ThE Papers 05/04

Departamento de Teoría e Historia Económica

Universidad de Granada

I do not play lotteries*

Pablo Branas-Garza, Universidad de Granada

Nikolaos Georgantzis, Universidad Jaume I

Pablo Guillen, Harvard Business School

May 16, 2005

*Pilar Sánchez-Olías and the rest of the ACOJER staff facilitated this study. Jordi Brandts organized our ideas at the beginning and Al Roth at the end. Pablo Brañas-Garza acknowledges the hospitality of the Insitutut d'Anàlisi Economica (IAE/CSIC) during this research. Corresponding author. Pablo Guillen. Harvard Business School, Gallatin Hall E1-3, Soldiers Field Road, Boston, MA 02163. Phone: +1 617 495 6753; Fax: +1 617 495 5287; pguillen@hbs.edu.

We study individual decision making in a lottery-choice task performed by three subject populations: gamblers under psychological treatment ("addicts"), gamblers' relatives ("victims"), and normal (as far as gambling is considered) individuals. We find that addicts are willing to take less risk than normal individuals, but the large majority of victims reports themselves unwilling to take any risk at all. Furthermore, both addicts and victims maintain their choices invariant across different scenarios concerning the risk-return tradeoff.

Keywords: risky decision making, pathological gambling, attraction and repulsion to chance.

JEL Class.: C91,

1 Introduction

Since the late 40's, individual decision making under risk has been one of the most popular issues studied by economists and psychologists. On one hand, theoretical analysis, initially undertaken mostly by economists, has framed the basic problem as a generic situation in which individuals choose among a number of probability-outcome pairs. On the other hand, empirical contributions from both disciplines have adopted a variety of methodologies. These include questionnaires, economic experiments and real-world data. The most salient result across all these different methodologies is that decisions taken on a risky environment are very sensitive to the framing of the problem, specially as far as the outcome domain is concerned.

There is, therefore, a concern about the external validity of abstract lottery-choice tasks. It is not clear whether behavior in *such tasks reasonably predicts behavior in any real world situation*. A negative answer to this question could undermine the interest of all efforts made so far in understanding human behavior in lottery-choice experiments. An extreme and more focused version of this question is addressed in this paper. *We study population affected by gambling problems*. Given that their lifes have been directly or indirectly affected by a pathological attitude towards risky decision making, would that person's behavior in an abstract lottery-choice decision making task significantly deviate from a "normal" subject's behaviour? In what way?

In order to answer this question, we have faced a population of 82 subjects with a *hypothetical* framing of the lottery-choice task introduced by Sabater & Georgantzís [15] and further developed and discussed in Georgantzís *et al.* [8]. The test is designed to capture two dimensions of a subject's preferences towards risky choice. *i*) First, it distinguishes between risk averse and risk neutral/risk loving subjects. *ii*) Second, the test explores the subjects reaction to the premium trade–off.

We consider three different subsamples. The first one, labelled as ADDICTS, consists of 32 patients under psychological treatment for pathological gambling. The second subsample, labelled as VICTIMS, consists of 30 spouses of individuals belonging to the first subsample. The third is our control population, it consists of 20 Normal subjects. In fact, Sabater & Georgantzís [15] and Georgantzís *et al.* [8] provide us with a much larger data set obtained with "normal" student-subjects faced with the same task under both hypothetical and real motivation (money or classroom grades). However, given the age difference between students and the two focus groups in our study, we have created a new "normal" sample for the sake of comparability.

In our experiement, no subject in any subsample received any money or other real reward. They made decisions to win hypothetical money. We chose this procedure because of ethical reasons. Indeed, we cannot offer to play real reward lotteries to individuals recovering from pathological gambling. We had to apply the same methodology to the other two subsamples because we wanted the three of them to be comparable to each other.

Interestingly, addicts' on average reported higher degree of risk aversion than normal individuals. However, victims exhibit even higher risk aversion. Furthermore, a large percentage of victims, around 70%, refused to take any risk at all.

A second salient result of this research is that both addicts and vitims are insensitive to increases in expected hypothetical rewards, while normal subjects take higher risks when rewards increase.

Behavior of normal individuals, meaning low risk aversion, can be justified by the hypothetical payoff structure. Thus, higher risk aversion shown by both addicts and victims becomes surprising and have to be explained by the *specificity of the subsample.* Both the risk aversion result and the extreme insensitivity of victims and addicts towards prizes encouraging risk taking are compatible with the hypothesis that people who have suffered directly or indirectly the consequences of pathological gambling declare to be unwilling to play any lottery.

In Section 2 we further discuss our objectives and hypothesis. In Section 3 we explain the experimental design. Section 4 summarizes the results and Section 5 contains conclusions. The appendix presents an English translation of the instructions including our lottery panel.

2 Objectives & Hypothesis

Our intention is to study individual attitudes towards risk. However, our viewpoint differs from previous articles. Our analysis is focused on individuals who have, or have had, a problematic relation with gambling. That is, people diagnosed as pathological gamblers on one side or, their spouses on the other. There are some precedents of experimental economics research done using "special subject pools". For instance, the article of Battalio et al. [2] reports the results of a token economy experiment run with 38 patients of Central Islip State Hospital. More recently there is notice of this type of research conducted by Ernst Fehr with schizophrenics and Rosemarie Nagel with Alzheimer patients.

