Financial Conduct Authority

61

Occasional Paper

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Robo-Advice for Borrower Repayment Decisions

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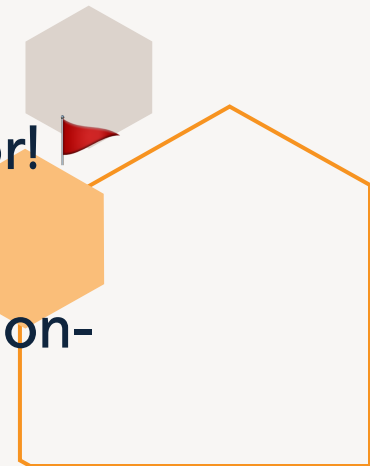
Key Findings

1. People demand robo-advice, particularly when there is no explanation

2. People's WTP for robo-advice is greater than the monetary benefits gained from using robo-advice
   - May be due to underestimation of one's ability to allocate debt payments correctly or valuing other benefits such as reducing cognitive effort/stress

3. Algorithm aversion (lack of trust in algorithm) leads to rejecting and/or overriding robo-advice
   - Some participants believed they could do better than the robo-advisor!

4. Robo-advice, even with explanation, doesn't help people improve decision-making in this domain, so continuous robo-advice may be required



Agenda


Why robo-advice for debt-management?
Debt Repayment Allocation Problem
Research Questions
Experimental Design
Results

Why robo-advice for debt-management?

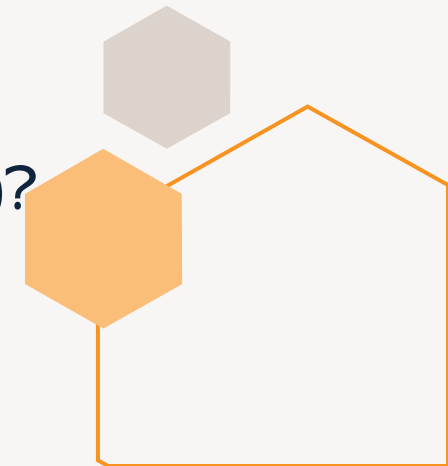
- Poor debt-management lowers financial security and wealth accumulation, and has long term financial consequences

- The optimal solution to the debt repayment allocation problem is **objective** and does not depend on risk preference or beliefs of an individual
  - Similar to the setup of my credit card experiment!

- Algorithm aversion: People, especially the vulnerable ones, tend to distrust new technologies and override robo-advice, even when the robo-advice gives the best possible solution

Research Questions

1. Whether (and by how much) exposure to robo-advice improves loan repayment?
   - No robo-advice vs. Robo-advice
2. Do participants prefer “explainable” robo-advice?
   - Robo-advice with education vs. Robo-advice without education
3. How much are participants willing to pay (WTP) to obtain robo-advice?
   - Use BDM-auction for paid robo-advice
4. Which participants override the robo-advice?
   - Follow robo-advice vs. Override robo-advice
5. Do participants learn how to manage debt over time (learning effect)?
   - Pre-intervention vs. post-intervention phase



Debt Repayment Allocation Problem

Problem: Given a fixed amount of money and a set of debt obligations, how would you allocate the debt repayments such that the total borrowing cost (interest and fees) is minimised?

- Example:

This month you have £1,000 set aside to pay off some of your debts. How will you split this payment across your debts to minimise interest and fees?

	Balance	Interest rate	Minimum payment	Fee for missed minimum payment	This month I will pay off...
Credit card	£1,040.55	22.5% APR	£26.01	£12	
Overdraft	£466.74	45.9% APR	£0.00	£0	
Revolving loan	£879.04	49.5% APR	£19.78	£48	

- **What is the optimal strategy?**

Debt Repayment Allocation Problem

- **Optimal strategy**:
    1. Pay off the min. repayment for every debt
    2. Order the debt by interest rate
    3. Pay off the debts with the highest interest rate first and work down

This month you have £1,000 set aside to pay off some of your debts. How will you split this payment across your debts to minimise interest and fees?

