Debt Aversion

Theory and Experiment

Thomas Meissner & David Albrecht

Maastricht University

EEA ESEM
August 2023

Introduction

Motivation

- Debt aversion: intrinsic unwillingness to take on debt, even if economically reasonable
  - Suboptimal investment
    - Tertiary education (Field, 2009; Caetano et al. 2019)
    - Energy-efficient technologies (Schleich et al., 2021)
    - Entrepreneurs (Nguyen et al. 2020, Paaso et al. 2021)
  - Suboptimal consumption
    - Consumption/saving experiments
      (Meissner, 2016; Duffy and Orland, 2020, Ahrens et al. 2022)
  - Suboptimal portfolio choice
    - Debt repayment experiments (Martínez-Marquina and Shi, 2022; Ozyilmaz, 2022)

Introduction

What we do

- This project:
  1. Model of debt aversion
  2. Experiment involving real debt contracts
  3. Structural estimation of debt aversion
- Debt preferences will be jointly considered with:
  - Risk aversion
  - Loss aversion
  - Time preferences
- All these preferences may affect how people save and borrow and therefore need to be controlled for

Introduction

Identification

- Compare willingness to accept different saving and debt contracts
  - structural similarity: gain and loss of money, temporally separated
- **Debt Aversion:** Willingness to pay a premium to avoid being in debt (after controlling for other preferences)

- Compare willingness to accept different saving and debt contracts
  - structural similarity: gain and loss of money, temporally separated
- **Debt Aversion:** Willingness to pay a premium to avoid being in debt (after controlling for other preferences)

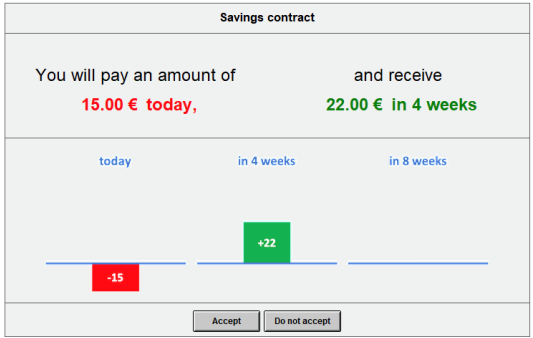
Preview: Yes, people are willing to ...

Experiment

- 90 binary choices over lotteries and intertemporal prospects
  - binary choices from 7 multiple price lists (MPLs)
  - 3 standard MPLs to elicit risk and time preferences
  - 4 new MPLs that consist of *saving* and *debt* contracts
- One "decision that counts" randomly chosen

