GENDER DIFFERENCES IN INVESTMENT DECISIONS UNDER LOSS LIMITATION

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Abstract

In our study we focus on the impact of loss limitation on risk attitudes of men and women. We conducted laboratory experiment on risk taking under limited losses. Our results support the outcomes of large scale surveys, whose results shown significant difference in risk taking among genders. Our empirical results show the difference in risk taking decisions on both, unregulated market as well as on regulated markets. Male subject were investing more than female subjects, as predicted. An interesting outcome is that female subjects did not reflect the change in market settings into the change in their decisions. Male subjects increased their wagers in regulated market settings.

Keywords: Long term decision, risk taking, loss limitation

Introduction:

Long list of titles in economic literature sumarizes reasons why government should intervene on the market. The most important ones are market failures and losses in efficiency. Possible way how to overcome market imperfectness and increase social efficiency is to impose regulation. The area of our interest is to investigate the influence of regulation of potential losses on investment behavior. We focus on long term investment decisions (pension funds, long term savings accounts).

We decided to investigate the difference in investment decisions with limited losses between genders. Literature and academic studies based on field data tend to conclude that women are relatively more risk averse than men, whereas the laboratory experiments render inconclusive results.

Literature review

The existence of gender differences in willingness to undertake risks has been documented in a large number of questionnaire and experimental studies. One of the most cited is a meta-analysis by Byrnes, Miller, and Schafer (1999), which reviewed over 150 papers on gender differences in risk perception. They concluded that the literature “clearly” indicated that “male participants are more likely to take risks than female participants”.

Fehr-Duda and de Gennaro (2006) used for analysis abstract and contextual environment. They stated that gender differences in risk taking may be due to differences in subjects’ valuations of outcomes or due to the way probabilities are processed. Published results of their experiment indicate that men and women differ in their probability weighting schemes; however, they did not find a significant difference in the value functions. Women tend to be less sensitive to probability changes and also tend to underestimate large probabilities of gains to a higher degree than do men, i.e. women are more pessimistic in the gain domain. The combination of both effects results in significant gender differences in average probability weights in lotteries framed as investment decisions. The analysis concludes that women’s relative insensitivity to probabilities combined with pessimism may indeed lead to higher risk aversion.

Different results where described by Harris and Jenkins (2006). They observed 657 participants and assessed their likelihood of engaging in various risky activities relating to four different domains (gambling, health, recreation, and social domain), and reported their perceptions of (1) probability of negative outcomes, (2) severity of potential negative outcomes, and (3) enjoyment expected from the risky activities. Women's greater perceived likelihood of negative outcomes and lower expectation of enjoyment partially mediated their lower propensity toward risky choices in gambling, recreation, and health domains. Perceptions of severity of potential outcomes were a partial mediator in the gambling and health domains. The genders did not differ in their propensity towards taking social risks. A fifth domain of activities associated with high potential payoffs and fixed minor costs was also assessed. In contrast to other domains, women reported being more likely to engage in behaviors in this domain. This gender difference was partially mediated by women's more optimistic judgments of the probability of good outcomes and of outcomes being more intensely positive.

In this paper we focus on long term investment decisions inspired by Benartzi and Thaler (1995) who were trying to answer the question: Why is the equity premium so large or why is anyone willing to hold bonds? Their answer is based on two concepts from psychology of decision- making. (1) loss aversion (the tendency of individuals to be more sensitive to reductions in their levels of well-being than to increases – summarized in prospect theory by Kahneman and Tversky (1979); and (2) mental accounting – the implicit method individuals use to evaluate and code financial outcomes - Kahneman and Tversky (1984), Thaler (1985). Myopic loss aversion refers to loss aversion and short evaluation period.

To simulate long term decision making in the design of an experiment we use repeated gambles. Klos et al. (2005) points out that while everyone agrees that risk reduction is a desirable goal, not all definitions of risk are consistent with the observation that risk is reduced by repeated plays. Equating risk with the probability of a loss is only one possibility. Most people would agree that the magnitude of potential losses needs to be considered as well. They investigate the effect of time horizon on investment behavior, and report the results of an experiment in which business graduate students provided certainty equivalents and judged various dimensions of the outcome distribution of simple gambles that were played either once or repeatedly for 5 or 50 times. Despite correctly realizing that outcome standard deviation increases with the number of plays, respondents showed evidence of Samuelson's (1963) fallacy of large numbers. Perceived risk judgments showed only low correlations with standard deviation estimates, but were instead related to the anticipated probability of a loss (which was overestimated), mean excess loss, and the coefficient of variation.