	Balance	Interest rate	Minimum payment	Fee for missed minimum payment	This month I will pay off...
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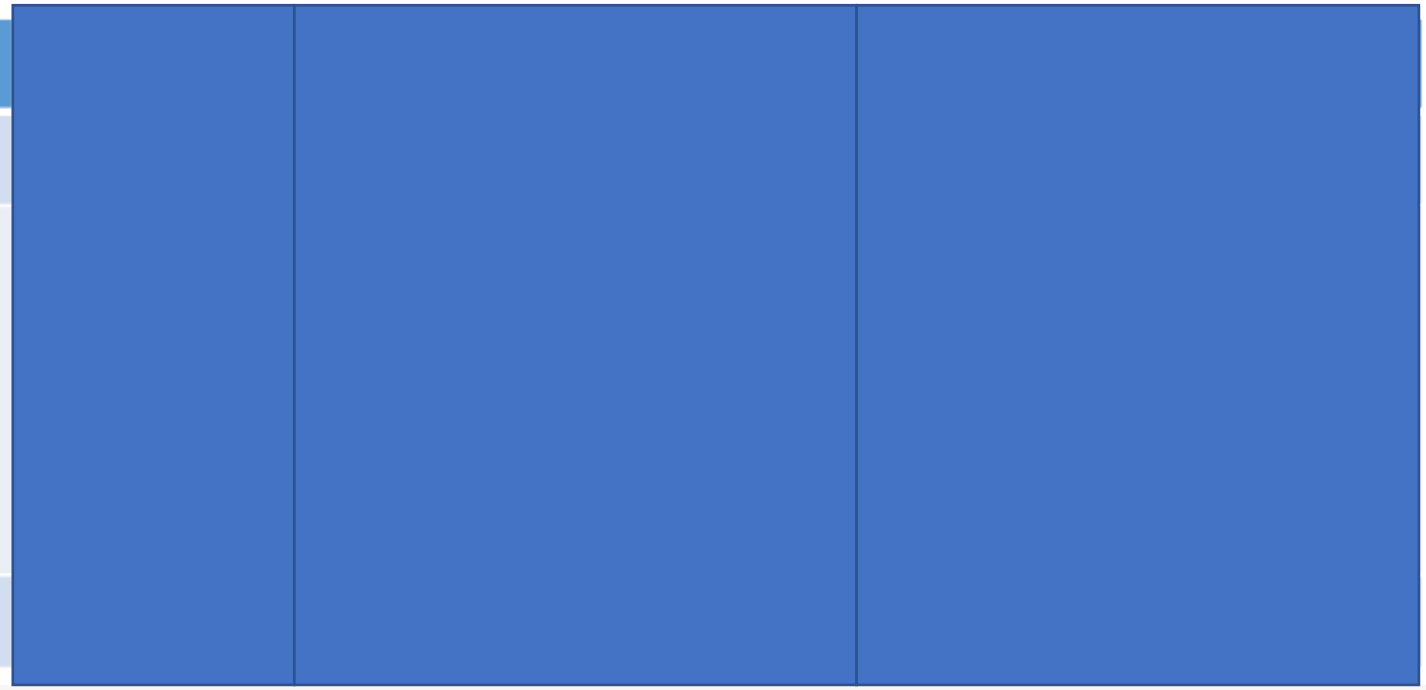
Best outcome:
$29.19

Worst outcome:
$93.57

Experimental Design Pt. 1

Problem: Given a fixed amount of money and a set of debt obligations, how would you allocate the debt repayments such that the total borrowing cost (interest and fees) is minimised?

Phase	Trials
Pre-intervention	1-3
Intervention	4-6
Post-intervention	7-9



No feedback

- Under the robo-advice treatments, participants can accept or reject the robo-advice offer.
- If they accepted the advice, the optimal allocation was automatically filled in
- Participants can still modify the allocation after accepting the robo-advice

Experimental Design Pt. 2

Problem: Given a fixed amount of money and a set of debt obligations, how would you allocate the debt repayments such that the total borrowing cost (interest and fees) is minimised?

- In every phase, participants completed one easy, moderate, and hard trial at random
  - *Easy* : interest rates
  - *Medium* : interest rates + min. repayments
  - *Hard* : interest rates + min. repayments + late fees

- **Paid Robo-advice: using BDM-auction to elicit WTP**
  - Rather than having a fixed fee, the experiment used a BDM-auction (also used in Xiaping's experiment to elicit confidence)
  - Participants were asked to bid truthfully the amount of potential savings that they were willing to pay for robo-advice.
  - If the amount was greater than a randomly generated number, then they received the robo-advice, otherwise nothing

Data Collection

- Randomised Control Trial (RCT)
- Conducted in Qualtrics, **N = 3,423**
- Expected time spent on survey: 15mins (relatively short… 9 trials + questions)

