Disentangling the Effects of Time Pressure on Risk Attitudes

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Introduction

1. Decision Making under Time Pressure
   - Many real life situations involve time pressure
   - Auctions, Floor and e-traders, Deals
   - Medical decisions, sports, deadlines
   - Standard theory is silent

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2. Time pressure in risky choice

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   - Medical decisions, sports, deadlines
   - Standard theory is silent
2. Time pressure in risky choice
3. What are the effects on risk attitudes

Related literature

Psychology

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Economics

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- Kirchler et al (2017)

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Does time pressure increase or decrease risk aversion?

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Which component is mostly affected?

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Which component is mostly affected?
What is the role of noise in decision making?

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- 100 tokens endowment to allocate

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- 2 Arrow securities x and y
- 2 states of the world with probability π
- Prices p_x and p_y
- Choose a portfolio of x and y s.t. $x + y = 100$
- Wide range of prices and probabilities

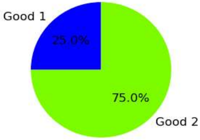
This is practice question 1 out of 1

0 : 17

You have 100 tokens to allocate between Good 1 and Good 2.

The price of Good 1 is: 11
The price of Good 2 is: 5

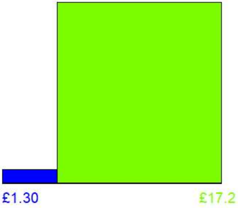
Please use the slider to choose your allocation



Good 1:
14.2

Good 2:
85.8

Submit



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- Within subjects design
- Same tasks in randomised order
- 51 subjects (22 females) with an average age of 21.8

Theoretical Framework

Expected Utility

$$\max_{X} \pi_x u(e_x \times X) + \pi_y u(e_y \times Y)$$
$$\text{s.t. } X + Y = 100$$

where X, Y the allocation to the assets and $e_s = 1/p_s$

Theoretical Framework

Rank Dependent Utility

$$\max_{X} w_x u(e_x \times X) + w_y u(e_y \times Y)$$
$$\text{s.t. } X + Y = 100$$

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$$u(z) = \frac{z^{1-r}}{1-r}$$

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Weighting function- Prelec

$$w(p) = \exp(-(-\log(p))^{\gamma})$$

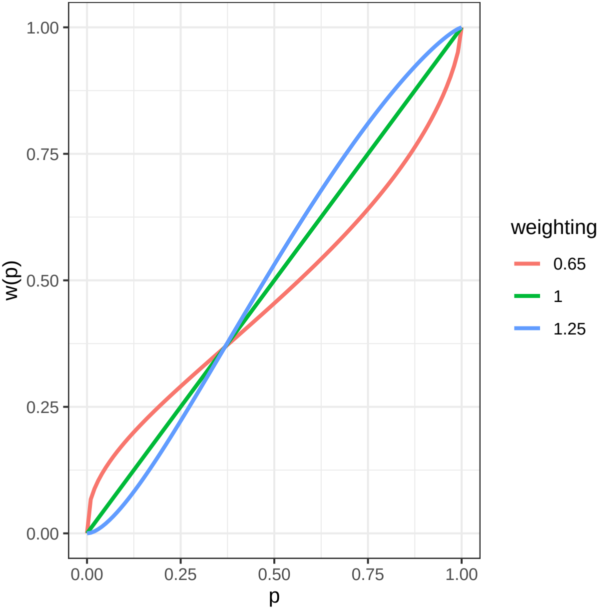

Figure 1: Weighting function $\exp(-(-\log(p))^{\gamma})$

Theoretical Framework

Optimal solution

$$X^* = \frac{100 e_y (e_x w_x)^{1/r}}{e_y (e_x w_x)^{1/r} + e_x (e_y w_y)^{1/r}}$$

where $w_x = \exp(-(-\log(p))^{\gamma})$ and $w_y = 1 - w_x$

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Algorithm checks for all possible 3 rankings

- $e_x \times X > e_y \times Y$
- $e_x \times X < e_y \times Y$
- $e_x \times X = e_y \times Y$

