opportunities to take advantage of consumers in these and other markets for complex goods and services. Thus, consumer protection techniques that work for financial products are worth considering in other contexts.

In the body of this Essay we first identify the aspects of current financial services regulation that apply most directly to robo advice: the regulation of intermediaries such as securities brokers, insurance agents, and mortgage brokers.[14] We set out the traditional goals of that regulation: promoting *competence* (to provide appropriate advice and associated services), *honesty* (of that advice and associated services), and *suitability* (of the financial products

11. The estimated size of the retirement market in the U.S. is $25 trillion. INV. CO. INST., INVESTMENT COMPANY FACT BOOK 124 (2015), https://www.ici.org/pdf/2015_factbook.pdf. By comparison, as of Q1 2017, the total assets under investment of the six largest robo advisors ranged from a high of $60 billion (Vanguard Personal Advisor) to a low of $1 billion (Future Advisor, which is owned by BlackRock). *See* Tom Baker & Benedict Dellaert, *Regulating Robo Advisors: Old Policy Goals, New Challenges*, WHARTON PUB. POL'Y ISSUE INITIATIVE, July 2017, at 1–2.

12. *See, e.g.*, WALLACH & ALLEN, *supra* note 4, at 55–56; Barocas & Selbst, *supra* note 4, at 677; Kroll et al., *supra* note 4, at 657 (noting the challenges algorithms pose for procedural regularity).

13. *See generally* MICHAEL S. BARR ET AL., FINANCIAL REGULATION: LAW AND POLICY (Robert C. Clark et al. eds., 2016) (exploring law and policy in financial regulation).

14. *See infra* Part II.A.

sold to, or recommended for, the specific consumer).[15] We then explain why any well-designed robo advisor should meet those goals at least as well as a typical human advisor, most likely better, with the emphasis appropriately placed on the caveat, "well designed." At the same time, however, robo advice raises new challenges for regulators, most immediately to develop the expertise to assess whether robo advisors in fact are well designed.

In beginning with these traditional goals, we have two objectives: first, to review why robo advisors are at least potentially superior to unassisted humans on these dimensions for most consumers; and, second, to create a conceptual link between existing regulatory goals and the new regulatory concerns. That conceptual link supports regulators' efforts to proceed under their existing legal authority to develop the capacities they need to address these new concerns, recognizing that they will need to operationalize this authority in new ways.[16]

We then identify the core technical components of robo advisors that regulators need to understand and develop procedures to assess, including the algorithms and processes that generate personalized rankings of financial products for consumers; the consumer and financial product data that the algorithms ingest; the choice architecture through which that advice is delivered; and the associated information technology infrastructure. Focusing on these core components is the first stage of a regulatory trajectory that regulators can follow as robo advisors develop in sophistication and scale.

This analysis is conceptual and not specific to any specific governmental agency, private regulatory organization, or ex post liability regime, nor is it specific to any sector of the financial services market. At a conceptual level, the analysis applies to most, if not all, consumer financial products and to regulators of these products. Accordingly, we advocate an inter-governmental, inter-agency dialog, with experts from inside and outside the financial services

---

15. *See infra* Part II.B. Note that this description of the three goals is a conceptual one that does not map perfectly on the diversity of financial services regulations. *Cf.* Howell E. Jackson, *The Trilateral Dilemma in Financial Regulation*, *in* OVERCOMING THE SAVING SLUMP: HOW TO INCREASE THE EFFECTIVENESS OF FINANCIAL EDUCATION AND SAVING PROGRAMS 82, 100 (Annamaria Lusardi ed., 2008) ("Generalizations are tricky given the range of legal regimes.").

16. *See, e.g.*, Kara M. Stein, Comm'r, U.S. Sec. & Exch. Comm'n, Remarks at Harvard Law School's Fidelity Guest Lecture Series: Surfing the Wave: Technology, Innovation, and Competition (Nov. 9, 2015), https://www.sec.gov/news/speech/stein-2015-remarks-harvard-law-school.html.

> The Commission is now challenged with thinking through what it means to regulate a robo advisor. This concept did not even exist when most of the laws applicable to investment advisers were drafted. Most of these laws are based on the idea of a human investment adviser on the other end of the phone or sitting across the table from you. . . . Clearly, if we want our markets to remain at the top, we need to embrace innovation. And FinTech clearly promises some exciting advances. But, we also need to be prepared to anticipate and ideally prevent problems before they arise. Remaining competitive requires both market participants and regulators to thoughtfully evolve with innovation, not react to it way after the fact.

Id.

industry sharing information, identifying ways to make the necessary human capital available to regulators, and developing an approach to regulating robo advisors that increases the likelihood that they are honest and competent. Some agencies have taken steps to learn about robo advice as part of their larger efforts to engage with Financial Technology, or "FinTech," but to date they have done so largely within their own regulatory silos and within their own countries.[17] There is no formal inter-agency coordination in the United States, and international coordination is even less developed.[18] While there is no evidence that this lack of oversight and coordination has caused harm yet, it almost certainly will in the future, as the market simply cannot be counted upon to be self-correcting when robo advisors grow in scale to the point that they reshape financial product markets.[19]

In concluding, we explore steps that authorities might take beyond demanding a minimum level of competence and honesty. These include provisional ideas about how financial services regulation could facilitate quality-based competition and diversity among robo advisors to ensure the performance of intermediaries who use robo advisors increasingly exceeds that of their unassisted competitors. In addition, as regulators gain confidence in their capacity to assess and monitor robo advisors, and as robo advisors become a major force in the market, there may be less need for direct regulation of the forms and features of consumer financial products. Of course, these regulatory benefits will not occur automatically. As any robo advisor entrepreneur can attest, innovation requires understanding, assessment, coordination, and feedback.

II. ROBO ADVISORS AND FINANCIAL PRODUCT INTERMEDIARY REGULATION

In the popular press, a "robo advisor" is an automated investment service, most likely based in San Francisco, which competes with financial advisors by claiming to offer equally good, if not better, financial advice and service at a

17. *See, e.g.*, U.S. SEC. & EXCH. COMM'N, DIV. OF INV. MGMT., GUIDANCE UPDATE: NO. 2017–02 (2017), https://www.sec.gov/investment/im-guidance-2017-02.pdf; *see also* FINRA, *supra* note 1, at 3 (discussing governance and supervision of such advice). *See generally* Ryan VanGrack et al., Senior Advisor, U.S. Sec. & Exch. Comm'n, FinTech Forum: The Evolving Financial Marketplace (Nov. 14, 2016, 9:02 AM), https://www.sec.gov/spotlight/fintech/transcript-111416.pdf (discussing the opportunities and challenges of robo advice). We note that the SEC forum included a state government official from Vermont. *Id.* at 76.

18. The U.S. CFPB has been closely following the "Project Innovate" of the U.K. FCA, but to our knowledge, there have not been systematic efforts to share information in both directions.

19. While we cannot prove this point, a suggestive example comes from the impact of structured financial products during the financial crisis. *See generally* Joshua Coval et al., *The Economics of Structured Finance*, 23 J. ECON. PERSP. 3 (2009) (exploring the role of structured finance activities in the financial crisis).

lower price.[20] We use the terms "robo advice" and "robo advisor" more broadly to include the similar services emerging in other sectors of the financial services industry, most significantly in insurance, but also in consumer credit.[21] Using these terms so broadly emphasizes the similarities of these automated advisors across the financial services spectrum and supports the claim that regulators from the securities, banking, and insurance sectors need to work together to assess them. The investment-focused robo advisors have drawn the most attention from regulators,[22] but the promises and regulatory concerns raised by investment robo advisors apply equally to their insurance and banking counterparts.[23]

Accordingly, we use the term "robo advisor" broadly to refer to any automated service that ranks, or matches consumers to, financial products on a personalized basis.[24] Typically, the firms that provide these tools to consumers also sell the recommended financial products, but advertising funded "lead generation" services also can provide them.[25] The consumer

20. *See* Rob Berger, *7 Robo Advisors That Make Investing Effortless*, FORBES: INVESTING (Feb. 5, 2015, 10:28 AM), http://www.forbes.com/sites/robertberger/2015/02/05/7-robo-advisors-that-make-investing-effortless (discussing several popular robo advisors and their key features); *see also* Arielle O'Shea, *Best Robo-Advisors: 2017 Top Picks*, NERDWALLET (June 23, 2017), https://www.nerdwallet.com/blog/investing/best-robo-advisors (defining a robo-advisor and describing its features).

21. Insurance robo advisors include Healthcare.gov (health insurance) and CoverHound.com (auto and homeowners insurance). While we have not found any true robo advisors in the banking context, Zillow's mortgage comparison tools and NerdWallet's credit card comparison tools are a step in that direction.

22. *See, e.g.*, BLACKROCK, DIGITAL INVESTMENT ADVICE: ROBO ADVISORS COME OF AGE 1 (2016), http://www.blackrock.com/corporate/en-lm/literature/whitepaper/viewpoint-digital-investment-advice-september-2016.pdf; FINRA, *supra* note 1, at 1; MASS. SEC. DIV., POLICY STATEMENT: ROBO-ADVISERS AND STATE INVESTMENT ADVISER REGISTRATION 4 (2016), http://www.sec.state.ma.us/sct/sctpdf/Policy-Statement–Robo-Advisers-and-State-Investment-Adviser-Registration.pdf.

23. *See, e.g.*, CTRS. FOR MEDICARE & MEDICAID SERVS., PROCESSES AND GUIDELINES FOR BECOMING A WEB-BROKER IN THE FEDERALLY-FACILITATED MARKETPLACE 7 (2015), https://www.cms.gov/CCIIO/Programs-and-Initiatives/Health-Insurance-Marketplaces/Downloads/AB-Task-23-Draft-Web-broker-101-Webinar-Slide-Deck-09-30-15.pdf; Memorandum from the Ctr. for Consumer Info. & Ins. Oversight 1 (Jan. 8, 2016), https://www.cms.gov/CCIIO/Programs-and-Initiatives/Health-Insurance-Marketplaces/Downloads/Role-of-ABs-in-Marketplace-1_6_16.pdf.

24. Although it is more traditional in the legal literature to refer to mutual fund shares, bank accounts, and insurance policies as financial services, rather than products, people in the industry use the term "product," and related terms like manufacturer, distributor, retailer, and designer, because those terms allow for more precise description and analysis than the broader and conceptually vague term "financial service." *See, e.g.*, ERNST & YOUNG, US FUND DISTRIBUTION 2014: SEA OF CHANGE ON THE HORIZON 3 (2014) (referring to manufacturers and distributors of mutual funds), http://www.ey.com/Publication/vwLUAssets/ey-the-state-of-us-fund-distribution-in-2014/$File/ey-us-fund-distribution-report.pdf.