- **Individual measures**:
  - Demographic information: gender, age, employment, education, etc.
  - Financial literacy, numeracy, risk tolerance, patience, and generalised trust
  - Asked to describe the positive and negative aspects of the robo-advice tool
  - Credit history (over the past 12 months): types of loans and whether they had fallen behind on any of the debt
  - Preference for working with human advisors or "automated assistants", and whether they were WTP more/less/same to work with a human advisor

Baseline debt management performance

- **Performance measure:**

$$\%\ Savings\ Forgone_{i,p} = \frac{Interest\ Paid_{i,p} - Minimum\ Interest\ Payable_p}{Maximum\ Interest\ Payable_p - Minimum\ Interest\ Payable_p}$$

Worst= 100%; Best = 0%

- **Pre-intervention**: 21.9% savings foregone
  - Equivalent to 3.55% higher payment per year
- **Control group's performance** was determined by:
  - Financial literacy - most important factor in determining their debt management skill
  - Numeracy, general knowledge and patience also have significant negative effects on % savings forgone

1. Whether (and by how much) exposure to robo-advice improves loan repayment?

- No robo-advice (control) vs. Free robo-advice

- Control group's average savings forgone across 9 trials: **19.7%**
- For all participants who were offered robo-advice, they saved **14.6%** more than participants who were not offered robo-advice
  - 24.7% participants rejected the free robo-advice
- For participants who were offered **AND accepted** robo-advice, they saved **19.6%** more than participants from the control group
  - Most participants who received robo-advice followed the recommendations (given that the effect seems to cover the control group's *savings foregone*)

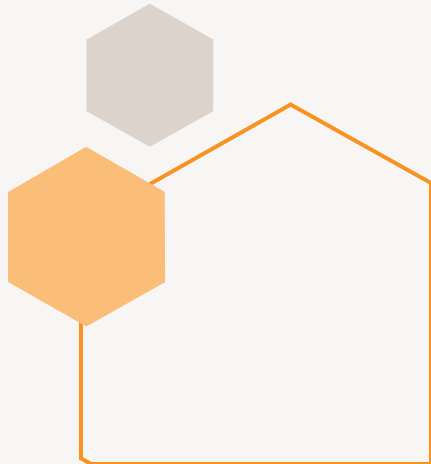
2. Do participants prefer "explainable" robo-advice?

	Free Robo	Free Robo with Education	Paid Robo	Paid Robo with Education
Receive robo and follow	75.2%	66.7%	22.5%	20.4%
Receive robo, do not follow	5.3%	3.2%	1.1%	1.6%
Demand robo, do not receive	0%	0%	39.4%	37.7%
Do not demand robo	19.5%	30.1%	36.9%	40.3%

- Robo-advice with education vs. Robo-advice without education

- More participants prefer free robo-advice *without* education (80.5%) than free robo-advice with education (69.9%)
  - Similar, but much smaller effect when participants were asked to paid for the robo-advice

- This may suggest that participants don't value "explainable" AI
  - Perhaps participants don't understand the explanation… due to lack of financial knowledge?



3. How much are participants willing to pay (WTP) to obtain robo-advice?

- Free robo-advice vs. Paid robo-advice

- Using the BDM-auction, participants were willing to pay more for robo-advice
  - WTP was higher than the benefits received from accepting robo-advice

- Possible reasons:
  1. Participants underestimate their performance in allocating debt payments
  2. Participants value other aspects of using robo-advice, such as avoiding cognitive effort, reducing stress and anxiety

