Experimental Design

Moritz Loewenfeld* Jiakun Zheng†, ‡

February 26, 2021

1 The Experiment

This document details our experimental design. Our study consists of choices between 35 pairs of lotteries and a questionnaire. For each participant, one of the choices is randomly selected and participants are paid based on this choice. Payoffs are displayed in an experimental currency that is converted into Chinese Yuan after the experiment. Participants complete the study on a computer. The experiment was programmed with oTree (Chen et al., 2016).

Our study consists of five parts. We will describe each part in turn. For participants in the study, no difference will be drawn between the different parts. Rather, all tasks will be presented as choices between two options. Subjects will be exposed to choices from part I-IV in random order. For Part I, II and III choices, the randomization is such that it maximizes the number of tasks subjects will see between two choices between which only the correlation structure changes (see below). After completing these tasks, subjects are informed that they will make 5 additional decisions for which they will receive immediate feedback on the outcome of their decision. These five choices appear in random order. All randomization is done at the subject level.

There are two treatments which will be described in more detail below. Participants are randomly and permanently assigned to one treatment by the computer. Each treatment will consist of around 150 participants. The experiment will be conducted at Renmin University of China in Beijing.

2 The lottery choices

2.1 Part I: Mao pairs

Subjects decide between six Mao pairs as in Dertwinkel-Kalt and Köster (2019). Two of the Mao pairs each have the same variance, with one of these two Mao pairs being more symmetric (corresponding to $S = 0.6$ in table 1) than the other. See table 1. To each subject, each Mao pair will be presented in two correlation structures, maximally and minimally correlated.

*Toulouse School of Economics, University Toulouse Capitole, 1 Esplanade de l'Université, 31080 Toulouse Cedex 06, France. Email(✉): moritz loewenfeld@tse-fr.eu.

†School of Finance, Renmin University of China, No.59 Zhongguancun Street, Haidian Dist., Beijing 100872, P.R.China. Email (✉): jiakun.zheng@outlook.com.

‡China Financial Policy Research Center, No.59 Zhongguancun Street, Haidian Dist., Beijing 100872, P.R.China.

Table 1 Mao pairs used in Dertwinkel-Kalt and Köster (2019).

Left-skewed lottery	Right-skewed lottery	Variance	Abs. skewness	Relative skewness	
(120, 90%; 0, 10%)	(96, 90%; 216, 10%)	1296	2.7	-2.7	-1.5
(135, 64%; 60, 36%)	(81, 64%; 156, 36%	1296	0.6	-0.6	1.0
(40, 90%; 0, 10%)	(32, 90%, 72, 10%)	144	2.7	-2.7	-1.5
(45, 64%; 20, 36%)	(27, 64%; 52, 36%)	144	0.6	-0.6	1.0
(80, 90%; 0, 10%)	(64, 90%; 144, 10%)	576	2.7	-2.7	-1.5
(90, 64%; 40, 36%)	(54, 64%; 104, 36%)	576	0.6	-0.6	1.0

There are two treatments. In the correlation effects plus event splitting effects treatment (CEESE), we replicate Dertwinkel-Kalt and Köster (2019). In this treatment, participant see presentations (i) and (iii) in table 2. Here, both correlation effects (CE) and event splitting effects (ESE) are present. In the correlation effects only (CEO) treatment, we control for ESE and only correlation effects are present (presentations (ii) and (iii) in table 2. Each subject faces 6*2=12 decisions in part I.

Table 2 Reducing Relative Skewness

(i) $\eta = 0$

Probability	p	$1-p$
$L(E,V,-S)$	x_1	x_2
$L(E,V,S)$	y_2	y_1

(ii) $\eta = 0$

Probability	p	$1-2p$	p
$L(E,V,-S)$	x_1	x_2	x_2
$L(E,V,S)$	y_2	y_1	y_1

(iii) $\eta = 1$

Probability	p	$1-2p$	p
$L(E,V,-S)$	x_1	x_2	x_2
$L(E,V,S)$	y_1	y_1	y_2

2.2 Part II: Common Consequence Allais Paradox.

Each subject faces 3 lottery pairs for two different common consequences z that might elicit behavior typical of the common consequence Allais paradox. There are two common consequences, $z = a_l$ and $z = b$. Note that the correlation structure cannot be changed for $z = b$ because in this case option B yields b with certainty (see table 3). For $z = a_l$, each subject faces the choice task for two different correlation structures namely independent and maximally positively correlated. This results in 3*2+3=9 decision for each subject. The parameter values for the different choice pairs are given in table 4. For the case in which lotteries are independent, we round probabilities in a way that induces a more negative correlation than independence would imply, whenever this is applicable.

Again, there are the two treatments, CEESE and CEO. Subjects in CEESE will face the presentation formats (i) and (ii) in table 3 , whereas subjects in CEO will face the presentation formats (iii) and (iv) in table 3.

2.3 Part III: Dominant and Dominated Lotteries

For this part, no difference will be drawn between the two treatments.