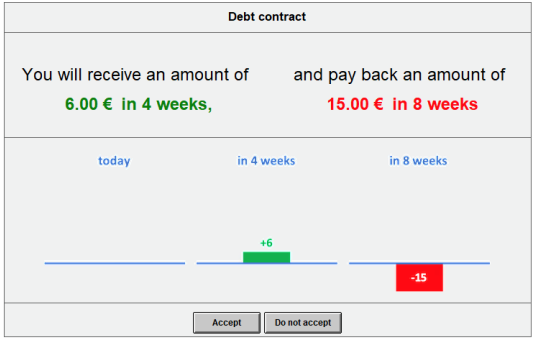
Experiment

Saving contract example



Experiment

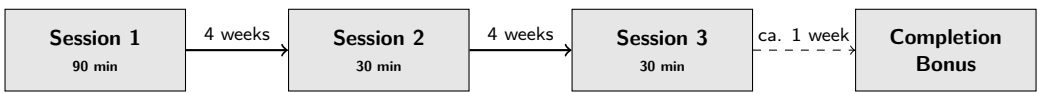
Debt contract example



Experiment

Timeline

Figure: Timeline of the experiment



Experiment

Procedures

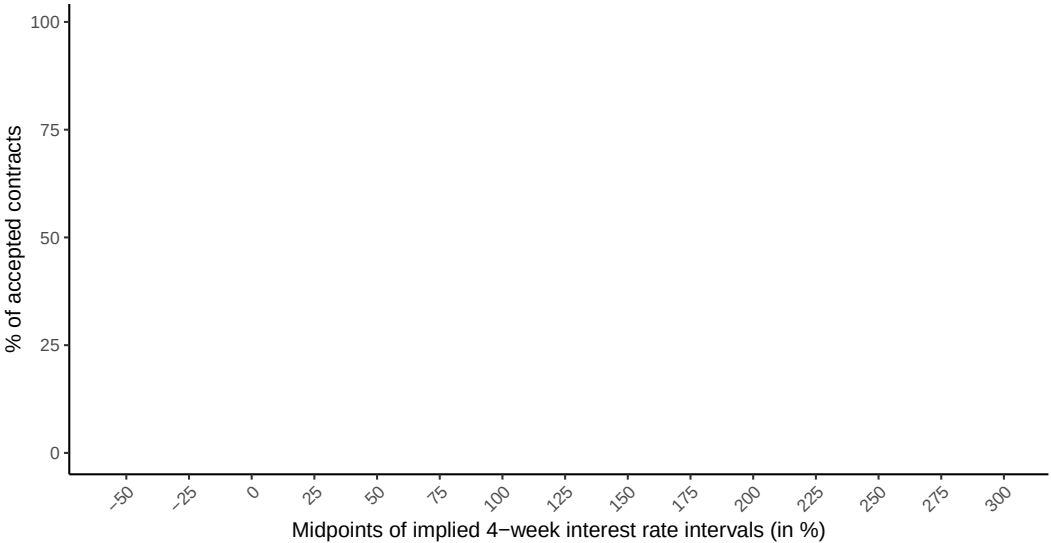
- Saving and debt are actual, real-time contracts with the experimenter
- If participants accept a contract, they agree to actually pay money to the experimenter
  - Saving: Pay at earlier date, receive at later date
  - Debt: Receive at earlier date, pay at later date

- At Date 1, participants may pay from show-up fee (€15 for all three dates)
- At later sessions, pay in cash or via Paypal

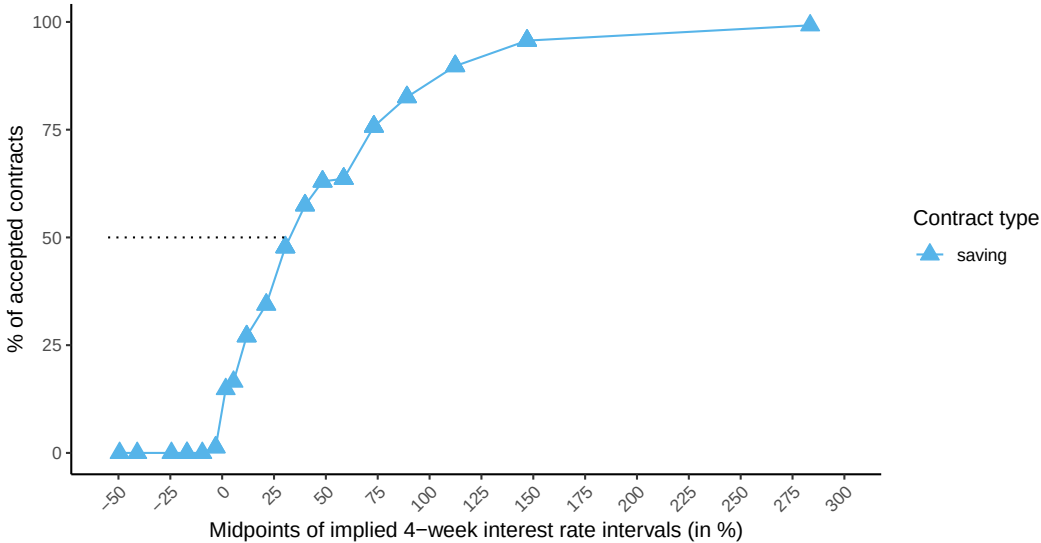
- n=127, in Maastricht (2019-2021 / BEElab)
- Average earnings: €43