25. A lead generation service is a website that provides information to consumers about a product and makes money by referring consumers to another company that actually sells the product. Examples include: Zillow's mortgage comparison tool and Credit Karma's credit card comparison tool. *See Best Credit Cards from Our Partners*, CREDIT KARMA, https://www.creditkarma.com/credit-cards (last visited

products that could be the subject of such robo advice include: deposit accounts, home mortgages, and other forms of consumer credit from the banking sector; all of the personal lines of insurance, including auto, life, disability, health, and homeowners insurance, as well as annuities; and, from the securities sector, mutual fund shares and other savings products regulated as securities.[26]

Our definition of "robo advisor" is closely aligned with what the Financial Industry Regulatory Authority ("FINRA") calls "digital investment advice tools," which include automated investment analysis and recommendation services sold to traditional financial advisors.[27] Our broader definition includes both "hybrid robos," which place a human interface on top of what is primarily an automated process, and automated portfolio selection and management tools sold to more traditional financial advisors who provide services that retain even more of a human touch.[28] Like FINRA, we mean to emphasize the continuities between the new, consumer-facing automated intermediaries and the kinds of automated services that have previously been available to traditional intermediaries.[29] We expand the term "robo advisor" even further, however, to include comparably automated services in the insurance and banking sectors to emphasize the technological and regulatory continuities across the financial services industry.

A. POLICY JUSTIFICATIONS AND REGULATORY OBJECTIVES

In a nutshell, the primary justifications for consumer financial services regulation are the following: to provide some degree of protection for

---

Oct. 29, 2017); *Compare Mortgage Rates and Home Loans*, ZILLOW, https://www.zillow.com/mortgage-rates (last visited Oct. 29, 2017).

26. Securities issued by operating companies are not consumer financial products in the sense in which we are using that term. If a financial product intermediary developed and mass marketed a service that created individualized securities portfolios, we would regard those portfolios as the consumer product, not the securities in the portfolios, unless consumer financial product companies started creating securities designed to be included in those portfolios.

27. FINRA, *supra* note 1, at 2 (dividing digital investment advice tools into two groups: "financial professional-facing" tools and "client-facing" tools).

28. *See, e.g.*, FRANCIS M. KINNIRY JR. ET AL., VANGUARD RES., PUTTING A VALUE ON YOUR VALUE: QUANTIFYING VANGUARD ADVISOR'S ALPHA 16 (2016), http://www.vanguard.com/pdf/ISGQVAA.pdf (noting the benefits that the Vanguard Advisor's Alpha framework can provide for traditional financial advisors); Efi Pylarinou, *SigFig Advises Hundreds of Billions and Pivots from B2C to B2B*, BANK INNOVATION (Aug. 17, 2015), http://bankinnovation.net/2015/08/sigfig-advises-hundreds-of-billions-and-pivots-from-b2c-to-b2b (discussing the success of a SigFig tool designed to provide advice for independent brokers).

29. *See* FINRA, *supra* note 1, at 2–3 (describing history of digital investment advice); *see also* BARR ET AL., *supra* note 13, at 471 (automated investment services have been "used for many years by financial professionals to develop a customer's trading portfolio"); Michael S. Piwowar, Comm'r, U.S. Sec. & Exch. Comm'n, Statement at Financial Technology Forum (Nov. 14, 2016), https://www.sec.gov/news/statement/piwowar-statement-financial-technology-forum-111416.html ("FinTech is frequently lauded as a disruptive force that is transforming the financial services industry . . . .").

consumers regarding the safety of their financial products; to protect society from the negative consequences of the failure of financial product providers; and to protect consumers from being exploited due to their relative lack of knowledge about financial products and their dependence on the product providers.[30] In addition, some financial services regulation aims to ameliorate inequality, for example, by limiting the ability of insurance companies to charge prices based on risk or requiring banks to provide services within minority and low income communities.[31] Finally, some financial services regulation aims to advance broader political economy goals, such as anti-trust regulation, money laundering regulation, and regulations that discourage financial companies from amassing too much political power.[32]

The financial services industry and its associated regulatory bodies are traditionally divided into three major sectors: securities, banking, and insurance.[33] The relative importance of the policy justifications for regulation differs across these sectors. For example, banking regulation attempts to make ordinary consumer bank deposits completely safe through a combination of solvency regulation and deposit insurance,[34] and insurance regulation attempts to make most kinds of consumer insurance almost as completely safe through solvency regulation and guaranty funds.[35] By contrast, securities regulators do not attempt to make mutual funds or other securities completely safe. They focus instead on increasing the transparency of

30. *See* Howell E. Jackson, *Regulation in a Multisectored Financial Services Industry: An Exploratory Essay*, 77 WASH. U. L.Q. 319, 334–36 (1999). Note that we have simplified Jackson's framework in light of our focus on robo advisors. For example, we do not separately identify the objective of protecting consumers from a financial services provider changing its risk profile after purchase.

31. *See* Tom Baker, *Health Insurance, Risk, and Responsibility After the Patient Protection and Affordable Care Act*, 159 U. PA. L. REV. 1577, 1589–91(2011) (explaining how the ACA restricts the ability of health insurers to price based on risk). *See generally* Keith N. Hylton & Vincent D. Rougeau, *Lending Discrimination: Economic Theory, Econometric Evidence, and the Community Reinvestment Act*, 85 GEO. L.J. 237 (1996) (explaining history of the Community Reinvestment Act and testing the underlying market discrimination thesis).

32. Jackson, *supra* note 30, at 337; *cf.* Mark J. Roe, *Foundations of Corporate Finance: The 1906 Pacification of the Insurance Industry*, 93 COLUM. L. REV. 639, 639–41 (1993) (asserting the influence of American politics on the determinacy of corporate structures); Press Release, Dep't of Fin. Servs., DFS Issues Final Anti-Terrorism Transaction Monitoring and Filtering Program Regulation (June 30, 2016), http://www.dfs.ny.gov/about/press/pr1606301.htm (noting the announcement of the anti-money laundering regulation by the New York State Department of Financial Services).

33. Jackson, *supra* note 30, at 320. Jackson identifies futures trading and pensions as distinct from ordinary securities transactions. *See, e.g.*, *id.* at 362. We ignore futures trading and defined benefit pensions, and we treat defined contribution pensions as securities transactions with an employment law overlay.

34. *Id.* at 332–39.

35. *Id.* at 358. Note that in the insurance sector completely safe means only that the insurance company has the financial capacity to pay claims, not that the insurance company will have a perfect record in paying claims.

securities markets, preventing fraud, and promoting education and research that helps consumers manage investment risk.[36]

In the financial services realm, regulation addresses solvency, entity organization and licensing, market conduct, and product approval.[37] The aspects of financial services regulation most likely to apply to robo advisors are those directed at consumer product intermediaries.[38] These regulations apply directly to the companies that create robo advisors when those companies also function as consumer product intermediaries themselves, and indirectly when they sell their robo advisor services to consumer product intermediaries.[39] Within the schema of the policy justifications set out above, protecting consumers from being taken advantage of due to their relative lack of knowledge about financial products is most relevant to intermediaries. This justification is important across all three major sectors of the financial services industry.

Intermediaries like securities brokers, mortgage brokers, and insurance agents and brokers all have the potential to help consumers make better sense of the financial services available to them and, accordingly, to ameliorate the information imbalance between consumers and the producers of financial products.[40] However, there are significant challenges to reaching this

36. Jackson, *supra* note 30, at 345–46; Toni Williams, *Empowerment of Whom and for What? Financial Literacy Education and the New Regulation of Consumer Financial Services*, 29 LAW & POL'Y 226, 232 (2007) (noting that national regulators in the UK and Canada represent financial education as empowering consumers to manage investment risks); *Investor Alert: Automated Investment Tools*, U.S. SEC. & EXCHANGE COMMISSION (May 8, 2015), https://www.sec.gov/oiea/investor-alerts-bulletins/autolistingtools htm.html (providing a general overview of automated investment tools for investors).

37. *See generally* BARR ET AL., *supra* note 13 (identifying and discussing agencies responsible for licensing and entities and supervising market conduct in all three sectors, protecting solvency in the insurance and banking sectors, and approving products in the insurance sector).

38. Note that different strands of academic literature use the term "intermediary" differently. For example, in the financial services literature the term is used to refer to banks, insurance companies, and mutual fund companies. *See* Jackson, *supra* note 30, at 328–30. By contrast, the insurance and industrial organization literatures use the term to refer to middlemen. *See, e.g.*, Gary Biglaiser & James W. Friedman, *Middlemen as Guarantors of Quality*, 12 INT'L J. INDUS. ORG. 509, 509–12 (1994). We use the term to refer to middlemen and to the retail sales aspects of banks, insurance companies and mutual fund companies. For a survey of regulatory strategies directed at the retail sales and advising function, see generally Jackson, *supra* note 15 (cataloging circumstances in which consumers rely on financial advisors to recommend products or services and regulatory approaches to addressing the problem of steering based on side payments to the advisors).

39. *See* FINRA, *supra* note 1, at 1.

40. *See, e.g.*, J. David Cummins & Neil A. Doherty, *The Economics of Insurance Intermediaries*, 73 J. RISK & INS. 359, 386 (identifying the role of insurance agents and brokers as information intermediaries in reducing adverse selection); Daniel Schwarcz & Peter Siegelman, *Insurance Agents in the 21st Century: The Problem of Biased Advice*, *in* RESEARCH HANDBOOK IN THE LAW & ECONOMICS OF INSURANCE 36, 41–43 (Daniel Schwarcz & Peter Siegelman eds., 2015) (reviewing research on other kinds of intermediaries, such as financial advisors).

potential.[41] Consumers are almost as poorly equipped to identify the quality of an intermediary as they are to evaluate the quality of the financial products.[42] For example, because they need the help of the intermediary to evaluate those products, they cannot evaluate the quality of the intermediary by evaluating the quality of the intermediary's recommendations. Moreover, the prevailing commission-based compensation for intermediaries creates significant conflicts of interests that lead to biased advice.[43] Finally, the diversity and complexity of financial products makes it difficult to be sufficiently expert to consistently offer good advice, especially across the range of financial services.

Financial services regulation addresses these challenges using three main sets of regulatory tools: licensing and education requirements designed to ensure that an intermediary has at least a minimum level of competence regarding the products the intermediary is licensed to sell; disclosure requirements and antifraud rules that require intermediaries to be honest with their customers; and standards of conduct, such as the fiduciary standard, designed to encourage intermediaries to match their customers with suitable financial services.[44] These regulatory tools already apply to robo advisors indirectly, when regulated entities provide robo advice. However, it is important to consider whether regulators can and should apply any of these tools directly to the robo advisors themselves, and not just to the currently licensed and regulated entities that use them.

B. ROBO ADVISORS: COMPETENCE, HONESTY, AND SUITABILITY

We contend that, at least for mass-market consumer financial products, a well-designed robo advisor will be more competent and suitable than most human advisors while being as honest as the most honest humans. We recognize that, by specifying that the advisor be *well designed*, we are stacking the deck in favor of robo advisors. At this point, our goal is simply to

41. Jackson, *supra* note 15, at 83–84.

42. *See* Schwarcz & Siegelman, *supra* note 40, at 47–48 tbl.2.1 (summarizing empirical studies showing "financial intermediaries serving ordinary consumers often offer poor advice").