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Use allocation data to estimate r and γ via Maximum Likelihood Estimation

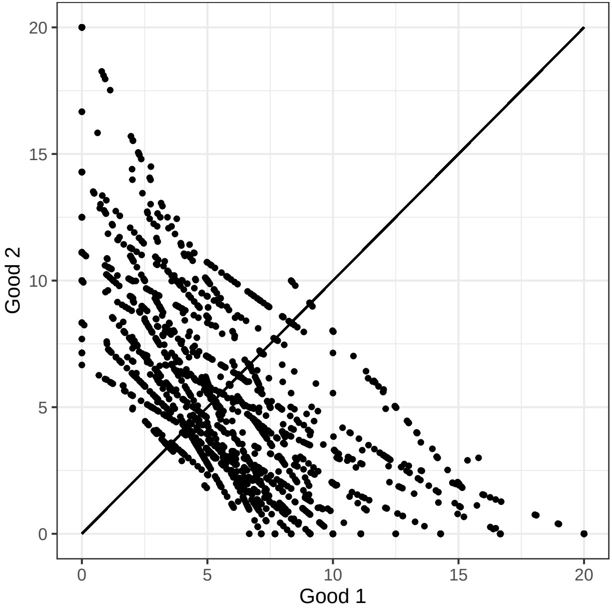

Figure 2: Scatter plot of portfolios

Statistical model

Beta distribution

- Actual allocation$\rightarrow$ centered to the optimal allocation + noise

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- $X_a \sim Beta(\alpha, \beta)$ with α, β shape parameters
- $\alpha = \frac{X^*}{100}(s-1)$
- $\beta = (1 - \frac{X^*}{100})(s-1)$
- s the precision parameter to be estimated

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Likelihood function

- Maximise $\prod^N f(X_a, Y_a, X^*, Y^*, r, \gamma, s)$
- where $f(.)$ is the density of the Beta distribution

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Use allocation data to estimate r and γ via Maximum Likelihood Estimation

Parameter	Estimate
r	1.380
s.e.	0.034
r_{tp}	-0.382
s.e.	0.043
γ	0.963
s.e.	0.021
γ_{tp}	-0.107
s.e.	0.025
s	53.038
s.e.	0.614
s_{tp}	-1.156
s.e.	0.893
LL	-6862.400
Obs	2040

Table 1: MLE estimates of the pooled data

		NTP	TP	ALL
	Mean	1.723	1.520	1.704
	Median	1.353	1.228	1.275
r	s.d.	1.289	1.319	1.363
	Min	0.200	0.101	0.322
	Max	5.000	5.000	5.000
	Mean	1.032	1.022	1.046
	Median	0.935	0.986	0.876
γ	s.d.	0.545	0.540	0.510
	Min	0.000	0.001	0.263
	Max	2.000	2.000	2.000
	Mean	32.440	34.759	27.168
	Median	21.899	27.998	20.713
s	s.d.	27.113	27.729	22.206
	Min	3.984	2.844	3.442
	Max	100.000	100.000	100.000