3. How much are participants willing to pay (WTP) to obtain robo-advice?

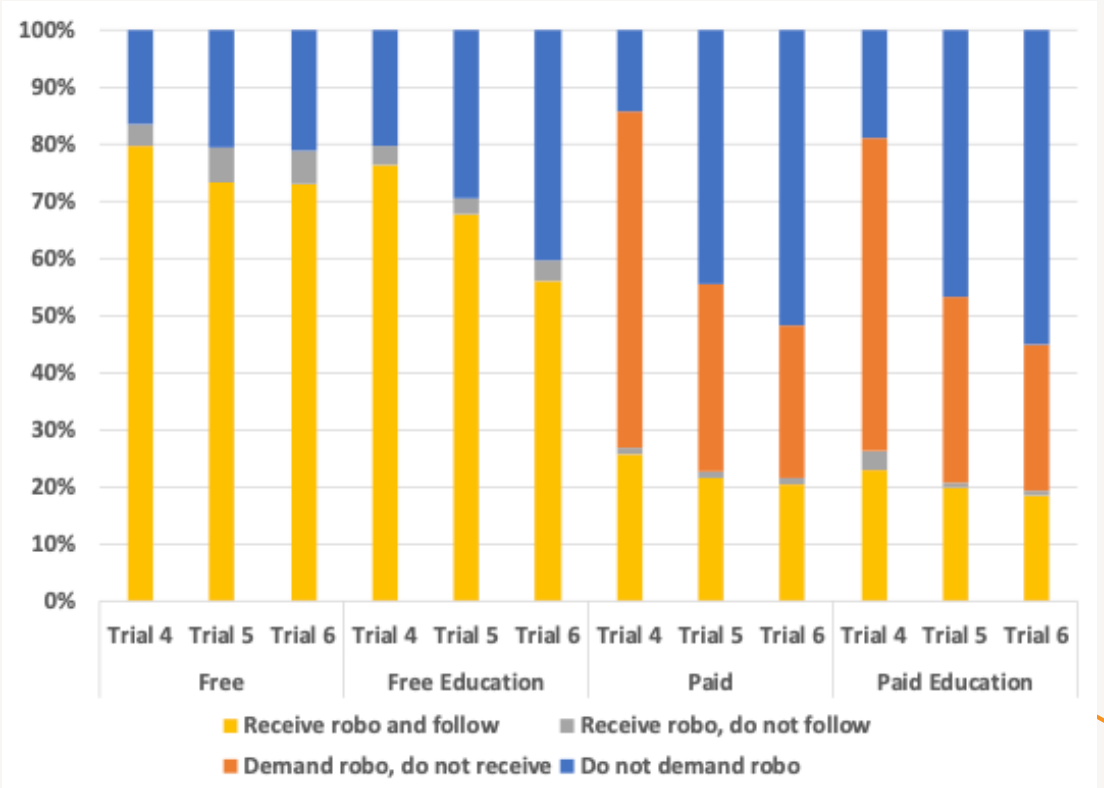
Interestingly…

- 38.6% of the participants did not demand for robo-advice
- Their reasons:
  1. 22% found it expensive
  2. 54% wanted to make their own decisions
  3. 21% claimed that they can make better decisions than the robo-advisor 🚩🚩🚩
     - This is not possible since the robo-advice provides the optimal solution…

4. Which participants override the robo-advice?

- Accept robo-advice vs. Reject robo-advice

- When robo-advice was free, low-literacy participants were more likely to implement the robo-advice *fully* than high-literacy participants (who override advice more often)
- Participants who have **greater trust in algorithms** were less likely to override advice
  - Other characteristics were insignificant
- 5% of the participants who received free or paid robo-advice chose to override the recommendations (grey bars)



Do participants learn how to manage debt over time (learning effect)?

- Pre-intervention vs. post-intervention phase

Even with no feedback

- Participants did learn to allocate debt repayments better over time
- However, there is no incremental learning from exposure to robo-advice
- In the post-intervention phase, the treatment groups performed similarly as the control group
  - Perhaps participants paid less attention to the problem when there is robo-advice
  - This implies the need for continuous intervention if robo-advice were to be implemented like a nudge
  - Perhaps AI-boosting is a better solution to improve decision-making?

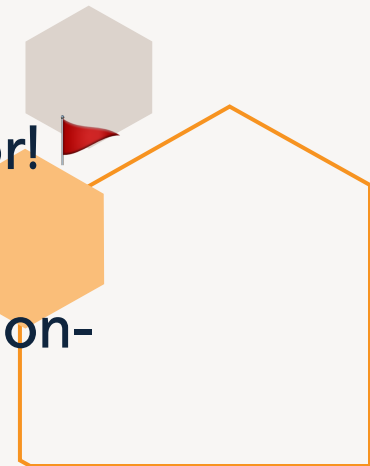
Conclusion

1. People demand robo-advice, particularly when there is no explanation

2. People's WTP for robo-advice is greater than the monetary benefits gained from using robo-advice
   - May be due to underestimation of one's ability to allocate debt payments correctly or valuing other benefits such as reducing cognitive effort/stress

3. Algorithm aversion (lack of trust in algorithm) leads to rejecting and/or overriding robo-advice
   - Some participants believed they could do better than the robo-advisor!

4. Robo-advice, even with explanation, doesn't help people improve decision-making in this domain, so continuous robo-advice may be required



Some thoughts about this paper

- The authors did not look at how the *difficulty level* affects performance with/without robo-advice, and demand for robo-advice
  - This is where we come in!

- It wasn't clear if participants were allowed calculators or pen/paper, I assumed they did since it was done online.
  - This could affect performance…

- Interesting to see that "trust in algorithm" is the key measure of robo-advice adoption, and not related to knowledge

Thank you!

Questions?