Confidence must be earned

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Toulouse School of Economics

Robo-Advising: Less AI and More XAI?

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Outline

- **The promises of robo advisors**
  - How they work
  - Personalization, reduced biases, financial inclusion
- **The growing role of AI in robo advising**
  - Going beyond traditional questionnaires
  - Hyper-personalization
  - Clients interactions
- **The future of robo-advice**
  - Algorithm aversion and trust
  - More personalisation?
  - Designing efficient human/robot interaction

01

The Promises of Robo-Advisors

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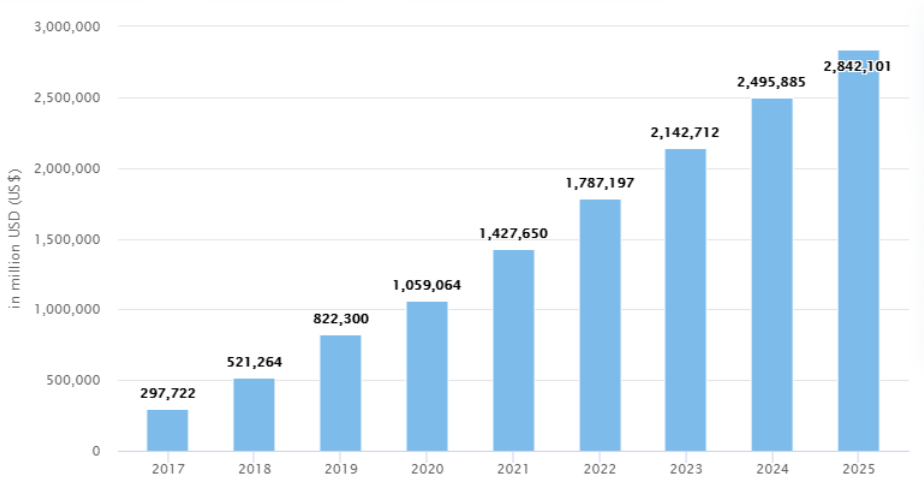
The Growing Role of Robo-Advisors

- **A “robo-advisor” is an online platform providing financial advice or allowing the automated management of a portfolio of assets**
  - Direct **digital relationship** (subscription, reporting, rebalancing)
  - Intuitive interface, accessible at any time, can establish a dialogue based on the client's project
  - Access to a **large choice of funds and ETFs**
  - **Asset allocation and rebalancing** advice at limited cost

- **Global market is around $1 trn**
  - AUMs worldwide are projected to reach $2.8 trn in 2025 (Statista)



Notes: Data is shown using current exchange rates. The applied current exchange rates are displayed in the Key Market Indicators below. This replacement of the 2017 constant exchange rate with current exchange rates was carried out in October 2021.

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Robo-advisors: How They Work

- **Define goals**
  - Combination of wealth / consumption objectives constrained by budgetary conditions and risk budgets

- **Assess personal preferences**
  - Preferences (risk aversion etc.) and personal risks (income, real estate, etc.)

- **Construct and communicate an optimal investment strategy**
  - Typically based on sample portfolios or an optimization (Markowitz, Black Litterman)
  - Rarely more sophisticated techniques

- **Alerts are sent / portfolios rebalanced automatically when asset allocation drifts from the target one**

Source: Beketov et al. (2018)

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Robo-advisors: How They Work

– **Three types of robo-advisors (European Parliament, 2021)**

Generic Robo-advice	Personnalized Robo-advice	Managed account
– Do not consider the personal situation of the client – Platform suggesting attractive investments like an online broker	– Software provides investment advice based on clients preferences – Client **makes investment decision**	– Software manages financial instruments on behalf of the client, rebalancing the portfolio – The robo-advisor **does not need client approval** for investment decisions

Relies on **human-robot interaction**

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The Promises of Robo Advisors

- **Improved clients' knowledge and personalization**
  - Detailed **questionnaire**
  - Partnerships with **financial account aggregators**, platforms of investment, lending, and tax calculation
    - Wealthfront and Venmo, Redfin, Coinbase, Lending Club, Turbotax ; Yomoni & Bankin ; Linxo & Grisbee ; Vanguard & Yodlee

- **Reduced bias in clients' treatment**
  - But in practice, robots are mainly used by **young people**

- **Financial inclusion**
  - By reducing costs, new technologies can reach traditionally under-served
  - Robo-advisors require **lower initial capital** to open an account
  - They charge **lower fees** than human advisors

In Practice

- **Robo advice improves the situation of individuals, in particular those not covered by traditional financial advice**

  - D’Acunto Prabhala and Rossi (2019) find the robo adopters increase stock holdings and experience greater **diversification**, and reduced **behavioral biases**

  - Reher and Sokolinski (2020) analyse the effects of the reduction of the account minimum from $5,000 to $500 by a major U.S. robo-advisor. This led to a 59% increase in the share of "middle class" participants