Table 2: MLE estimates at the individual level

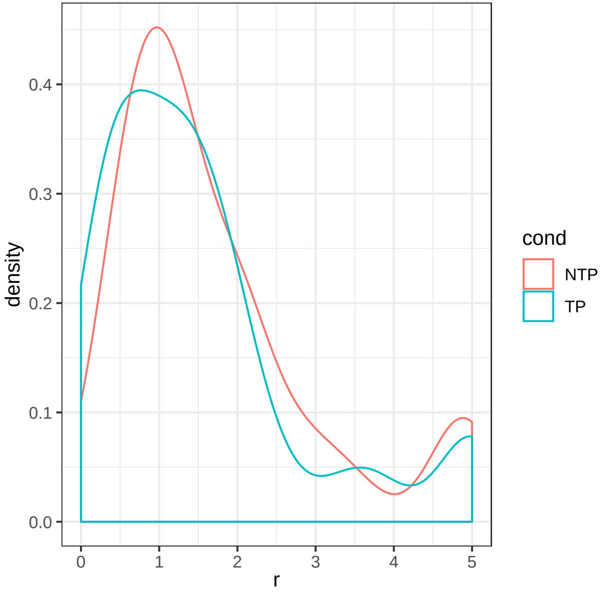

Figure 3: Densities for the risk parameter r

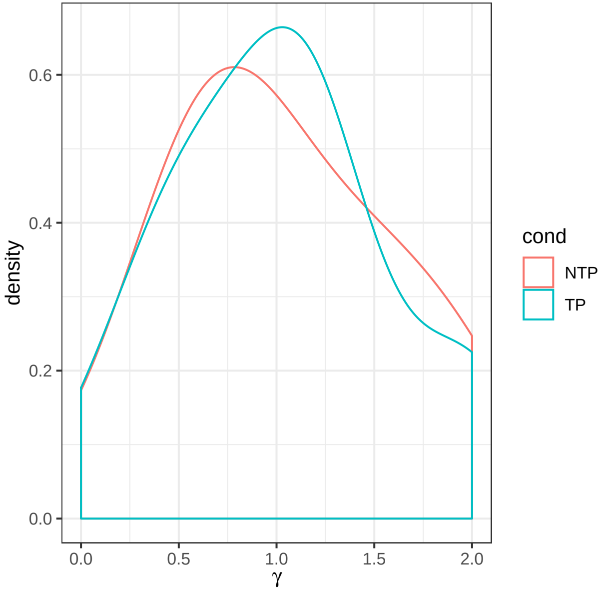

Figure 4: Densities for the weighting parameter γ

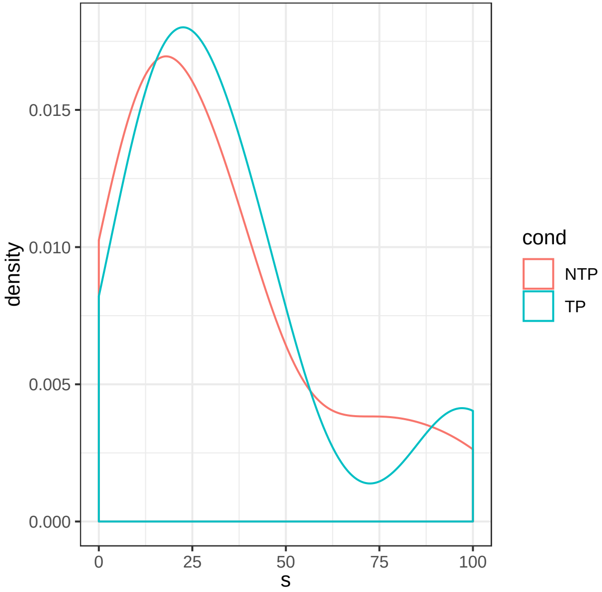

Figure 5: Densities for the precision parameter s

Parameter	p-value
r	0.033
γ	0.660
s	0.391

Table 3: Wilcoxon signed-rank test NPT vs TP

Changes to risk attitude

Certainty equivalent

$$u(CE) = w_x u(e_x \times X) + (1 - w_x) u(e_y \times Y)$$

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Ratio of CEs

$$k = \frac{CE_{NTP}}{CE_{TP}}$$

- If $k > 1 \rightarrow$ increase in risk aversion
- If $k < 1 \rightarrow$ decrease in risk aversion
- If $k = 1 \rightarrow$ no change

Diff	subjects	%
$CE_{TP} > CE_{NTP}$	21	57%
$CE_{TP} < CE_{NTP}$	29	41%
$CE_{TP} = CE_{NTP}$	1	2%

Table 4: Changes in risk attitudes

Conclusion

Summary

- Test the effects of time pressure on risk attitudes
- Time pressure decreases risk aversion for the majority of the subjects
- This change is attributed to changes in the risk coefficient

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Extensions

- Use data for big-five personality traits and Self-efficacy
- Extend to psychological models (DDF)
- Bayesian modelling
- Extend to losses

Thank you!