Experimental Design

We conducted computerized laboratory experiment at ESI of Chapman University in April and May 2012 using group of 58 subjects (students of the Chapman University). 33 males and 25 females were randomly chosen from the database. 10 to 14 subjects participated in each experimental session. One session lasted for approximately 50 minutes and the average earning for participant was approximately $20 (show up fee of $7 included). Experiment consisted of three parts.

We designed an experiment with two different lotteries (representing two treatments: unregulated and regulated market). Each treatment consists of three rounds of three consecutive lotteries. Subjects were about to decide about the wager for three of lotteries in one round. Subject can decide about the wager from initial endowment of 200 cents within the interval of 0 to 200 for one round of three lotteries. A remarkable series of laboratory experiments has found that subjects are more willing to invest in risky assets with positive expected returns if only aggregated returns are reported to them, rather than the individual

component returns. We informed subjects about monetary result for one lottery as a whole. In "Fair treatment" we defined lottery with 2/3 chance of losing the wager and 1/3 chance of chance of winning 2.5 times the wager. In second treatment ("Unfair lottery") we limited the possible loss in the case of negative outcome from the lottery to the half of the wager. The third part of experiment was risk elicitation. For risk elicitation we used standard Holt - Laury test (Holt - Laury, 2002). After fulfilling all three parts of experiment, subjects were asked to fill the questionnaire.

Discussion:

For the evaluation and statistical analysis of results we used the SPSS program. 33 male and 25 female subjects participated in the experiment. According to previous reported large scale analysis results males are significantly more risk positive than females. In our sample males were biding higher wagers, with the exception of wager number three, but the difference is not statistically significant (see the Independent sample test in Appendix 1) as equal variances were not assumed.

Table 1: General statistics for wagers according to gender

	Gender	N	Mean	Std. error mean
wager1	Male	33	121.55	10.367
	Female	25	104.04	9.114
wager2	Male	33	124.67	9.885
	Female	25	112.68	9.050
wager3	Male	33	126.67	10.994
	Female	25	127.80	8.412
wagerII1	Male	33	147.42	10.016
	Female	25	108.84	7.737
wagerII2	Male	33	145.939	10.4189
	Female	25	110.000	8.4465
wagerII3	Male	33	142.03	11.341
	Female	25	119.12	9.671

** Wager is referring to the "Fair lottery". WagerII is referring to the "Unfair lottery". In this table we present general statistics for wagers in three "Fair lotteries" and in three "Unfair lotteries".*

In regulated setting (Unfair lottery) losses were limited to the half of the wager in the case of negative outcome from three lotteries in one round. The amount of wager increased significantly in this treatment among male subjects. It rose from 121.55 cents for the first wager in "Fair lottery" to 147.42 cents for the first wager in "Unfair lottery". In contrary, females had consistent amount of wagers for both treatment, in "Unfair lottery" they reported slightly lower wagers.

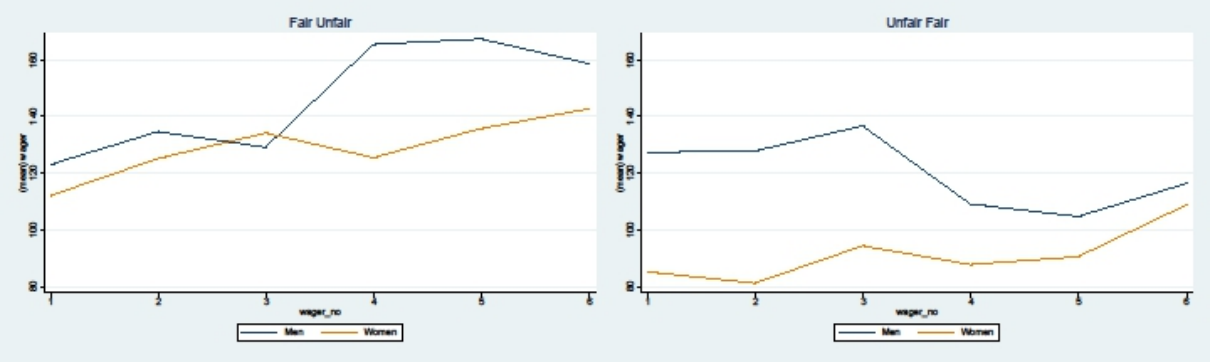
Table 2: Wagers according to the order of treatments