  - Bianchi and Briere (2021) also show that with robo-advice, participants increase their risk exposure and risk-adjusted returns, especially **investors with smaller portfolios**
    - Increased **attention and trading, net inflows**
    - Increased **risk taking** (+9% equities, relative to an average exposure of 18%)
    - Increased **rebalancing on alerts**
    - 2/3 of return improvement (+3%) due to dynamic rebalancing

02

The Growing Role of AI

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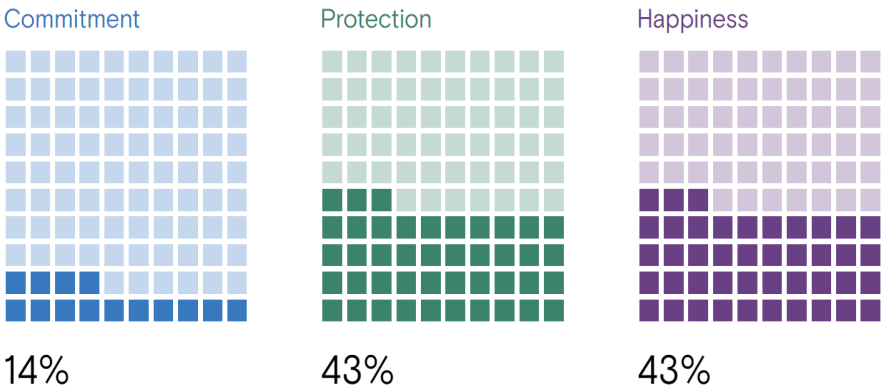
Going beyond traditional questionnaires

- **New “playful” forms of questionnaires mixing psychology and finance**
- **Traditional risk tolerance questionnaires are judged as intrusive, boring and time-consuming**

- Use **behavioral “science”** to assess the suitability of clients for financial risks
- Determine individuals’ **investment character**, behavioral traits
- **Engage** with clients

  Ex: Shroders’ InvestIQ, Goldman Sachs’ MoneyMind, Neuroprofiler, Financial DNA



Source: https://yourmoneymind.finlife.com/

- **ESG preferences: a new field of investigation**

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Hyper-personalization

- **Traditionally, most robo advisors were using clients profiling “grids”**
  - Apparent personalized advice on personal finance but few robo advisors were using AI to build bespoke portfolios and recommendations

- **Recenty, asset managers acquisitions/partnerships with customized portfolio construction specialists**
  - Ex: Charles Schwab bought digital advisor Motif, Abrdn, acquired Exo Investing

- **The holy grale: the « Spotify model »**
  - Personalize portfolio recommendations and updates like Spotify creates custom music playlists based on a short quiz and data from users past preferences

- **Personalize to behavioral traits, personal values, ESG preferences, etc.**
  - Ex: AutoCIO developed by Arabesque AI allows asset managers and investment professionals to build active equity strategies customized to clients’ sustainability objectives, using “thousands of variables over 4 million strategies available through the platform”

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Developing Clients Interactions

Chatbots

- To make customers aware of additional services and offerings
- To recommend stocks in specific sectors based on their investment portfolios
- To notify them about favourable foreign exchange rates in their trading accounts

Alerts to avoid investment mistake

- Schwab « Project Bear » uses AI to predict when investors are getting nervous
  - Vulnerable to increased emotion and noise in the markets
- Part AI-part human program
  - **AI scans clients' behavioral or demographic attributes**.
  - If the algorithm figures that you have a 60% of greater likelihood of selling in times of high volatility, and the market is going wild, you're getting a **call by a human advisor**

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03

The Future of Robo-Advice: What Role For AI?

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Algorithm Aversion and Trust

- **Robo-advisors rely on algorithm in different part of their process**
  - Investor's profiling and optimal asset allocation definition

- **Algorithm aversion**
  - General **lack of trust** in algorithm (HSBC, 2019)
    - Only 8% of respondents would trust a robot programmed by experts to offer mortgage advice, 41% trusting a mortgage broker. 9% would be likely to **use a horoscope** to guide investment choices!
    - **19% said they would trust a robo-advisor**
    - Large differences across **countries**

- **Algorithm complexity problematic for those with lower financial capabilities** (Ryan, Trumbull and Tufano, 2011 ; Lerner and Tufano, 2011)

- **Merton (2017), "What you need to make technology work is to create trust."**

Impact of Trust on Investment Decisions

- **Increased risk taking**
  - Bianchi and Briere (2021): +9% increase in equity exposure after robo-advice adoption (relative to an average 18% exposure).
  - Individuals more likely to accept an **asset allocation that is far away** (and riskier) from actual asset allocation
  - Hong et al. (2020): 14% increase (relative to an average risky exposure of 37%) on a sample of 50,000 Chinese consumer clients of Alibaba.