▸ Descriptive Details

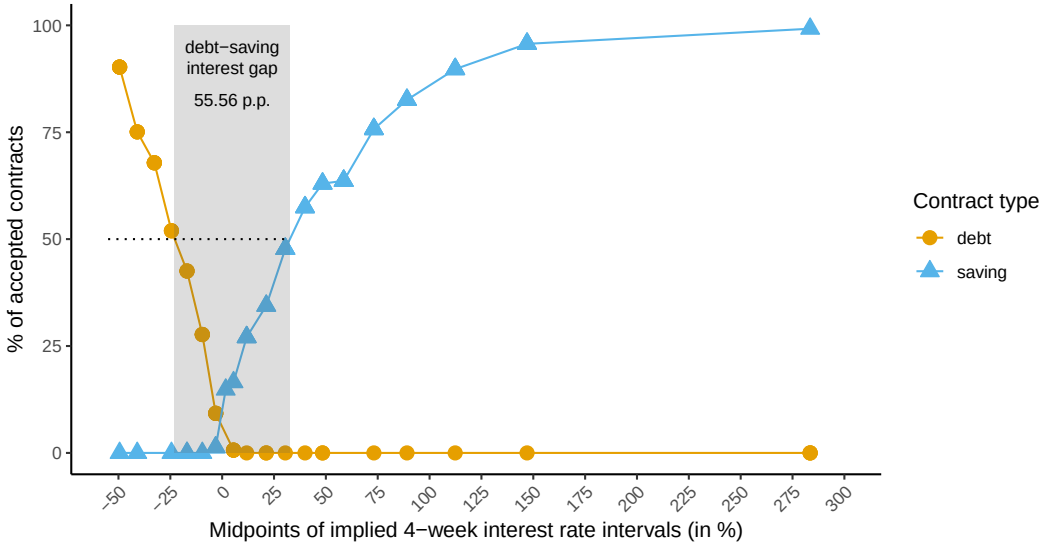
A glimpse at the data...



A glimpse at the data...



A glimpse at the data...



Theory

General model

- Two period model ($\tau \in \{t, T\}$, $0 \leq t < T$):

$$U(x_t, x_T) = \mathbb{E}\left[\phi(t)v(x_t) + \phi\left(T\right)v(x_T) - \mathbb{1}_{debt}c\left(x_t, x_T\right)\right]$$

$$\mathbb{1}_{debt} = \begin{cases} 1 & \text{if } x_t > 0 \text{ and } x_T < 0 \\ 0 & \text{otherwise.} \end{cases}$$

- $\phi(\tau)$ is the discount function.
- $v(x)$ value function evaluating monetary gains and losses.
- $c(x_t, x_T)$ denotes the cost of being in debt.

Theory

Debt aversion

- Value function:

$$v(x) = \begin{cases} u(x) & \text{if } x \geq 0 \\ -\lambda u(-x) & \text{if } x < 0 \end{cases} \qquad \lambda > 1 \equiv \text{loss aversion}$$

- Cost of being in debt:

$$c(x_t, x_T) = (1-\gamma)\phi(T)v(x_T) \qquad \gamma > 1 \equiv \text{debt aversion}$$

- Saving contracts:

$$U(x_t < 0, x_T > 0) = -\lambda\phi(t)u(-x_t) + \phi\,(T)\; u(x_T)$$

- Debt contracts:

$$U(x_t > 0, x_T < 0) = \phi(t)u(x_t) - \gamma\lambda\phi\,(T)\; u(-x_T)$$

Theory

Main specification

- Atemporal utility function (CRRA):

$$u(x) = \frac{(x)^{1-\alpha}}{1-\alpha} \qquad \alpha > 0 \equiv \text{risk aversion}$$

- Discount function:

$$\phi(\tau) = \frac{1}{(1+\delta)^{\tau}} \qquad \delta > 0 \equiv \text{discounting}$$

- Present bias: omitted

Results

Aggregate parameter estimates

- The average participant discounts the future, and is risk, loss and **debt averse**