Order of Treatments		N	Mean	Std. Error Mean
wager1	Fair First	32	118.94	10.372
	Unfair First	26	107.92	9.547
wager2	Fair First	32	131.09	9.928
	Unfair First	26	105.23	8.502
wager3	Fair First	32	131.03	10.889
	Unfair First	26	122.38	8.892
wagerII1	Fair First	32	150.41	10.027
	Unfair First	26	106.65	7.426
wagerII2	Fair First	32	155.438	9.1820
	Unfair First	26	99.692	8.5575
wagerII3	Fair First	32	152.63	10.569
	Unfair First	26	106.96	9.502

** We refer to "Fair lottery" in the case, that there is no limit on losses and gains from lottery, this setting represents unregulated market environment. We refer to "Unfair lottery" if loss in the case of negative outcome is limited to half of the wager. This table shows mean wagers for all subjects according to the order of treatment.*

Wagers in situation when subjects were facing fair market conditions followed with regulated market are significantly higher, except for the first wager. We can also observe significant increase in amount of wagers in situation with limited losses. In "Fair lottery" there is no statistically significant difference in the amount of wagers depending on the order of lotteries. We can observe statistically significant difference in wagers in lottery with limited losses. In this treatment, wagers tent to be higher if subjects start an experiment with "Fair lottery". We investigated if the different order of treatments caused different wagers between male and female subjects. T test statistics for both groups approved that the order of treatments affects more female than male subjects. Female starting with Unfair lottery tent to bid lower in Unfair lottery than in Fair lottery treatment. This results support some previous findings that females are more likely misjudging the level of risk. In Figure 1 we present change in average wagers caused by the change of market environment. We can summarize, that male subjects bid higher wagers than female subjects, except for the third bid in Fair Unfair treatment. This finding is in line with large scale research outcomes.

Figure 1: Average wagers in in Fair – Unfair and Unfair – Fair treatments by gender



To support our outcome we run statistical analysis for averages of wagers in "Fair" and in "Unfair lottery" for every subject. Results are reporting increase in average amount of wager in "Fair lottery" in comparison to "Unfair lottery" within male subjects from 124 to 145 units. Within female subjects the average wager was higher in Fair lottery (but the difference was not statistically significant). Male subjects had higher bids in "Unfair lottery" than in "Fair lottery" and it is statistically significant on the 90% level of confidence. Female subjects were bidding equally low in both treatments.

Table 3: Paired Samples Test for Order of Treatments and Gender

Gender	Order of Treatment	Average Fair Wager	Average Unfair Wager	Paired Differences			t	df	Sig. (2-tailed)
				Std. Error Mean	95% Confidence Interval				
					Lower	Upper			
Male	Fair First	123,8056	134,6389	12,89867	-61,78055	-7,78611	-2,697	19	,014
	Unfair First	117,1282	116,5128	14,89841	-31,84547	33,07624	,041	12	,968
Female	Fair First	128,9500	163,7333	8,92934	-30,48668	8,82002	-1,213	11	,250
	Unfair First	106,5641	92,3590	5,10342	3,08572	25,32453	2,783	12	,017

This table shows that females were more affected by the order of treatments when deciding about wager than males.

We analyzed the impact of the order of lotteries on the amount of wager. Subjects who participated in "Unfair lottery" as the first treatment bid lower average wagers in "Fair lottery", but this observation is not statistically significant on the 95% level of confidence. We can confirm that with 95% level of confidence that subject tent to bit lower wagers if they start with "Unfair lottery".

To measure the risk attitudes of subjects we used Holt - Laury test on risk elicitation. Within our sample of 58 subjects 44 subjects clearly expressed their risk attitudes and we could divide them into groups of sensitivity (slightly risk loving, risk neutral, slightly risk averse, risk averse, very risk averse and extremely risk averse). We grouped outcomes and

created three groups of subjects according to their risk attitudes (Risk loving, Risk neutral and Risk Averse). In contradiction to our expectations, risk loving subjects were biding the lowest wagers in both orders of treatments.