43. *See* COUNCIL OF ECON. ADVISERS, THE EFFECTS OF CONFLICTED INVESTMENT ADVICE ON RETIREMENT SAVINGS 13, 15–16 (2015), http://purl.fdlp.gov/GPO/gpo55500 (identifying several ways in which conflicts of interest affect the quality of advice and the subsequent investment performance); Schwarcz & Siegelman, *supra* note 40, at 44–47 (describing the effect of intermediaries' commission-based compensation).

44. *See* NAT'L ASS'N OF INS. COMM'RS, REVISIONS AND CLARIFICATIONS TO THE UNIFORM LICENSING STANDARDS (2011), http://www.naic.org/documents/committees_ex_pltf_producer_licensing_ul_standards_revised.pdf (describing education requirements); Jackson, *supra* note 30, at 344–45, 349–51 (describing disclosure and anti-fraud rules and standards of conduct); Schwarcz & Siegelman, *supra* note 40, at 61–62 (describing licensing requirements). Note that we simplify Jackson's more detailed list of regulatory strategies set out in Jackson, *supra* note 15, at 100 (noting that "generalizations are tricky given the range of legal regimes"). For present purposes we include price controls and prohibitions on certain conduct within the general category of standards of conduct.

demonstrate why it is plausible that a robo advisor could be well designed. The examples that follow lay the groundwork for our subsequent exploration of what is involved in assessing whether a robo advisor is well-designed.

1. A Health Insurance Robo Advisor

Our first example is the one with which we have the most experience: health insurance robo advisors.

i. Competence

In this context, competence means the ability to help consumers select a health insurance plan that provides appropriate coverage at a reasonable cost, taking into account factors such as consumers' risk aversion with regard to out-of-pocket payments and their preferences about qualitative differences among the plans, such as the network of health care providers and the extent of the health plans' involvement in managing care.[45]

ii. Honesty

Honesty is somewhat harder to define in this and other contexts. In our view, honesty includes making only true statements about the health plans, the intermediary's compensation, and the purchase process. In addition, honesty should include accurately describing the basis for any recommendations, making disclosures to correct a misimpression that the advisor is considering all of the plans in the market if the advisor is not doing so, disclosing any compensation or other arrangements that might have the potential to bias the advice adverse to the consumer's interests, and providing advice that is not in fact biased in that manner.

A well-designed health insurance robo advisor should provide advice that is superior to humans working without automated assistance in terms of both competence and honesty. Even an unbiased and competent human advisor can at best offer rules of thumb based on the choice patterns that the advisor has observed or learned about. For example, an experienced broker could offer advice such as the following: when choosing among the four plans

45. *See, e.g.*, AON RETIREE HEALTH EXCHANGE, https://retiree.aon.com (last visited Oct. 29, 2017). For recent evidence that consumers need this kind of advice even to pick among a small set of options, see generally Saurabh Bhargava, George Loewenstein & Justin Sydnor, *Do Individuals Make Sensible Health Insurance Decisions? Evidence from a Menu with Dominated Options*, (Nat'l Bureau of Econ. Research, Working Paper No. 21160, 2015) (demonstrating that people made objectively bad decisions when choosing among a small number of health insurance plans). If the company that creates the robo advisor also functions as an insurance broker, the company will also need to be competent at brokers' other functions, such as making sure that the insurance policy is issued in a timely manner and that consumers' ongoing customer service needs are met. These latter functions are obviously very important to consumers, but they are not part of the "robo advice" we are exploring in this essay, nor do they lie at the core of the comparative advantage of health insurance robo advisors. Accordingly, we will set them aside for present purposes.

typically offered at a major U.S. university, the expensive, low-deductible, broad-network plan is the one preferred by the professors and the doctors at the university hospital; the cheaper HMO plan is preferred by the staff and the healthy, young assistant professors.[46] Even when such rules of thumb are correct on average, they will provide the wrong guidance for some people,[47] and they are quite unlikely to be helpful when the alternatives expand beyond a small number of options.[48]

Health insurance robo advisors can offer richer, more personalized advice. With access to the right data and the ability to ask a few questions of the consumer, they can develop reliable predictions of the likely range of costs under all of the available plans; they can create personalized rankings that use survey data, expert assessments and other techniques to take into account both price and non-price features of the plans; they can customize these rankings based on the risk aversion and other expressed preferences of individual consumers; and they can do all of this instantaneously with choice sets of any size.[49]

In terms of honesty, a robo advisor will always provide the advice that it is programmed to provide, and it can be programmed in a way that meets a demanding standard of honesty: making only true statements, disclosing the methods for providing the advice, and providing advice that takes into account only factors that are consistent with the consumer's interests (insofar as it is possible to know those interests). Indeed, this more demanding honesty standard should be considered an aspect of what it means to be well-designed. While human advisors can endeavor to meet this same standard of honesty, common sense and psychological research make it hard to imagine people always meeting that standard when they are rewarded in ways that are not fully aligned with consumer interests.[50]

---

46. *See generally* Pavel Atanasov & Tom Baker, *Putting Health Back into Health Insurance Choice*, 71 MED. CARE RES. & REV. 337 (2014) (describing plans offered at a large private university).

47. In our university example, there will be some senior faculty who would be well served by a high deductible plan with an HSA or an HMO, and who would appreciate having a few thousand more dollars each year to spend on other things, and there also are likely to be some staff and healthy junior faculty whose preferences for freedom to choose doctors and distaste for both deductibles and HMOs are sufficient to justify paying the higher price for the low deductible, broad network plan. *See id.* at 338.

48. BARRY SCHWARTZ, THE PARADOX OF CHOICE: WHY MORE IS LESS 2 (2004) ("[A]s the number of choices keeps growing, negative aspects of having a multitude of options begin to appear. As the number of choices grows further, the negatives escalate until we become overloaded.").

49. *See* BEN HANDEL & JONATHAN KOLSTAD, HAMILTON PROJECT, GETTING THE MOST FROM MARKETPLACES: SMART POLICIES ON HEALTH INSURANCE CHOICE 12 (2015), http://www.hamiltonproject.org/assets/files/smart_policies_on_health_insurance_choice_final_proposal.pdf.

50. *See, e.g.*, JONATHAN BARON, THINKING AND DECIDING (4th ed. 1988).

iii. Suitability

Finally, the assessment of the competence of a robo advisor and the suitability of the products it recommends go hand in hand. By definition, a competent robo advisor will only recommend suitable products. Indeed, using difficult test cases to evaluate whether a robo advisor consistently recommends suitable products is one of the ways to evaluate whether the robo advisor is well-designed. Humans, however, are different. Even competent humans make mistakes, and competent humans can also be biased or dishonest.[51] Indeed, it is for this reason that financial services regulators developed suitability and other conduct standards that permit an after-the-fact assessment of whether intermediaries gave good advice.[52]

2. A Home Mortgage Robo Advisor

Our second example is a home mortgage robo advisor.[53]

i. Competence and Suitability

In this context, competence means the ability to help consumers select the right mortgage at the best rate available.[54] Doing this competently requires taking the relevant details of the consumers' financial situation into account, including likely household income over time, amount and timing of household financial obligations, risk factors associated with the kind of mortgage in question, the likely length of time before sale of the home, the consumer's credit rating, and other factors that people with more domain

---

51. On competent humans making mistakes, see COMM. ON QUALITY OF HEALTH CARE IN AM., INST. OF MED., TO ERR IS HUMAN: BUILDING A SAFER HEALTH SYSTEM 63–65 (Linda T. Kohn et al. eds., 2000) (documenting the extent of medical malpractice and attempting to de-politicize that issue by emphasizing that humans in all walks of life make mistakes). On competent humans being biased, see generally Sendhil Mullainathan et al., *The Market for Financial Advice: An Audit Study* (Nat'l Bureau Econ. Research, Working Paper No. 17929, 2012) (noting that financial advisers tend not to de-bias their clients and instead often reinforce biases that are in their interests). On competent humans being dishonest, see Nina Mazar et al., *The Dishonesty of Honest People: A Theory of Self-Concept Maintenance*, 45 J. MARKETING RES. 633, 642 (2008).

52. *See* Robert H. Mundheim, *Professional Responsibilities of Broker-Dealers: The Suitability Doctrine*, 1965 DUKE. L.J. 445, 447–52 (presenting the justifications of and need for a suitability doctrine).

53. We have been unable to find any mortgage robo advisors. The closest service we have found is Zillow's mortgage rate comparison feature, which is an advertising and lead generation tool that does not attempt to match the mortgage types to the consumer's needs. *See Compare Mortgage Rates and Home Loans*, *supra* note 25 ("We make it easy to see current mortgage rates, compare multiple mortgage quotes, and sort results to find the lowest fees, APR, or monthly payment."); *see also* MAGNIFYMONEY, http://www.magnifymoney.com (last visited Oct. 29, 2017) (an example of an additional financial loan lead-generation service).

54. For a description of how difficult this is to do well because of risk-based mortgage pricing, see Patricia A. McCoy, *Rethinking Disclosure in a World of Risk-Based Pricing*, 44 HARV. J. ON LEGIS. 123, 138–47 (2007) (comparing transparency of pricing and terms in the prime market with the subprime market).

expertise than we can identify. As with health insurance, helping consumers choose the best mortgage is a complicated matching problem that a well-designed algorithm could execute on a more personalized, consistently accurate basis than a human.[55] Additionally, because the assessment of competence and suitability go hand in hand, a competent mortgage robo advisor will only recommend suitable mortgages.[56]

ii. Honesty

In the mortgage context, honesty means making only true statements about a mortgage's rates and features, the intermediary's compensation, and anything else relevant to the mortgage search, application, and closing process. Honesty also includes accurately describing the basis for any recommendations, disclosing the risks associated with taking out mortgages in amounts or types that will be difficult for the consumer to afford, making common sense disclosures that might be needed to correct a misimpression regarding what plans the advisor is considering, disclosing the existence of any compensation or other arrangements that have the potential to bias the advice in a way that is not consistent with the consumer's interests, and providing advice that is not biased in that manner. As with health insurance, a robo advisor can be programmed to meet this demanding standard of honesty, and doing so should be considered an aspect of what it means to be well-designed.

---

55. *Cf.* Howell E. Jackson & Laurie Burlingame, *Kickbacks or Compensation: The Case of Yield Spread Premiums*, 12 STAN. J.L. BUS. & FIN. 289, 291–92 (2007) (demonstrating that when human mortgage brokers are compensated through yield spread premiums they steer consumers to mortgages with higher interest rates than optimal for consumers). A mortgage robo advisor could be programmed to prevent this kind of mismatching.