Results

Aggregate parameter estimates

- The average participant discounts the future, and is risk, loss and **debt averse**
- Joint ML-estimation in random utility frame with logit Fechner error Details
  - additional parameter of decision noise μ
  - $\mu = 0$ is deterministic choice, $\mu \to \infty$ is uniform randomization

	Point estimate	Standard Error	95% Conf. Interval
Risk aversion: α	0.6430	0.0344	0.57 , 0.71
Discounting: δ	0.0359	0.006	0.02 , 0.05
Debt Aversion: γ	**1.0535**	**0.0112**	**1.03 , 1.08**
Loss Aversion: λ	1.1074	0.0118	1.08 , 1.13
Fechner error: μ	0.4483	0.0402	0.37 , 0.52

n: 12,240, cluster: 127, log-likelihood: -4107,9

Results

So what?

- Average participant would be indifferent between accepting or rejecting:
  €20.93 today €-15 in 4 weeks

- Counterfactual, *debt-neutral* person with the same preference parameters (except $\gamma = 1$):
  €18.08 today €-15 in 4 weeks

$\Rightarrow$ "Borrowing premium" of €2.85 (=16% of the principal €18.08)

▸ Decomposition

Further results

- 89% of participants are debt averse ▸ Distribution estimation
- the longer the indebtedness the higher the borrowing premium ▸ Long contracts
- higher cognitive ability is associated with less debt aversion ▸ Covariates

Conclusion

- Debt aversion is a genuine preference, wide-spread and impacts choice
- We should care, e.g. as policy uses subsidized loans to spur wanted behaviour
- Real indebtedness in the lab is possible and interesting
  - e.g. to study underlying mechanisms
  - seemingly unrelated behavior when indebted

Conclusion

- Debt aversion is a genuine preference, wide-spread and impacts choice
- We should care, e.g. as policy uses subsidized loans to spur wanted behaviour
- Real indebtedness in the lab is possible and interesting
  - e.g. to study underlying mechanisms
  - seemingly unrelated behavior when indebted

Thank you

The working paper...

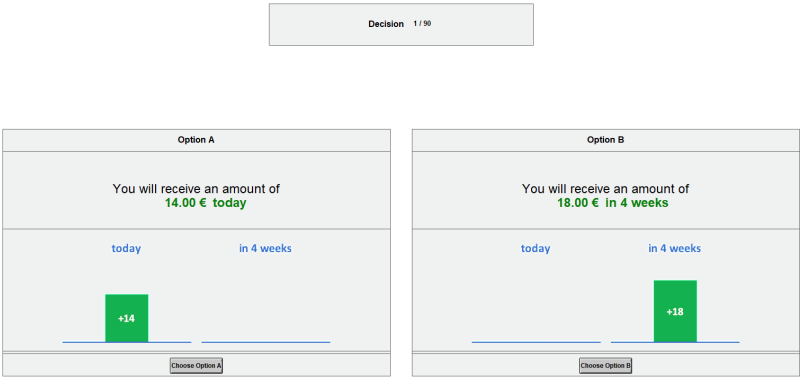
Appendix

Descriptive details

- (Mostly student) sample from behavioral econ lab at Maastricht University (NL)
  - 74% undergrad; 25% Master
  - various backgrounds from music to law, but clear mode in field of "Business and/or Economics"
  - 61 % female
  - 22% German, 17% Dutch, 11% Belgian and 9% Italian

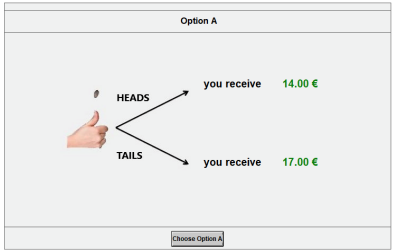
Back to Design Back to Results

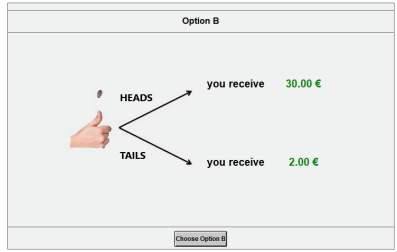
Example time preference choice



Back

Example risk preference choice





Back

Maximum likelihood estimation

- Random utility model (RUM): a decision maker chooses option B if $U(X^B) + \varepsilon^B \geq U(X^A) + \varepsilon^A$.