Figure 2: Average wagers in Fair First Treatment

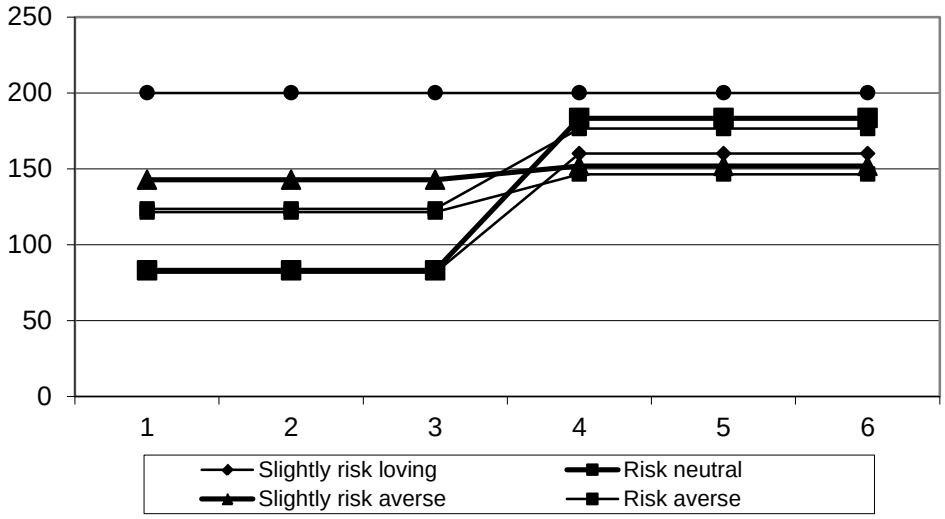
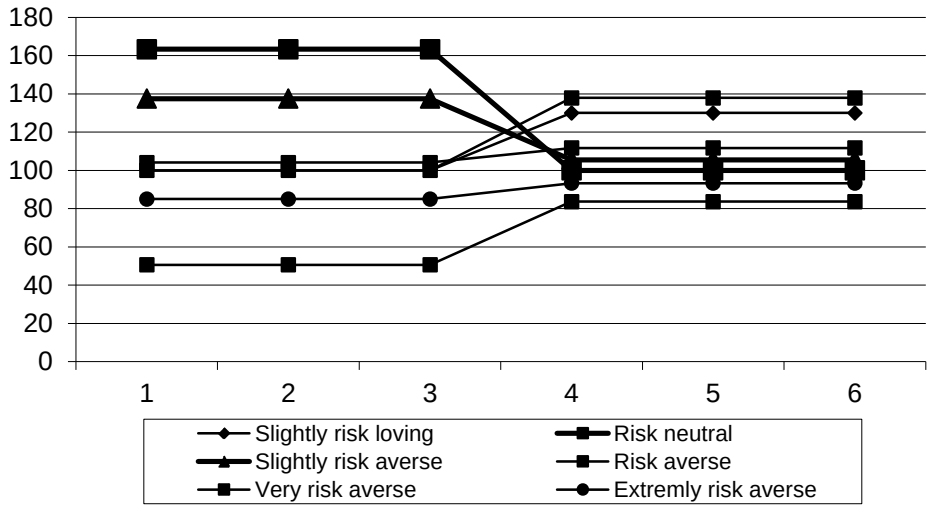


Figure 3: Average wagers in Unfair First Treatment



Conclusion

We were focused on long-term decisions, using multiple gambles to simulate this environment. Consistent with previous research studies we expected that male subjects would bid higher wagers then female subjects, that both groups, males and females, would increase their wagers in regulated market ("Unfair lottery").

In conducted experiment subjects were exposed to two different environments. In Fair lottery they could win 2.5 times their wager with the probability of 33.33 % and loose the wager with probability of 66.66 %. This setting was representing unregulated market. In Unfair lottery losses from lottery were limited to the half of wager. This setting represents regulated market. The results of our investigation showed that male subjects were biding higher wagers than female subjects in both treatments. This outcome is consistent with large scale surveys. Within male population we found support for our second expectation as well.

Average wagers of males were higher in regulated lottery. Average wagers of females were lower comparing the ones of males.

Surprisingly, female subjects bid lower wagers in regulated lottery but not on reasonable level of statistical significance, which means that they did not changed their behavior. In comparison the male subjects were able to better assess the change in risk and were learning to higher wagers in unfair lottery. We can explain this using observation from large scale surveys, which state that females are less sensitive to the change in conditions and level of risk. This conclusion remark needs to be investigated in further research.

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