56. If the company that creates the robo advisor also functions as a mortgage broker, it would need to be competent at making sure that the mortgage is issued in a timely manner. The full automation of that task is much more difficult—but also potentially much more valuable—than fully automating the sale of insurance primarily because of the greater risk inherent in issuing a mortgage. An insurance policy only obligates the insurer to pay costs in the future, providing insurers the opportunity to police fraud in the sales process after the fact. By contrast, a mortgage company gives the consumer the money up front in return for the consumer's promise to repay the money in the future. Automating that process would be valuable and potentially part of the comparative advantage of the kind of company that would create a home mortgage robo advisor. Nevertheless, we will not address it further, except to make two quick observations. First, because a mortgage issuer gives the consumer the money up front, mortgage issuers will not agree to issue mortgages on an automated basis at scale without verifying the competence of that automation. Thus, the potential need for regulatory oversight of this aspect of automation is less acute than that of the product matching function. Second, the immediate beneficiaries of fully automated mortgage sales platforms are likely to be consumers with stable relationships with banks, credit cards, employers, and other large institutions. Thus, full automation has the potential to raise concerns about the inequality reproducing aspects of the financial services industry.

3. An Investment Robo Advisor

Our third example is the one most commonly associated with the label "robo advisor."[57]

i. Competence

We consider investment robo advisors last, despite the fact that, arguably, they are the most fully developed financial services robo advisors currently in the market.[58] We leave them for last because it is most obvious to us that the human financial advisors they are assisting or replacing need to be competent at many things other than simply matching consumers to products. By contrast, matching consumers to the relevant financial products is the core function of insurance and mortgage brokers. Thus, as consumers come to trust the speed and reliability of robo advisors' ranking and matching algorithms and the "always on" nature of automated services, and as the logistical difficulties of automating the mortgage underwriting process are overcome, it is easy to imagine automated systems, supplemented perhaps by call centers, gradually replacing many of the human insurance and mortgage brokers in the consumer market, as has already happened to travel agents.[59]

By contrast, matching consumers to financial products is only part of what a financial advisor can do for clients. A financial advisor can help people decide how much and how best to save, and, when the time comes, how much can safely be spent from those savings. Financial advisors can help clients create plans; they can set up structures and processes for implementing and sticking to plans; they can counsel clients who do not stick to the plans; and they can help clients adjust plans when circumstances change. These are in addition to the more readily automated tasks such as helping consumers decide how much they should be saving for retirement in light of relevant considerations regarding their financial situation, providing good advice about how and when to change or rebalance their investments over time, and providing projections to guide the retirement and decumulation process, once again in light of relevant considerations regarding clients' financial situation over time.

---

57. *See, e.g.*, U.S. SEC. & EXCH. COMM'N, *supra* note 17, at 1.

58. For examples of investment robo advisors, see the sources cited *supra* note 1.

59. *See* Shea Laverty, *Impact of Technology on the Travel Agency Business*, CHRON, http://smallbusiness.chron.com/impact-technology-travel-agency-business-57750.html (last visited Oct. 29, 2017) (highlighting how technology has changed the travel agency business). We distinguish between forms of insurance that, because of legal or contractual requirements, are not optional for consumers (e.g., auto and homeowners) and forms of insurance that are optional (e.g., life and disability insurance). For the latter forms of insurance, persuading people to buy them is also a core function, one that we expect will increasingly be the province of general purpose financial advisors and subject to automation through that channel.

Many financial advisors focus their efforts on selling financial products that generate commissions and fees, rather than on planning and coaching, and this helps explain why regulators and others have focused on the incentives that can distort the matching function of financial advisors.[60] Yet, planning and coaching can be more important than matching customers to products. For example, a financial advisor who exclusively recommends financial products that spin off high fees and commissions, but is good at getting her clients to adopt routines that allow them to live within their means and save and, consequently, to feel financially secure, may be helping her clients more than the financial advisor who scrupulously recommends optimal investments but is hopeless at helping clients to save and live within their means.

As existing investment robo advisors demonstrate, designers can easily automate product matching and other aspects of investing, such as rebalancing,[61] for investors who are prepared to adopt the passive investing strategy recommended by disinterested finance researchers.[62] Relationship management and other, more difficult to model aspects of the work of financial advisors are harder to automate. Accordingly, the robo advisors with the largest and fastest growing market shares sell their services through or to human financial advisors.[63] For example, the two largest sellers of passive investment funds in the United States—Vanguard and BlackRock—both now offer "hybrid robo" services that place a human relationship layer on top of a highly automated process, for which consumers pay a management fee that is somewhat higher than the fee for the fully automated robo advisors, but much less than half of the fee of traditional financial advisors.[64] As robo advisors

60. COUNCIL OF ECON. ADVISERS, *supra* note 43, at 15–16.

61. Passive investing refers to investing in funds that attempt simply to match the performance of the class of securities to which the fund is indexed. At present, investment robo advisors often employ algorithms to match consumers to a mix of exchange traded (index) funds based on the consumers' age, risk tolerance, and time horizon, among other factors. Rebalancing is the process of periodically adjusting the mix of investments so that differences in the relative performance of the investments do not lead the investor's portfolio to shift away from the preferred mix. For a description of what it would mean for an investment robo advisor to be well designed, see FINRA, *supra* note 1, at 8–9.

62. *See, e.g.*, BURTON G. MALKIEL, A RANDOM WALK DOWN WALL STREET: THE TIME-TESTED STRATEGY FOR SUCCESSFUL INVESTING 288 (11th ed. 2016).

63. Peggy Collins & Charles Stein, *The Vanguard Cyborg Takeover*, BLOOMBERG (Mar. 24, 2016, 11:00 AM), http://www.bloomberg.com/news/articles/2016-03-24/the-vanguard-cyborg-takeover (noting that the Vanguard Group's hybrid robo advisor has surpassed standalone robo advisors); *Vanguard and Schwab Hybrids Trump Pure Robos in Assets*, FIN. ADVISOR IQ (Mar. 29, 2016), https://financialadvisoriq.com/c/1323523/147603 (discussing the success of Vanguard Group's and Schwab's hybrid models over the standalone robo advisors).

64. Clint Boulton, *Roboadvisors Stand at the Vanguard of Human-Machine Collaboration*, CIO (Mar. 25, 2016, 12:02 PM), http://www.cio.com/article/3048318/vertical-industries/roboadvisors-stand-at-the-vanguard-of-human-machine-collaboration.html (describing Vanguard Group's hybrid services); *With FutureAdvisor, BlackRock Seeks to Compete with Schwab, Vanguard*, THINKADVISOR (June 14, 2016),

gradually replace the product matching function and other functions that are easily automated, it is possible that in the retail consumer market, financial advisors will largely replace stock brokers and that financial advisors increasingly will compete on the basis of their ability to do more of the planning and coaching aspects of their job.[65] We would applaud such a result, and we are sufficiently confident that it will take place that we have begun advising undergraduates who express an interest in helping professions such as nursing and social work to also consider careers in financial planning.

ii. Honesty

As in the health insurance context, there are different potential standards of honesty. At a minimum in our opinion, honesty means making only true statements about the products, the advisor's compensation, and anything else that is relevant to the products, the advice, and the purchase process, and honesty should also include accurately describing the basis for any recommendations, making any common sense disclosures that might be needed to correct a misimpression that the advisor is considering all of the products in the market if the advisor is not doing so, disclosing the existence of any compensation or other arrangements that might have the potential to bias the advice in a way that is not consistent with consumer's interests, and providing advice that is not biased in that manner.[66]

iii. Suitability

As with insurance and banking robo advisors, suitability goes hand in hand with competence for an investment robo advisor. A competent investment robo advisor will only recommend or make investments that are suitable for the consumer who is relying on the robo advisor, whether directly or indirectly.[67]

---

http://www.thinkadvisor.com/2016/06/14/with-futureadvisor-blackrock-seeks-to-compete-with (noting that BlackRock acquired FutureAdvisor to develop its hybrid services).

65. *See* Ryan VanGrack et al., *supra* note 17, at 12 ("[D]igital allows you to scale the service model of the existing financial advisory ecosystem by taking some of the workload off of financial advisors so they can focus on the unique differentiation and unique value added in terms of coaching, [and] relationship building with their clients . . . ."). *See generally* David Dubofsky & Lyle Sussman, *The Changing Role of the Financial Planner Part 1: From Financial Analytics to Coaching and Life Planning*, 22 J. FIN. PLAN. 48 (2009) (discussing similar changes for financial planners).

66. *See* U.S. SEC. & EXCH. COMM'N, *supra* note 17, at 3–5 (listing disclosures that robo advisers might make).

67. *See id.* at 7. The SEC's recent Investment Management Guidance Update for robo advisors raises the interesting complication of a robo advisor that gives clients the opportunity to choose investments that the robo advisor did not recommend and, thus, that may not be suitable for the investor according to the algorithm in the robo adviser. *See id.* The guidance document concludes:

> [A] robo-adviser should consider providing commentary as to why it believes particular portfolios may be more appropriate for a given investment objective and

III. ROBO ADVISORS: NEW REGULATORY CHALLENGES

The discussion so far suggests that a *well-designed* robo advisor will be competent and honest, and it will recommend to a consumer only financial products that are suitable for that consumer. Of course, by specifying that the robo advisors will be "well designed," we have stacked the deck in their favor. This is not because we believe that robo advisors necessarily will be well designed. Indeed, we believe the contrary.[68]

While robo advisors have the potential to outperform humans in matching consumers to mass market financial products, they are not inherently immune from the misalignment of incentives that has historically affected financial product intermediaries.[69] A robo advisor can be designed to ignore those incentives, but many consumer financial product intermediaries that develop or purchase robo advisors are subject to those incentives.[70] It would be naïve to simply assume that intermediaries will always choose the algorithms and choice architecture that are best for consumers, rather than those that are best for the intermediaries.

This means that regulators should take a more active role in assessing robo advisors as robo advisors grow in scale. Indeed, the same returns to scale that make a robo advisor cost-effective lead to similar returns to scale in assessing the quality of a robo advisor. An expert administrative agency is well situated to realize those returns to scale. Moreover, the potential solvency and systemic risks posed by hundreds of thousands, or even millions, of consumers choosing their financial products based on the same or similar models are sufficiently large and different in kind from those traditionally posed by

---

> risk profile. In this regard, a robo-adviser may wish to consider whether pop-up boxes or other design features would be useful to alert a client of potential inconsistencies between the client's stated objective and the selected portfolio.

Id.

68. For example, our research and that of our collaborator Eric Johnson demonstrate how simple choice architecture techniques can be used to mislead consumers, especially when combined with a biased or inaccurate ranking algorithm. *See generally* Benedict G.C. Dellaert, Tom Baker & Eric J. Johnson, Sorted Partitioned Sets as Personalized Choice Architecture, (unpublished manuscript) (on file with author) (presenting results of experiment in which changing the order of the presentation of plans changed consumer choices); *see also generally* Peter A. Ubel, David A. Comerford & Eric Johnson, *Healthcare.gov 3.0—Behavioral Economics and Insurance Exchanges*, 372 NEW ENG. J. MED. 695 (2015) (presenting results of an experiment in which switching the metals assigned to plans changed consumer choices); Harris Meyer, *Copycat Enrollment Websites Hamper ACA Sign-up Efforts*, MOD. HEALTHCARE (Oct. 25, 2016), http://www.modernhealthcare.com/article/20161025/NEWS/161029946/copycat-enrollment-websites-hamper-aca-sign-up-efforts (discussing the impact of misleading enrollment sites on health insurance enrollment through healthcare.gov).