$$P(B) = F\left(\frac{U(X^B) - U(X^A)}{\mu}\right) = F(\Delta U)$$

- F is cumulative distribution function of $(\varepsilon^A - \varepsilon^B)$ and $\theta = (\alpha, \delta, \gamma, \lambda, \mu)$
- Fechner error with logit link, logistic distribution $F(\xi) = (1 + \mathrm{e}^{-\xi})^{-1}$
- Log-likelihood function:

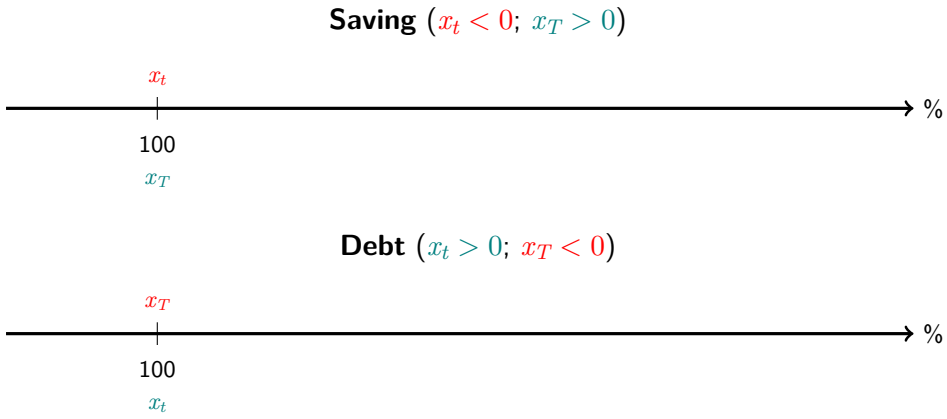
$$ln\ L(\alpha, \beta, \delta, \gamma, \lambda, \mu) =$$
$$\sum_i \sum_j \left[ln\left(F(\Delta U)\right) c_{ij} + ln(1 - F(\Delta U))(1 - c_{ij})\right]$$

- $c_{ij} = 0$ if individual i chooses A in choice j and $c_{ij} = 1$ if individual i chooses B in choice j.

Back

Results

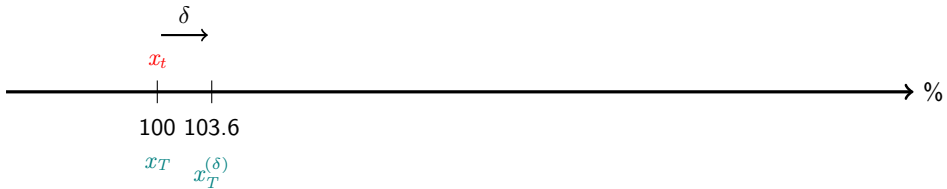
Decomposing the influence on indifference contracts



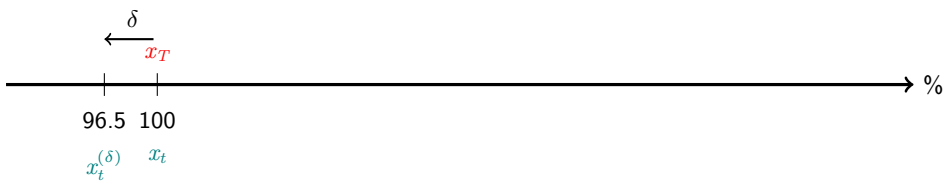
Results

Decomposing the influence on indifference contracts

Saving ($x_t < 0$; $x_T > 0$)