We include, for all subjects, two lottery pairs for which one lottery dominates the other. Subjects

Table 3 $a_h > b > a_l$. $z \in \{a_l, b\}$. $b - a_l > a_h - b$

(i) positive correlation, no ESE

CEEESE 1	p_h	p_z	p_l
A	a_h	z	a_l
B	b	z	b

(ii) independent, $z = a_l$

CEESE 2	$p_h(p_l + p_h)$	$p_h p_z$	$p_z(p_l + p_z)$	$(p_l + p_z)(p_l + p_h)$
A	a_h	a_h	a_l	a_l
B	b	a_l	a_l	b

(iii) positive correlation, ESE

CEO1	$p_h - p_h p_z$	$p_h p_z$	$p_z - p_h p_z$	$p_h p_z$	p_l
A	a_h	a_h	z	z	a_l
B	b	b	z	z	b

(iv) independent, ESE

CEO 2	$p_h - p_h p_z$	$p_h p_z$	$p_z - p_h p_z$	$p_h p_z$	p_l
A	a_h	a_h	z	z	a_l
B	b	z	z	b	b

Table 4 Parameters for the Allais paradoxes.

	p_h	a_h	p_z	p_l	a_l	b
1	33%	125	66%	1%	0	120
2	25%	95	70%	5%	5	76
3	30%	145	60%	10%	22	104

will see these choices in two correlation structures. In the positive correlation structure, one lottery dominates the other state-wise, meaning that it yields a higher payoff in every possible state of the world. In the negative correlation structure, one lottery dominates the other in the sense of first order stochastic dominance. See table 5. Each subject faces four decisions in part III.

2.4 Part IV and V: Same Marginal Lotteries

For part IV and V, no difference will be drawn between the two treatments.

For each subject, we include 2 blocks of 5 choices between two lotteries with the same marginal, but different relative skewness. These choices will be completed by the subjects in both treatments. Each subject will see one block of 5 such choices mixed into the other decisions. The other block of 5 choices will appear after subjects have completed all other lottery choices. For these choices, subjects will receive immediate feedback on the outcome of their choices. Whether subjects will receive feedback for part I or part II choices is randomized at the subject level. For the lotteries, see table 6 and 7. In part IV and V, subjects complete a total of 10 choices.

Table 5 Dominant and Dominated lotteries.

State-wise 1	1/3	1/3	1/3
A	76	53	17
B	71	48	12

FOSD 1	1/3	1/3	1/3
A	76	53	17
B	12	71	48

State-wise 2	1/4	1/4	1/4	1/4
A	107	67	21	8
B	104	61	18	5

FOSD 2	1/4	1/4	1/4	1/4
A	107	67	21	8
B	5	104	61	18

Table 6 Same Marginal lotteries. Block 1.

1	1/3	1/3	1/3
A	73	64	20
B	20	73	64

2	1/3	1/3	1/3
A	120	0	33
B	0	33	120

3	1/3	1/3	1/3
A	101	53	0
B	0	101	53

4	1/4	1/4	1/4	1/4
A	149	0	16	50
B	0	16	50	149

5	1/4	1/4	1/4	1/4
A	120	0	20	60
B	0	20	60	120

Table 7 Same Marginal lotteries. Block 2.

1	1/3	1/3	1/3
A	9	33	110
B	110	9	33

2	1/3	1/3	1/3
A	15	41	101
B	101	15	41

3	1/3	1/3	1/3
A	3	50	86
B	86	3	50

4	1/4	1/4	1/4	1/4
A	7	26	32	143
B	143	7	26	32

5	1/4	1/4	1/4	1/4
A	13	37	81	94
B	94	13	37	81

3 Questionnaire

Survey on how subjects made decisions: Directly after the last choice task, subjects are prompted to answer a short survey regarding their decision making in the experiment. Subjects are asked to which extent, on a scale from 1-9 they 1) compared payoffs by columns 2) compared lotteries by rows 3) considered the probabilities 4) calculated the expected value of each option. Participants can also add any comments or other consideration in free form.

The survey further includes:

- The CRT (Frederick, 2005)
- Willingness to take risk (WTR) (Dohmen et al., 2011)
- General Regret-Tendency (Schwartz et al., 2002)
- Investment regret (Guiso, 2015). Scale (1-5).
- Five items on numeracy taken from Schwartz et al. (1997) and Cokely et al. (2012)
- Standard demographics: These include age, gender, field of study, nationality, level of education, household income, and whether participants work.

References

Chen, D. L., M. Schonger, and C. Wickens (2016). otreeâ€"an open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance 9*, 88–97.

Cokely, E. T., M. Galesic, E. Schulz, S. Ghazal, and R. Garcia-Retamero (2012). Measuring risk literacy: The berlin numeracy test. *Judgment and Decision making*.

Dertwinkel-Kalt, M. and M. Köster (2019). Salience and Skewness Preferences. *Journal of the European Economic Association 0*(0), 1–51.

Dohmen, T., A. Falk, D. Huffman, U. Sunde, J. Schupp, and G. G. Wagner (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association 9*(3), 522–550.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic perspectives 19*(4), 25–42.

Guiso, L. (2015). A test of narrow framing and its origin. *Italian Economic Journal 1*(1), 61–100.

Schwartz, B., A. Ward, J. Monterosso, S. Lyubomirsky, K. White, and D. R. Lehman (2002). Maximizing versus satisficing: Happiness is a matter of choice. *Journal of personality and social psychology 83*(5), 1178.

Schwartz, L. M., S. Woloshin, W. C. Black, and H. G. Welch (1997). The role of numeracy in understanding the benefit of screening mammography. *Annals of internal medicine 127*(11), 966–972.