69. *See* Fligstein & Roehrkasse, *supra* note 2, at 625; Schwarcz & Siegelman, *supra* note 40, at 64–66.

70. *See, e.g.*, Schwarcz & Siegelman, *supra* note 40, at 625.

consumer financial product intermediaries to justify regulatory attention on those grounds alone.[71]

The smart thing for regulators to do is to start developing the necessary capacities now, when the stakes are lower, and when consumers are still sufficiently uncertain about robo advisors that some firms may actually welcome the legitimation that could accompany independent certification of the quality of robo advice.[72] Indeed, we predict that at least some powerful actors in the financial services sector will decide to support such regulatory initiatives in order to be in a position to shape them in a manner that they believe is sensible, as the largest asset management company in the United States has already signaled that it is prepared to do.[73]

Toward that end, we offer two sets of conceptually framing ideas. First, based on our investigation of existing robo advisors across the three main sectors of the financial services industry, we have identified four core components of robo advisors that require distinct capacities to assess: (1) the ranking or matching algorithms and related processes; (2) the customer and financial product data to which the algorithms or other matching processes are applied; (3) the choice architecture through which the advice is delivered; and (4) the information technology infrastructure. Second, because there is so little research and analysis available to guide the regulation of robo advisors today and because the need for and corresponding returns to regulatory oversight will increase as the scale of robo advice increases, we propose a regulatory *trajectory*, rather than a regulatory agenda, that starts by building the necessary human capital. Only then will policymakers be equipped to set a regulatory agenda.

A. COMPONENTS OF ROBO ADVISORS THAT POSE REGULATORY CHALLENGES

In discussing these core components of robo advisors, our goal is to provide a basic introduction and some examples of the issues that can arise in assessing competence, honesty, and suitability. To make these assessments, regulatory agencies will need to develop the appropriate, domain-specific scientific and engineering expertise to go beyond our generalizations. Until they do so, robo advisors will be "regulated" only by their contracting partners and through the application of more general legal requirements such as those

71. *See infra* Part III.

72. *See* Stein, *supra* note 16 ("Clearly, if we want our markets to remain at the top, we need to embrace innovation. And FinTech clearly promises some exciting advances. But, we also need to be prepared to anticipate and ideally prevent problems before they arise. Remaining competitive requires both market participants and regulators to thoughtfully evolve with innovation, not react to it way after the fact.").

73. *See* BLACKROCK, *supra* note 22, at 8.

governing privacy, data security, and unfair and deceptive trade practices.[74] While those existing safeguards and requirements provide some protection for consumers, they are unlikely to be enough once robo advisors reach mass market scale. Even if market forces and existing safeguards somehow manage to ensure that robo advisors are honest and competent from the perspective of individual consumers, they cannot address the problems of scale. As we discuss in greater detail below, the problems of scale are classic collective-action problems, in which the combination of individually rational actions produces a collectively irrational result.[75]

1. Ranking or Matching Algorithms and Processes

An algorithm is a formula, or formal statement of rules, that guides a process.[76] For robo advisors, the key algorithms are those that rank the financial products for consumers to select, and if the robo advisor makes the selection, the algorithm then matches consumers with products. Each algorithm is embodied in software code that is based on a model of how to optimize the fit between the attributes of the financial products available to the consumer and the attributes of the consumers who are using the robo advisor.

Traditionally, analysts and developers that create matching and ranking algorithms have an explicit, articulable model, based on ideas about which product attributes are desirable to people with certain attributes. For example, developers may program an investment robo advisor to recommend that the mix of bond and stock funds in a consumer's retirement savings portfolio gradually shift over time so that the portfolio becomes more heavily weighted with bond funds as the consumer ages.[77] Likewise, an analyst could program a mortgage robo advisor to present the mortgages to a consumer in a ranking that is negatively correlated with the estimated risk of payment

74. *See generally* 45 C.F.R. § 164 (2016) (setting forth the HIPAA regulations); REVISED UNIF. DECEPTIVE TRADE PRACTICES ACT (NAT'L CONFERENCE OF COMM'RS ON UNIF. STATE LAWS 1966) (providing the standard for some states' laws regulating deceptive practices); Press Release, Dep't of Fin. Servs., Governor Cuomo Announces First-in-the-Nation Cybersecurity Regulation Protecting Consumers and Financial Institutions from Cyber-Attacks to Take Effect March 1 (Feb. 16, 2017), http://www.dfs.ny.gov/about/press/pr1702161.htm (describing Governor Cuomo's cybersecurity regulation).

75. Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243, 1244–45 (1968).

76. *See* Kroll et al., *supra* note 4, at 640 n.14; *see also* Mike Ananny, *Toward an Ethics of Algorithms: Convening, Observation, Probability, and Timeliness*, 41 SCI., TECH., & HUM. VALUES 93, 97 (2016) ("Computer science defines an algorithm as a 'description of the method by which a task is to be accomplished.'").

77. This is standard procedure in a target date retirement fund. *See, e.g.*, Olivia S. Mitchell & Stephen Utkus, *Target-Date Funds in 401(K) Retirement Plans* 1–2 (Nat'l Bureau of Econ. Research, Working Paper No. 17911, 2012).

shocks or other features that increase the rate of default for a mortgage.[78] Further, developers may program a health insurance robo advisor to rank health plans as a function of the total cost of the health plans for the individual consumer or a function of a set of cost and quality factors.[79]

Our sense is that most or all robo advisors presently in operation primarily use algorithms of this sort, meaning that they adhere to a readily explainable and examinable logic.[80] To assess the competence of these algorithms, some of the information that regulators could require from the consumer product intermediaries include:

(1) explanations of the models and the data upon which the models are based;

(2) evidence regarding the appropriateness of the data used to create the model, including the kinds of data-related problems described in relation to customer and product data below;

(3) explanations of the outcomes that the algorithms are seeking;

(4) evidence that the algorithms perform in the way that they are designed;

(5) evidence of how the creators of the robo advisor are measuring whether the algorithm is succeeding and what they are doing in response;

78. *See, e.g.*, McCoy, *supra* note 54, at 153 (arguing in favor of disclosing the potential for payment shocks and prepayment penalties).

79. *See, e.g.*, Dellaert, Baker & Johnson, *supra* note 68, at 14 (reporting how consumer selections changed when a leading private health insurance exchange shifted from a pure cost-based ranking to a cost/quality based ranking); Ellen McGeoch et al., What's the Bottom Line? Total Cost Estimators on the Health Insurance Marketplace (June 26, 2017) (unpublished research poster, AcademyHealth Annual Research Meeting) (reporting on variations in total cost calculators among different health insurance exchanges). The Aon Retiree Exchange is an example of a sophisticated health insurance robo advisor that considers both cost and quality in the U.S. context, powered by Picwell. *See* AON RETIREE HEALTH EXCHANGE, *supra* note 45.

80. In many other areas, and even for some aspects of some robo advisors today, software developers use "machine learning" algorithms, which are quite different. Machine learning algorithms are created by software programs that search for patterns in "big data." Algorithms created by machine learning programs identify predictive, not causal, relationships between variables, and they are often not intelligible to humans, including their creators. Thus they present a greater challenge to transparency than the kinds of algorithms we describe in the main text. *See generally* Cary Coglianese & David Lehr, *Regulating by Robot: Administrative Decision Making in the Machine-Learning Era*, 105 GEO. L.J. 1147 (2017) (exploring whether administrative law restricts government agencies from using machine learning algorithms). For an example of a health insurance robo advisor using machine learning techniques to build a component of the model, see PICWELL, http://picwell.com (last visited Oct. 29, 2017) (explaining that Picwell uses health insurance claims data and machine learning techniques to identify the "people like me" aspect of the Picwell cost prediction algorithm).

(6) explanations of what other alternatives the robo advisor creators considered and rejected; and

(7) other kinds of evidence and explanations that people with more specific domain knowledge can suggest.[81]

Of course, gathering all this information is just a start. The regulator must exercise good judgment based on this evidence, informed by domain-specific expertise.

To assess the honesty of the algorithms, regulators will need to review the accuracy of the algorithm descriptions provided to consumers as compared to the information about the algorithms provided to the regulators. Additionally, regulators will need to require demonstrations that the algorithms do not take into account—directly or indirectly—factors that would bias the outcomes in a way that harms consumers. For example, it would be improper for a matching algorithm to take into account either the size of the commission or fee paid to the financial product intermediary or a proxy for that commission or fee.[82] Indeed, the fact that it is possible to prevent algorithms from taking such factors into account represents a significant improvement over a human-based system, as it has been notoriously difficult to police the practice of steering clients and customers to the products that provide the best benefits to the intermediaries, not to the customers.[83]

In the securities context, the 2016 FINRA report on digital investment advice provides more detailed, domain specific descriptions of "effective practices" for FINRA-registered firms to use to assess the algorithms in investment robo advisors.[84] These practices could provide the basis for the development of disclosure requirements, and it is likely that parties who

81. *See, e.g.*, FINRA, *supra* note 1, at 5. We have been unable to find any examples of banking or insurance regulators producing similar reports or guidance.

82. A recent lawsuit alleges that a robo advisor designer and a major investment management company colluded "to design a robo-adviser program to steer [users] toward investments that paid [the investment management company] high fees." Diana Novak Jones, *Morningstar, Prudential Face Class Action over Robo-Adviser*, LAW360 (Aug. 4, 2017, 2:55 PM), https://www.law360.com/articles/951428/morningstar-prudential-face-class-action-over-robo-adviser; *see also* U.S. SEC. & EXCH. COMM'N, *supra* note 17, at 3 (noting that an investment robo adviser, as defined in that guidance statement, is a fiduciary and, thus, must provide disclosures that are "sufficiently specific so that a client is able to understand the investment adviser's business practices and conflicts of interest"). We question whether mere disclosure should be adequate.

83. In our experience studying and working in and around the financial services industry for decades, we have yet to meet anyone in the industry who believes that human consumer product intermediaries compensated on commission are consistently able to resist steering their customers to products that pay higher commissions. For research on this topic, see COUNCIL OF ECON. ADVISERS, *supra* note 43; Schwarcz & Siegelman, *supra* note 40, at 36–37; Mullainathan et al., *supra* note 51, at 1–5.

84. *See* FINRA, *supra* note 1, at 3–6. It is interesting to observe the degree of variation in the investment algorithms employed by the (anonymous) firms that FINRA used as the basis for the report.

believe that they have been injured by robo advisors will attempt to use these practices as standards of conduct in the litigation context. This is the kind of early effort that would be appropriate for the National Association of Insurance Commissioners, or one of the active state insurance departments, to take in the context of the emerging insurance web brokers that employ simple recommendation tools and that the Consumer Financial Protection Bureau should consider taking in the context of the emerging online tools for comparing mortgages and credit cards.[85]

2. Customer and Product Data

A high-quality ranking or matching algorithm will guide consumers to high-quality decisions only in combination with adequate data of two types: (1) the relevant attributes of the products available to the consumer, which must include an adequate representation of the variety of potentially suitable products available in the market to provide meaningful choice; and (2) the relevant attributes of the consumers for whom the algorithm is ranking or matching the products. There are two distinct categories of problems related to both of these data types: access and quality.