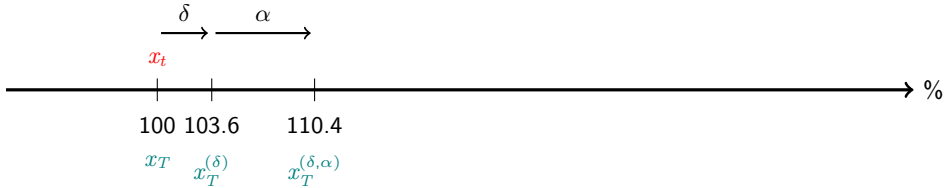
Debt ($x_t > 0$; $x_T < 0$)



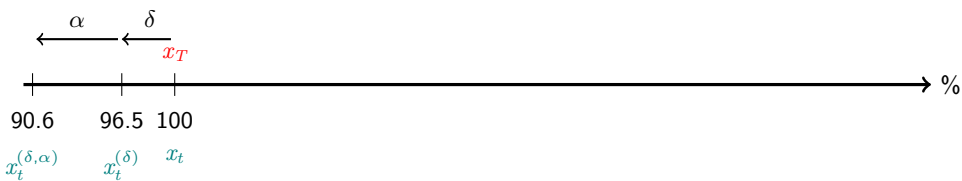
Results

Decomposing the influence on indifference contracts

Saving ($x_t < 0$; $x_T > 0$)



Debt ($x_t > 0$; $x_T < 0$)

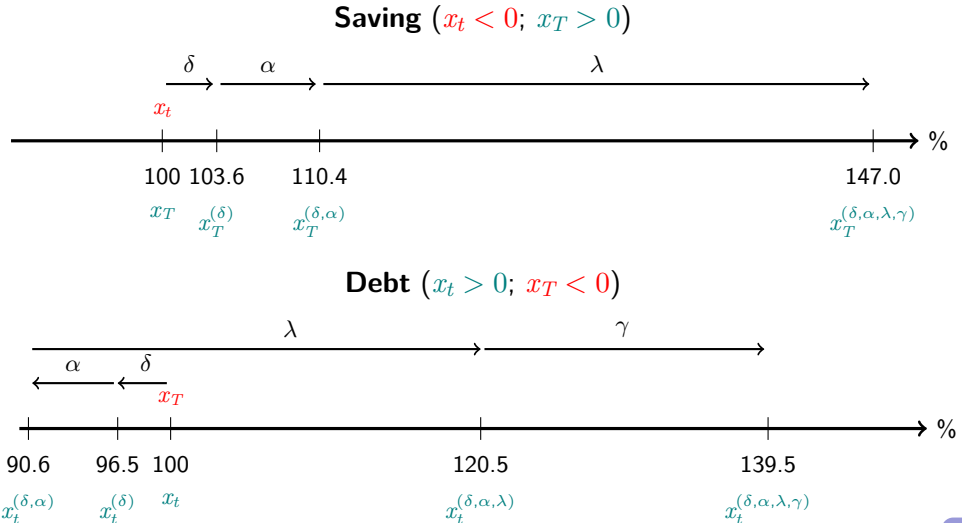


Results

Decomposing the influence on indifference contracts

Results

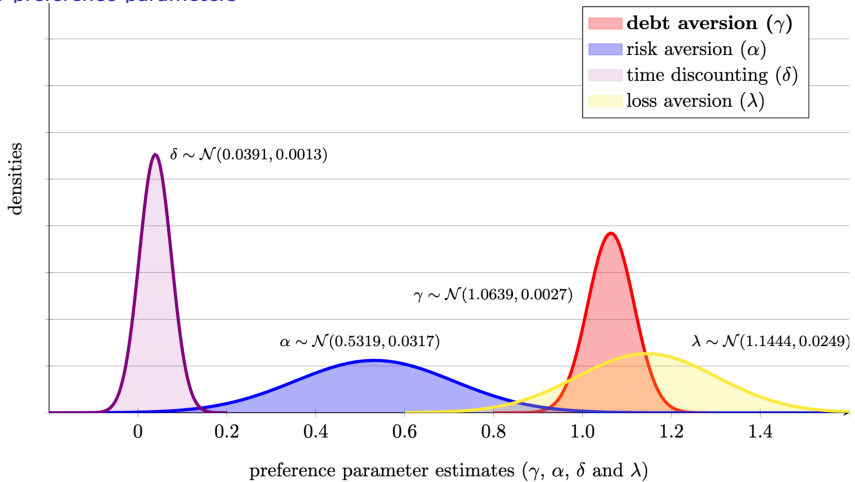
Decomposing the influence on indifference contracts