- **Robo-advisor seems to help individuals to move closer to their optimal level of risk-taking**
  - Not an **increase in the individual's risk tolerance** driven by robot support
  - Rather, better **alignment of the investment portfolio with the actual risk tolerance** of the individual, estimated from consumption growth volatility (Merton, 1971), measured from Alibaba's Taobao online shopping platform.

How to Build Trust? Explainability

- **Explainability**
  - Possibility of explaining a given prediction / recommendation, even if based on a very complicated model
  - For ex by evaluating the sensitivity of the prediction when changing one of the inputs
  - Explainability is a large driver of **trust**

- **Does explainable artificial intelligence improve human decision-making?**
  - Large debate in the context of self-driving cars
  - Psychological research: in complex decisions, **using heuristics** and ignoring part of the available information helps dealing more robustly with uncertainty than relying on resource-intensive processing strategies (Gigerenzer and Brighton, 2009) + **risk of information overload**
  - Experimental studies: providing drivers with information on how autonomous vehicle acts, helps maintain safe driving (Koo, Kwac, Ju, Steinert, Leifer and Nass, 2015) in emergency situations. Drivers are **faster to take control of the car** (Helldin et al., 2013).

How to Build Trust? Explainability

- **Explainability of robo-advice algorithms**
  - How to help customers appreciate the underlying finance model governing the algorithm, especially for less experienced investors who may lack financial literacy?

Full transparency of the complicated algorithm is not desirable

For ex disclosing all the details of the portfolio optimization methodology or the covariance matrix estimates.

Disclosing algorithm global functioning and limitations

For ex disclosing the sensitivity to model's parameters or which economic scenarios may cause the algorithm to perform less accurately

- **Difficulty: evaluating the performance of a robo-recommendation is not easy**
  - If AI used to design fully personalized allocations, they should be evaluated against fully personalized benchmarks (Lo, 2016)
  - Difficult to build counterfactuals of performance to evaluate the algorithm

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How to Build Trust? Control

- **Algorithm aversion can be reduced by giving people some control**
  - Forecasters more likely to choose the imperfect algorithm when they could **modify its forecasts**, even if severely restricted in the modifications (Dietvorst, Simmons and Massey, 2018)
  - One way to build trust is to let humans and robots interact, with the robot proposing an advice and the **human being the ultimate decision maker**

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How Far Shall We Go Into Personalization?

- **Optimal ptf choices rely on various individual characteristics**
  - Preferences: risk aversion, time preference
  - Characteristics: horizon, human capital, housing market exposure
  - Optimal allocations are usually very sensitive to these parameters which are hard to estimate: people tend to give inconstistent answers, reprofile etc.

- **How to take into account inconsistent responses from customers?**
  - FINRA report (2016) points out their poor consideration, some robo-advisors use contradictory answers
  - A lot of questionnaires based on self declaration

- **Personalization potentially introduces new parameter estimation errors**
  - Risk of overreaction to extreme/time-varying individual characteristics, potentially leading to “extreme” asset allocations

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Efficient Interactions between Humans and Robots?

- **Should robots become complements of substitutes of human decision?**
  - **Robo-advisors vs Managed accounts**: should one delegate the entire decision to the robot or let individuals monitor/intervene if necessary?
  - **Should we keep human advisors?** A number of platforms reintroduced human advisors (Scalable Capital, Nutmeg, etc.)

Substitutes?

PROS: Individuals have low financial literacy, little attention to their savings, may take biased decisions

CONS: In experiments (emergency situation), users may put **too much faith in robots** (Robinette et al. 2016)

They **lose the ability to learn**

Complements?

PROS: Robo interactions may **increase financial literacy.** Alerts can be used to learn about financial markets/ robo functioning (why rebalancing needed, etc.)
Allow to **gain feedback about clients**' behavior, perception of the algorithm, etc.

In practice, individuals tend to follow advice

CONS: individuals may take **wrong decisions**, especially under stress (during market shocks, etc.)

The Next Generation of Robo Advisors

Most robo advisors use simple procedures

Technological or **regulatory constraints** ?

- **U.S. discipline**: a registered investment advisor has a fiduciary duty to its clients (1940 Advisers Act, adapted by the SEC in 2017
- **Recent EU regulation (GDPR):** right to explanation, users can inquire about the logic involved in an algorithmic decision affecting them (say, through profiling)

Lack of clients' **trust** ?

More automation, more data and more complex models ?

OR

Alternative path: XAI (explainable artificial intelligence)

- **Algorithms easily interpreted and evaluated**
- **Allowing effective human-robo interactions**
  - Rather than full transparency, possibility to **explain and evaluate the recommendation**
- A way to **improve financial literacy** ?

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DISCLAIMER

The data used to carry out this study come from the processing of record keeping and account keeping of AMUNDI ESR employee and pension savings accounts. These data have been analyzed anonymously for scientific, statistical or historical research purposes.

MENTIONS LÉGALES

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