Data Access. With the notable exception of publicly traded securities[86] and some types of health insurance,[87] there are no public repositories of the kind of detailed financial product attribute data that a robo advisor needs in order to function. Therefore, absent robustly enforced legal requirements obligating product suppliers to provide such data to public repositories, robo advisors' only source of financial product data is from the product suppliers or their agents. These suppliers may be reluctant to provide these data for any number of reasons. A supplier may not maintain electronic records of their products that include all of the attributes employed in the robo advisors' algorithms; the supplier may update the price or other attributes of its

85. *See, e.g.*, COVERHOUND, https://coverhound.com (last visited Oct. 29, 2017) (providing an example of an insurance webbroker); MAGNIFYMONEY, http://www.magnifymoney.com (last visited Oct. 29, 2017) (providing an example of a consumer credit comparison tool); *see also* Memorandum from the Ctr. for Consumer Info. & Ins. Oversight, Health Ins. Marketplace Guidance 11–12 (Nov. 8, 2016), https://www.cms.gov/CCIIO/Programs-and-Initiatives/Health-Insurance-Marketplaces/Downloads/Role-of-ABs-in-Marketplace_Nov-2016_Final.pdf (illustrating how one regulator is attempting to regulate simple insurance robo advisers by requiring them to show the prices for all plans available in the marketplace).

86. The easy access to comprehensive, public securities data may be the reason that investment robo advisors are more developed than other robos. It is interesting to note that the FINRA report does not mention access to product data, perhaps because of the assumption that member firms already have access to all of the relevant securities data. With regard to customer data, FINRA emphasizes only that for at least some kinds of investment advice it is important to obtain a full description of the customer's portfolio. *See* FINRA, *supra* note 1, at 11.

87. *Health Insurance Marketplace Public Use Files (Marketplace PUFs)*, CTRS. FOR MEDICARE & MEDICAID SERVS., https://www.cms.gov/cciio/resources/data-resources/marketplace-puf.html (last visited Oct. 29, 2017).

products more frequently and dynamically than the robo advisor is able to accommodate; a supplier may believe that its product data records contain valuable proprietary pricing or underwriting information that cannot be trusted with the robo advisor; a supplier may believe that its products will not show well in comparison to other products; or a supplier may not wish to sell their products through the channels served by the robo advisor. Undoubtedly, there are other business reasons that make a supplier reluctant to provide data. Even if suppliers are obligated to provide some information about their products to regulators, the data may not be adequate for robo advisors because the regulator may not make the data publicly available, the data may not be in machine readable form, the data may not include all of the relevant product attributes, or the data may not be publicly released in time for the robo advisor to use it.

Customer data can of course be collected directly from customers while providing the robo advice to consumers. However, that can be burdensome for the customers, and they may not in fact possess, or have easy access to, the data that the robo advisor needs.[88] Thus, the more efficient and accurate approach in many cases would be to collect consumer data from third parties,[89] but those third parties may not maintain the information in a format that is accessible or they may not be willing to provide the information due to concerns related to fraud, legal constraints on providing the data, or other reasons.[90]

Regulators should be asking three kinds of questions related to accessing data. First, has the robo advisor obtained access to reasonable sources of data, and are there any concerns that inability to obtain data, particularly regarding products, will bias the rankings and matching in a way that disadvantages consumers in relation to intermediaries and sellers? Second, where there are gaps in data, what are the strategies that the robo advisor considered to address those gaps, why did the robo advisor choose the strategy(ies) that it employed, and was that choice reasonable? Third, does the regulator have the

88. For example, a health insurance robo advisor may need medical utilization records, a mortgage robo advisor may need detailed income or expense records, and an investment robo advisor may need detailed asset/investment records.

89. *See* PWC: FS VIEWPOINT, SIGNIFICANT OTHERS: HOW FINANCIAL FIRMS CAN MANAGE THIRD PARTY RISKS 4, 8 (2015), https://www.pwc.com/us/en/financial-services/publications/viewpoints/assets/pwc-third-party-vendor-risk-management.pdf (showing that 57% of survey respondents have an accurate inventory of all third parties that handle sensitive firm, employee, and customer data).

90. *Vendor and Third Party Management*, FFIEC: IT EXAMINATION HANDBOOK INFOBASE, http://ithandbook.ffiec.gov/it-booklets/retail-payment-systems/retail-payment-systems-risk-management/operational-risk/vendor-and-third-party-management.aspx (last visited Oct. 29, 2017) (providing guidelines for third-party data risk management); PWC, *supra* note 90, at 1 (noting that third parties have created problems for financial services institutions by mishandling consumer data).

authority, whether formal or informal, to increase access to data and thereby improve the quality of the robo advice?[91]

Data quality. Even assuming the data are available, there will be significant problems regarding the completeness and accuracy of the data, particularly in the early stages of the development of robo advisors.[92] In our interactions in and around the financial services field, we have found that there is an inverse relationship between people's experience working with data and their expectations regarding the completeness and accuracy of data. In our experience, people who work with data always expect to find problems with data; people who do not work with data tend to over-estimate the completeness and accuracy of data. To the extent that regulators lack experience, they may be over-trusting robo advisor assurances and, thus, demand less evidence that the robo advisors have adequately tested the accuracy and completeness of the data and that they have developed reasonable strategies to deal with missing or obviously incorrect data. Accordingly, regulators need to develop the capacity to ask hard, domain-specific questions about data quality and to evaluate the responses.

3. Choice Architecture

Robo advisors typically use automated processes to communicate their advice, whether directly to consumers in the case of a consumer-facing robo advisor or to a human intermediary in the case of more traditional automated tools. In the case of a consumer-facing robo advisor, there may also be the option, or even requirement, of closing the sale with human assistance through a call center or a chat function.[93] In all these cases, the robo advice is embodied in a ranked set of alternatives and information about those alternatives. Behavioral science research demonstrates the very large effects that choice architecture—the organization of the context in which people make decisions—can have on decisions.[94] For example, the order in which options are presented, the number of options that are presented, the attributes of the options presented (and in which order), the framing of

91. The CFPB's recent focus on encouraging banks to provide access to personal financial management software services is encouraging, as those services are likely to be an important provider of robo advice. *See* CFPB, Request for Information Regarding Consumer Access to Financial Records, 81 Fed. Reg. 83,806, 83,808 (Nov. 22, 2016).

92. *See, e.g.*, MASS. SEC. DIV., *supra* note 22, at 5 (noting that one of the problems of robo advisors is data inaccuracy).

93. *See, e.g.*, EHEALTH, https://www.ehealthinsurance.com (last visited Oct. 29, 2017) (providing chat and call center options).

94. Thaler and Sunstein coined the term "choice architecture." RICHARD H. THALER & CASS R. SUNSTEIN, NUDGE: IMPROVING DECISIONS ABOUT HEALTH, WEALTH, AND HAPPINESS 3–4, 81–100 (2008). The literature is vast and growing. For a recent review, see generally Eric J. Johnson et al., *Beyond Nudges: Tools of a Choice Architecture*, 23 MARKETING LETTERS 487 (2012) (examining the tools available for choice architects and their importance to decision-makers).

options (e.g., gain versus loss), all have major impacts.[95] This means that the way that robo advice is presented can have a profound effect on whether and how consumers use that advice.[96] Thus, as in the case of ranking or matching algorithms, there may be a role for regulators in assessing the competence and honesty of the choice architecture and the suitability of the products that it favors.

As Richard Thaler is fond of saying, salesmen have always intuitively understood the power of choice architecture.[97] Systematic research on choice architecture provides a vocabulary and a set of assessment tools. The challenge for financial services regulators is to gather and extend the *relevant* domain specific research. The goal should be developing the capacity to evaluate whether robo advisors' choice architecture is appropriate and does not undermine the quality of the ranking or matching algorithms. Incompetent choice architecture may lead consumers away from the best-ranked products or prevent them from buying altogether. For example, this could occur if robo advisors present products in an overly complex fashion. Regulators should also be looking out for choice architecture techniques that steer consumers in a manner that benefits the intermediary notwithstanding a neutral, merits-based ranking or matching algorithm.

There is too much learning from the choice architecture research to meaningfully summarize it here. What we can do is to note that behavioral scientists are developing ideas about best practices that will be useful to both robo advisors and regulators learning to assess robo advisors.[98] For example, robo advisors could assist consumers by making it easy to access their personally highest-ranked products in the market—even if those products are not the most profitable for the intermediary to sell—or they could update consumers on a yearly basis if it would be beneficial for them to switch to a more fitting product. Robo advisors could also design ranked sets of products in a format that facilitates easy consumer comparison and provides assistance in making a decision.[99] Finally, rigorous experimental testing is an important best practice that provides a record that could be made available for regulators to review in assessing whether the robo advisors have engaged in a meaningful and empirically informed choice architecture effort.

---

95. Johnson et al., *supra* note 94, at 488–96.

96. *See, e.g.*, Johnson et al., *supra* note 7, at 4–8 (demonstrating that pre-checking the best value plan and providing a simple demonstration of how the best value plan was selected substantially increased the percentage of consumers that chose the best value plan as compared to simply showing the consumers the value of the plans).

97. *See* E-mail from Richard Thaler, Professor, John R. Raben/Sullivan & Cromwell Fellowship Lecture, Yale Law School, to author (Aug. 25, 2017, 3:18 PM) (on file with author).

98. *See* Memorandum from John P. Holdren, Dir., to Heads of Exec. Dep'ts & Agencies (Sept. 15, 2016) (providing best practices guidance for agencies seeking to apply behavioral science insights to federal programs).

99. *See id.* at 2, 6.

Experimental testing, verification that the testing occurred, and verification that designers implemented the choice architecture that came out best for consumers in the testing, is easiest to do when the choice environment is fully automated.[100] To our knowledge, there has not yet been research on "hybrid robo" environments, such as (1) a consumer financial product intermediary that uses robo advisors behind the scenes and humans to interact with customers; or (2) a web-based intermediary that encourages or requires customers to make a phone call or use the chat function to ask questions and close the deal. Intuitively, the human/machine handoff provides significant opportunities to take advantage of consumers, for example through a "bait and switch," which involves offering additional options or pointing out features the robo advice did not emphasize. To evaluate these risks, regulators could require the intermediary to track the robo advice provided in each case and the products that the consumer purchased so the regulator could evaluate whether there are any systematic patterns to the cases in which the consumers did not follow the robo advice and, if so, require the intermediary to explain those patterns and demonstrate that the patterns are in the consumers' best interests. Indeed, the intermediary should already be collecting and analyzing that information for its own purposes. Thus, requiring that information should not impose an unreasonable burden.

Notably, the 2016 FINRA report regarding the identification of effective practices regarding algorithms and customer data is silent on the topic of choice architecture.[101] This is an unfortunate gap in an otherwise forward-thinking report, especially due to the consumer exploitation risks in the machine/human interface.