Back

Results

Distributions of preference parameters



- $P(\gamma > 1) \sim 89\%$, large majority is debt averse

▸ Back ▸ Variance-Covariance Matrix

Results

Distributions of preference parameters

	α	δ	γ	λ	μ
Risk aversion: α	0.0317^{***}				
Discounting: δ	-0.0013^{***}	0.0013^{***}			
Debt aversion: γ	0.0004	0.0005	0.0027^{***}		
Loss aversion: λ	-0.0159^{***}	0.0042^{***}	0.0039^{***}	0.0249^{***}	
Fechner error: μ	-0.0297^{***}	-0.0041^{***}	-0.0053^{***}	0.0263^{***}	0.0435^{***}

Table: Estimated variance-covariance matrix

Back

Extension

Debt duration

- Additional parameter of debt duration aversion (ζ)
  - Short debt (4 weeks): $U(x_t, x_{T=t+1}) = \phi(t)u(x_t) - \gamma\lambda\phi\,(T)\,u(-x_T)$
  - Long debt (8 weeks): $U(x_t, x_{T=t+2}) = \phi(t)u(x_t) - \gamma\zeta\lambda\phi\,(T)\,u(-x_T)$

	Point estimate	Standard Error	95% Conf. Interval
Risk aversion: α	0.640	0.034	0.573,0.706
Discounting: δ	0.043	0.007	0.028,0.058
Debt Aversion: γ	1.063	0.013	1.037,1.090
Debt Duration Aversion: ζ	**1.851**	**0.292**	**1.279,2.423**
Loss Aversion: λ	1.101	0.012	1.077,1.124
Fechner error: μ	0.448	0.040	0.369,0.527

n: 12,240, cluster: 127, log-likelihood: -4096

Back

Extension

So what?

- Average participant would be indifferent between accepting or rejecting:

  €20.67 today €-15 in 4 weeks
  €21.11 today €-15 in 8 weeks

- Counterfactual, *debt-neutral* person with the same preference parameters (except $\gamma = 1$):

  €17.43 today €-15 in 4 weeks
  €15.51 today €-15 in 8 weeks

$\Rightarrow$ 4-week "Borrowing premium" of €3.24 (=18.6% of €17.43)

$\Rightarrow$ 8-week "Borrowing premium" of €5.60 (=36.1% of €15.51)

Back

Results

Observable heterogeneity

	α risk aversion	δ discounting	γ **debt aversion**	λ loss aversion	μ fechner error
Age	0.035^{**}	-0.003	-0.006	-0.012^{***}	-0.038^{***}
Cognitive ability	-0.007	-0.012	-0.022^{*}	-0.015	-0.034
Female	0.161^{*}	-0.008	0.010	-0.063^{*}	-0.283^{*}
Financial literacy	-0.033	0.003	-0.003	-0.006	0.009
Agreeableness	-0.027	0.005	0.004	0.013^{*}	0.010
Conscientiousness	-0.040	-0.005	-0.016	0.005	0.055
Extraversion	-0.005	-0.003	0.001	-0.005	0.003
Negative emotionality	0.043	-0.002	-0.007	-0.015	-0.037
Openmindedness	0.021	0.001	0.004	-0.014	-0.008
Constant	-0.199	0.107^{**}	1.176^{***}	1.414^{***}	1.424^{***}

N: 12240, Log. Likelihood: -3695, BIC: 7860

▸ Descriptive Details ▸ Back