4. Information Technology Infrastructure

Assessing the security and stability of information technology architecture is an increasingly important aspect of financial services regulation that extends well beyond robo advisors.[102] Financial services regulators already appear to recognize the need to enhance their capacities in this area,[103] and the technical aspects of this lie far from our comparative advantage. Accordingly, we will not address this topic further, other than to offer two related observations. First, overly demanding information technology infrastructure requirements could serve as barriers to entry for

100. John R. Hauser et al., *Website Morphing*, 28 MARKETING SCI. 202, 213 (2009).

101. *See generally* FINRA, *supra* note 1. Perhaps for this reason the September 2016 BlackRock white paper on digital investment advice does not address choice architecture either. *See generally* BLACKROCK, *supra* note 22.

102. *See, e.g.*, Press Release, Dep't of Fin. Servs., *supra* note 32; *see also* BLACKROCK, *supra* note 22, at 8.

103. *See, e.g.*, Press Release, Dep't of Fin. Servs., *supra* note 32.

innovative new enterprises.[104] Second, regulators could address this concern by developing a strategy for new market entrants that increases the level of scrutiny with the scale of the enterprise and forgoing such scrutiny altogether for early-stage robo advisors and those with small market share, provided the small entrants only sell their services to businesses that have significant incentive to ensure an adequate information technology infrastructure.[105]

B. SCALE AND THE CONCEPT OF A REGULATORY TRAJECTORY

At a general level, the benefits of closer regulation of consumer financial product advice depend on the amount of harm that the advice could cause to consumers. Conceptually, the amount of this harm is a function of three factors: (1) the number of consumers affected by the potentially harmful action; (2) the probability of the harmful action occurring in the market, and (3) the severity of the consequence of the harmful action to the consumer. When more consumers are affected, when the harmful action is easy to introduce into the market, and when the severity of harm from the action is high, the need for regulation is greater.

All three factors have the potential to increase along with the market share of robo advisors. First, a successful robo advisor has the capacity to reach many more consumers than any single human advisor. Second, as the market share of robo advisors increases, there will be greater opportunities for robo advisors to fail. Third, because robo advisors may give more comprehensive and detailed advice than any single human advisor,[106] the potential harmful consequences of the robo advice to the individual consumer may be larger than that of a human advisor who operates within a narrower domain. Fourth, if one robo advisor gains truly massive market share, or if the models underlying competing robo advisors are sufficiently alike, there is a risk of

104. KPMG recently identified "[c]ybersecurity and consumer data privacy" as one of the "[t]en key regulatory challenges [f]acing the financial services industry in 2017." PHILIP MACFARLANE & KAREN STAINES, KPMG, TEN KEY REGULATORY CHALLENGES FACING THE FINANCIAL SERVICES INDUSTRY IN 2017 1, 5 (2017), https://assets.kpmg.com/content/dam/kpmg/sg/pdf/2017/02/Ten-key-regulatory-challenges-facing-the-financial-services-industry.pdf. This report identified a range of regulatory activity taking place across multiple agencies and levels of government. *Id.* at 1. Just keeping track of all of the potentially applicable changes could be a difficult challenge for a small company. *See id.* (laying out potential financial regulatory reforms which may adversely affect businesses).

105. For examples of regulators attempting to be more accessible and flexible for emerging businesses, see generally CONSUMER FIN. PROT. BUREAU, PROJECT CATALYST REPORT: PROMOTING CONSUMER-FRIENDLY INNOVATION (2016), https://www.consumerfinance.gov/documents/1331/102016_cfpb_Project_Catalyst_Report.pdf; FIN. CONDUCT AUTHORITY, REGULATORY SANDBOX (2015), https://www.fca.org.uk/firms/project-innovate-innovation-hub/regulatory-sandbox.

106. For example, a robo advisor may be able to provide recommendations based on more advanced personalized projections of future income streams or spending patterns and considering a broader portfolio of financial products than a human advisor.

highly correlated losses that could even pose systemic risk.[107] Finally, as robo advisors gain scale, there may be collective-action problems that arise from ranking and matching services that are individually rational but have perverse consequences for financial product markets.

To further illustrate this line of reasoning, consider the impact of Google or Yelp on tourists' search for a restaurant in a new town as compared to the traditional approach of asking the hotel concierge for a restaurant recommendation. Google's scale compared to the concierge is tremendous. It provides access to restaurant information to all tourists in all towns, and it is easily accessible to everyone. If it gives systematically bad restaurant advice, the impact will be much greater than bad advice given by any individual concierge. Even if the advice given by hotel concierges is on average just as bad, the advice given by many individual concierges would be bad in many different ways. Of course, the consequences of providing poor restaurant advice even on a large scale seem sufficiently small that regulating Google's or Yelp's restaurant reviews seems unlikely to be necessary. However, the consequences of poor financial advice can be severe even in an individual instance, and potentially catastrophic on a large scale.

The potential collective-action problems are more difficult to predict. One potential example relates to a familiar problem in machine learning: the trade-off between exploitation and exploration in learning algorithms.[108] If an algorithm is to learn, it must sometimes make a choice that is less than optimal, based on current information.[109] It must explore, rather than exploit. Yet, when the algorithm is part of a robo advisor, each individual consumer would prefer that the algorithm exploit, just as each individual user of the navigation app Waze would prefer that the app provide the shortest route based on known information and not send the user on an exploratory route.[110]

The second potential collective action problem results from the game theoretic nature of driving. Continuing with the Waze example, my travel time is a function not only of the distance between point A and point B but also of who else is on the road, and I can only control my own driving. If Waze employs an individually rational, or greedy, algorithm, it will always give me the best route in light of what everyone else is doing. Yet, as the famous

107. *See* O'NEIL, *supra* note 5, at 199–218; *cf.* CHARLES PERROW, NORMAL ACCIDENTS: LIVING WITH HIGH-RISK TECHNOLOGIES 3–14 (Princeton Univ. Press 1999) (1984).

108. *See generally* John Langford et al., Competitive Analysis of the Explore/Exploit Tradeoff (2002), https://www.cs.cmu.edu/~jcl/papers/exp_exp_icml/icml_final.pdf (investigating the explore/exploit trade-off in reinforcement learning using learning algorithms).

109. *Id.* at 1–2.

110. *See* WAZE, https://www.waze.com/en-GB (last visited Oct. 29, 2017) (describing an app which provides live traffic information and routes drivers to their destinations using the shortest route possible taking into consideration traffic patterns and trends).

Braess's paradox shows, individually rational driving behavior can lead to slower traffic overall, as everyone competes for the best route.[111] Thus, widespread adoption of a greedy Waze program could lead to longer drives for everyone. There are solutions, but those solutions require marginal cost pricing, which Waze cannot implement on its own, or for Waze to send some drivers on slower routes than other drivers, which violates the assumption of individually greedy route assignment.[112] Algorithms that favor some people over others should of course raise red flags.

Financial services also have a game theoretic structure. The cost of my insurance is a function not only of my risk but also of the risk of the other people in my pool. Similarly, the cost of my credit is a function not only of my credit risk but also the credit risk of the other people who are in my pool. In both cases, my costs depend on who is in the pool because the pool bears the costs of the insurance claims and bad debts of the members of the pool. In a world of perfect information, risk-based pricing could cut the link between my cost and those of the pool, but we do not live in that world.[113] Finally, the returns on my portfolio depend not only on the underlying businesses whose shares and bonds are in the portfolio, but also the investing behavior of other people.[114] At sufficient scale, robo advice can shape insurance and credit pools and even move investment markets. For example, the tsunami of index investing that is currently reshaping the mutual fund industry is the result of a distributed kind of robo advice in which algorithms supplant individual fund managers.[115] There is surely much more to come.

At this point, all such risk assessments can only be conceptual and speculative. Since robo advice is still not widely adopted in the market, the current lack of broad-based regulatory capacity seems unlikely to have done

111. Braess's paradox demonstrates mathematically how the introduction of a new, faster link between two points can paradoxically reduce the mean driving time, despite the introduction of new road capacity. *See* Eric I. Pas & Shari L. Principio, *Braess' Paradox: Some New Insights*, 31 TRANSP. RES. PART B: METHODOLOGICAL 265 (1997) (reviewing literature regarding the paradox).

112. *See generally id.* (explaining the circumstances under which the paradox holds and how marginal cost pricing can solve the problem).

113. *Cf.* Tom Baker, *Containing the Promise of Insurance: Adverse Selection and Risk Classification*, 9 CONN. INS. L.J. 371 (2003) (describing how insurance companies classify policy holders into risk pools because insurance companies lack complete information about policy holders' behaviors and risk aversion).

114. *See generally* Lawrence Harris & Eitan Gurel, *Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressures*, 41 J. FIN. 815 (1986) (demonstrating that the price of a stock rises when it is added to the S&P 500).

115. *See* Tom Petruno, *Small Investors' Move to 'Passive' Stock Funds Becomes a Stampede*, L.A. TIMES (Apr. 9, 2017, 3:00 AM), http://www.latimes.com/business/la-fi-investing-quarterly-index-funds-20170409-story.html.

much harm—yet.[116] The time has come for the financial services authorities to develop the capacity to engage in a more systematic risk assessment.

In that effort, it makes most sense to think of financial services regulation as following a dynamic regulatory *trajectory*. The first step is gathering information to assess what capacities the agencies need to develop, and some regulators have begun to do just that.[117] One useful model for this step is the market review commonly undertaken by the Financial Conduct Authority ("FCA") in the U.K. as an early step in their regulatory process.[118] Notably, the FCA conducted a broad Financial Advice Market Review that produced a final report in March 2016 that addressed automated financial advice as a potential solution to the problem of a lack of broad access to financial advice.[119] While that report did not address the kinds of regulatory challenges this Essay has identified, automated advice was not the central focus of the review. Now that automated financial advice has received such positive attention, the next logical step for the FCA and other regulators is to consider the challenges involved in ensuring that automated advice lives up to its potential.

After the market review and associated assessment of regulatory capacity, the next step is to develop the necessary regulatory capacities. In this phase, regulatory authorities will not be starting from ground zero, as the large financial services organizations that are purchasing robo advice services are already developing methods for assessing the quality of those services.[120] Thus, the regulatory agencies will simply need to address a "make or buy" decision about the necessary expertise.

After developing the appropriate regulatory capacities, regulators will be equipped to formulate a strategy that addresses the challenges involved in adapting to the scale and consequences of robo advice in the market in a manner that promotes both effective innovation and honest and competent robo advising. Over time, financial services regulators will likely take an increasingly strict approach toward safeguarding the competence and honesty of robo advisors and the suitability of their advice, but much of this oversight can be accomplished on an automated basis and, as discussed below, it will

116. Note that, although we are not proposing application of the precautionary principle here (because the small market share of robo advisors reduces the concerns), we expect that other commentators may do so. *Cf.* Cass R. Sunstein, *Beyond the Precautionary Principle*, 151 U. PA. L. REV. 1003, 1003 (2003) (noting the strength of the precautionary principle "in legal systems all over the world").

117. *See, e.g.*, FINRA, *supra* note 1; U.S. SEC. & EXCH. COMM'N, *supra* note 17; Press Release, N.Y. State Dep't of Fin. Servs., *supra* note 6.

118. *See generally* FIN. CONDUCT AUTH., FINANCIAL ADVICE MARKET REVIEW: FINAL REPORT (2016) (describing the market review for the year 2016).

119. *Id.* at 28.

120. *See* FINRA, *supra* note 1, at 13 (identifying best practices that assume the availability of services to evaluate the competence and honesty of digital investment advisors).

reflect and encourage the current dynamism in the broader financial technology market.

Of course, these are broad generalizations. However, that is all that is possible before the financial services authorities engage in the kind of systematic, interdisciplinary assessment that we advocate in this Essay.

IV. CONCLUSION: BEYOND BASIC HONESTY, COMPETENCE, AND SUITABILITY

The designers of robo advisor technology and the regulators of robo advisor technology have a ways to go before robo advisors reach their potential and deliver high-quality advice to a mass-consumer market across a broad range of financial services.[121] Nevertheless, it is not too early to begin thinking about what comes next. For that purpose, it is useful to assume that regulators will develop the capacity to confirm that robo advisors do what their creators and operators say, based on access to data of adequate quality, and that regulators will gain the authority to remove from the market robo advisors who cannot or will not prove their capabilities to regulators.[122] That means that, in the near future, consumers will have access to well-designed robo advisors that honestly and competently recommend suitable financial products for consumers across the entire spectrum of financial products, employing appropriate choice architecture and reliable information technology infrastructure.

If we assume this basic competence and honesty for the moment, we can look ahead to other challenges and opportunities. In this concluding Part, we present one such challenge and two opportunities. The challenge is fostering a market in which an evolving diversity of robo advisors and consumer financial product intermediaries compete based on the *measurable* quality of their advice and related services for consumers. The opportunities are a leap forward in the ability to hold consumer financial product intermediaries accountable and a new approach to consumer financial product regulation that fosters more diversity in the forms and features of consumer financial products to better match the heterogeneity of consumers.

The challenge. While some regulatory oversight of the core components of robo advisors seems necessary to ensure basic competence and honesty, there is a risk that regulatory oversight will be watered down in the face of pressure

---

121. *See* BLACKROCK, *supra* note 22, at 1 ("While digital advisors represent a very small segment relative to more traditional financial advice providers, their recent rapid growth suggests a need for a focused analysis of the business and activities of these advisors.").

122. *See, e.g.*, MASS. SEC. DIV., POLICY STATEMENT: STATE-REGISTERED INVESTMENT ADVISERS' USE OF THIRD-PARTY ROBO-ADVISERS 1, https://www.sec.state.ma.us/sct/sctpdf/Policy-Statement-State-Registered-Investment-Advisers-Use-of-Third-Party-Robo-Advisers.pdf; MASS. SEC. DIV., *supra* note 22, 4–6; THE BD. OF THE INT'L ORG. OF SEC. COMM'NS, REPORT ON THE IOSCO SOCIAL MEDIA AND AUTOMATION OF ADVICE TOOLS SURVEYS 21–22 (2014), http://www.iosco.org/library/pubdocs/pdf/IOSCOPD445.pdf.

by powerful financial services enterprises that have thrived in the past.[123] In addition, regulatory oversight poses the risk of discouraging innovation by serving as a barrier to entry into the market for robo advisors. Moreover, as regulators develop preferences about robo advisor design, and as regulated entities come to understand those preferences, oversight may lead to a model convergence that increases the risk of catastrophic failure.[124]

To counter these risks, we propose that, in addition to their oversight activities, regulatory agencies also develop contests of contests, in which the agencies provide substantial cash prizes to organizations that develop contests in which robo advisors compete based on measurable differences in the quality of their components—especially the ranking and matching algorithms, choice architecture, and data access and efficiency—as well as their overall performance. A contest of contests promotes diverse, innovative ways to measure success. That diversity and innovation in measuring success will promote diversity among and innovation by robo advisors, and because the contests will themselves change over time, there will be less risk that all robo advisors will be tuned to any single way of measuring success.

The accountability opportunity. The automated nature of robo advisors means that robo advice inputs and outputs, algorithms, and much of the choice architecture exists in digital form, and, thus, can be analyzed using digital tools. Indeed, it should be possible to store the customer and product inputs, advice algorithm, choice interface, market conditions, and outcome for every individual customer interaction and to link all the interactions of the firm with that customer over time, creating the robo advisor analog to the "black boxes" proposed for self-driving cars.[125]

Whether financial services regulators presently have the legal authority to require firms to retain these data and make them available for analysis is a domain-specific legal question that lies beyond the scope of our analysis.[126]

---

123. *See* BARR ET AL., *supra* note 13, at 644–48 (noting objections to adopting the fiduciary standard for all investment advisors, including traditional stock brokers, on the grounds that trying to apply that standard to stock brokers will water down the standard rather than improve consumer protection).

124. *See* FIN. CONDUCT AUTH., *supra* note 118, at 26 (noting the concern that robo advisors may stop innovating if the government becomes too actively involved). The FCA did not make the point about catastrophic risk. *See generally id.*

125. *See* Darrell Etherington, *Germany Wants a 'Black-Box' in Any Car with Self-Driving Features*, TECHCRUNCH (July 18, 2016), https://techcrunch.com/2016/07/18/germany-wants-a-black-box-in-any-car-with-self-driving-features.

126. The transparency complications raised by the use of machine learning algorithms is also outside the scope of our analysis for two reasons. First, our understanding is that machine learning algorithms are not presently used by robo advisors to any significant extent. Moreover, the issues are presently under close investigation in relation to the government's use of machine learning algorithms. *See, e.g.*, Coglianese & Lehr, *supra* note 80, at 1147 (proposing that, although currently under close government watch, the use of machine learning ought to "pass muster under core, time-honored doctrines of administrative and constitutional law"). Financial services

The main point is that these data could lead to a leap forward in our ability to hold consumer product intermediaries accountable for providing misleading, incomplete or otherwise inadequate advice. Similar to the black boxes in self-driving cars, these data would provide a record for analysis if the consumer has an "accident"—in this context, meaning that the consumer suffers a financial misfortune related to a consumer financial product—making it possible to evaluate the role of the intermediary and to determine whether to hold the intermediary accountable.

The diversity opportunity. From a consumer protection standpoint, the history of financial services innovation has not been kind to advocates of complexity and choice. Across all three of the major financial services sectors, consumer product intermediaries have used complexity and choice to take advantage of consumers, particularly those who are less sophisticated.[127] The days are gone in which policymakers believe that a minority of well-informed and careful shoppers—Thaler and Sunstein's "Econs"—can make a market fair when that market is structured to exploit fallible humans.[128] In response, consumer protection advocates have called for a return to "plain vanilla" financial products.[129] This is not because they believe that vanilla is best for everyone, but rather because the evidence shows that choice and complexity

regulators will be able to "piggy back" on the results of those investigations if and when machine learning algorithms become important in the robo advisor context.

127. *See, e.g.*, Tara Siegel Bernard, *Even Math Teachers Are at a Loss to Understand Annuities*, N.Y. TIMES (Oct. 28, 2016), https://www.nytimes.com/2016/10/29/your-money/403b-teachers-annuities.html; Tara Siegel Bernard, *Think Your Retirement Plan Is Bad? Talk to a Teacher*, N.Y. TIMES (Oct. 21, 2016), https://www.nytimes.com/2016/10/23/your-money/403-b-retirement-plans-fees-teachers.html; Tara Siegel Bernard, *An Annuity for the Teacher—and the Broker*, N.Y. TIMES (Oct. 26, 2016), https://www.nytimes.com/2016/10/27/your-money/403-b-retirement-plans-teachers-brokers-fees.html; Jackson & Burlingame, *supra* note 55, at 296, 308.

128. *See, e.g.*, Tom Baker & Peter Siegelman, *"You Want Insurance with That?" Using Behavioral Economics to Protect Consumers from Add-On Insurance Products*, 20 CONN. INS. L.J. 1, 37 (2013) (reviewing prior economic literature and summarizing behavioral economics research demonstrating that a small number of informed shoppers cannot prevent sellers from taking advantage of others).

129. *See, e.g.*, MICHAEL S. BARR ET AL., NEW AM. FOUND., BEHAVIORALLY INFORMED FINANCIAL SERVICES REGULATION 9–10 (2008), http://repository.law.umich.edu/cgi/viewcontent.cgi?article=1028&context=other (suggesting that a plain vanilla set of default mortgages would be easier to compare across mortgage offers); Elizabeth Warren, *Three Myths About the Consumer Financial Product Agency*, BASELINE SCENARIO (July 21, 2009), http://baselinescenario.com/2009/07/21/three-myths-about-the-consumer-financial-product-agency (noting that the promotion of "plain vanilla" contracts is CFPA's real regulatory break-through).

lead to exploitation and regressive cross subsidies.[130] They believe, with some reason, that vanilla is good enough for most people.[131]

Once consumers have—and use—easy access to robo advisors, the analysis could change. A good robo advisor gives an unsophisticated consumer more processing power than even the most sophisticated consumer working on her own. That could lead to a fundamental shift in regulatory strategy: from regulating the content of consumer financial products to (1) facilitating access to the data needed to make robo advisors work; and (2) taking appropriate measures to verify the quality of the robo advisors and the public access to them. This is a disclosure-based regulatory strategy with a twist: electronic disclosure of product attributes to robo advisors; an easy procedure for consumers to authorize electronic disclosure to robo advisors of their own relevant financial or other relevant data; and robo advisor disclosure of the data needed to verify their competence and honesty to the appropriate regulatory authority.

* * *

Our goal in this Essay has been to open a discussion within legal and financial services scholarship that invites the participation of those with expertise in other relevant disciplines. In keeping with this goal, we have raised more questions than we have answered, and we have barely sketched the outlines of even the best of our ideas. However, that is appropriate at this stage of the regulatory trajectory.

As robo advisors grow in scale, protecting the integrity of financial markets will require the kind of cross-disciplinary cooperation that regularly occurs in the domains of health and environmental regulation. As we observed at the outset, *people* design, implement and market robo advisers, and it cannot simply be assumed that they can or will always act in consumers' best interests. The lawyers, economists, and behavioral scientists already involved in financial services regulation will need to understand enough about computer and data science to craft and apply new regulatory strategies, and the computer and data scientists at the forefront of the innovation will need to understand enough about legal structures and ways of thinking to help make the new regulatory strategies sensible. The benefits from these efforts almost certainly will exceed the costs, because the very same returns to scale that make robo advisors so cost-effective lead to similar returns to scale in assessing their quality. Coordinating that effort is a logical and important

130. MICHAEL S. BARR ET AL., JOINT CTR. FOR HOUS. STUDIES, HARVARD UNIV., BEHAVIORALLY INFORMED HOME MORTGAGE CREDIT REGULATION 19–20 (2008), http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/ucco8-12_barr_mullainathan_shafir.pdf (noting that the market in some cases would like to exploit or exaggerate consumer fallibility).

131. Warren, *supra* note 129 (noting that "plain vanilla" contracts would meet the needs of about 95% of customers).

role for our expert financial services regulators. It is time for them to develop the necessary expertise.