Objective 1: *To estimate a risk aversion parameter for the pathological gamblers and compare it with normal people.*

Notice that, besides the players in our additcts subject are *not active* gamblers yet. However, psychiatrists consider them pathological gamblers forever. Then, we should consider this part of the analuysis as an exploratory study of this population. In sum, we check if they behave as normal people or, as pathological gamblers, they show any special feature.

Objective 2: *To estimate and compare a risk aversion parameter for the pathological gamblers' spouses.*

Again, it is not clear how victims are going to behave towards risk. On one hand they are people who have not been diagnosed as pathological gamblers. So, they should be indistinguishable from normals. However, they lived and suffered a pathological gambling environment. There is evidence in psychology about how close relatives' behavior affect people. This is well known for alcoholic relatives.

So, this fact might affect risk attitudes of victims making them to 'hate' gambling and then rejecting to take risks. Jimenez [9] analyzes risk aversion using experimental economics techniques for people coming from two different environments –family backgrounds: Urban and rural. She found no significant difference.

3 Experimental Design

Our main objective is to explore the effect of gambling on risk attitudes. We compare three different sub-samples: addicts, victims and normals.

We run an experimental session at Hotel El Pilar in La Carlota (Córdoba, Spain) in November 2003. The subject pool in this session consisted of members of the "Asociación Cordobesa de Jugadores en Rehabilitación"[1] (ACOJER). This is an association in which members are compulsive gambling players medically supervised. We run two treatments on this session:

i. In the first one ("addicts" treatment) all the subjects were compulsive gamblers belonging to the association. Thirty three people participated in the addicts treatment. Nevertheless, we got only 32 independent observations because one person refused to play the game at all.

ii. In the second ("victims" treatment) subjects were players' relatives or couples, therefore victims of their compulsive behavior. We got 30 independent observations in the victims treatment.

We did not pay any money to subjects in both addicts and victims treatments, they were just hypothetical, because of ethical reasons.

To compare results arising from that specific population with subjects not affected by gambling we run another experimental session at the Instituto de Estudios Sociales Avanzados (CSIC). This is a research center also located in Córdoba. We made a public call for an hypothetical experiment and we got 20 volunteers.

iii. The third group ("normals" treatment) were IESA-CSIC staff. This subsample was prefered over college students because of a higher homogenity on ageing and similar geographic origins, see Table1.

[1] A direct translation might be: *Cordobesian Association for Alcoholics in Rehabilitation.*

Table 1: Demographic Data

	Victims	Addicts	Normals
Age (Years)	$41,2$	$42,06$	$33,35$
Male (%)	$13,3\%$	$90,6\%$	60%
n	32	30	20

Notice there is a higher proportion of males on the addicts sample than both on victims or nomal. Some studies indicate that males are less risk averse than females (see Jiménez [9]; Olsen & Cox [11], and specially Byrnes *et al.* [3]). So, this might introduce a bias in the comparison between addicts and normals, making addicts even less risk averse. Victims are mostly women. In this case, the possible bias would favor a less risky observed behavior in favor of victims.

Our experimental design is based on slightly revised version of the ternary lotteries approach (see Roth and Malouf [14] or Murningham, Roth & Schoumaker [10] among others).

Let a lottery (p, X) imply a probability p or earning X (else nothing). Consider a continuun of such lotteries contructed to compesate a riskier options with increase in the expected payoff. Formally, each continuun of lotteries will be defined by the pair (c, r) corresponding, respectively, to the certain payoff c above which the expected payoff is incresed by r times the probability of earning nothing. Therefore,

$$pX(p) = c + (1-p)r \Longrightarrow X(p) = \frac{c + (1-p)r}{p}.$$

In order to simplify the decision problem faced by our subjects, we have used lottery panels each one of which corresponds to a dicrete version of a continuun of loteries. Figure 1 is the actual choice panel that experimental subjects received. It presents the payoffs corresponding to the favourable outcome of each lottery whose probability p is given at the first row of each each panel; the second row shows the payoffs and the third is the place where subject mark his preferred choice. These panels had been constructed using $c = 1$ and $r = 0.1, 1, 5, 10$. Each subject is asked to choose the most preferred lottery for each panel.

Figure 1: Lottery Panels

Panel 1

P	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Xpuntos	1.00	1.12	1.27	1.47	1.73	2.10	2.65	3.56	5.40	10.90
Preferencia										

Panel 2

P	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Xpuntos	1.00	1.20	1.50	1.90	2.30	3.00	4.00	5.70	9.00	19.00
Preferencia										

Panel 3

P	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Xpuntos	1.00	1.66	2.50	3.57	5.00	7.00	10.00	15.00	25.00	55.00
Preferencia										

Panel 4

P	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Xpuntos	1.00	2.20	3.80	5.70	8.30	12.00	17.50	26.70	45.00	100.00
Preferencia										

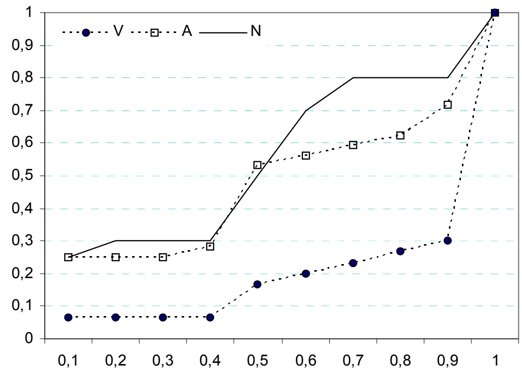
By inspection the farther right the subject chooses, the less risk averse he is, whereas risk neutral (risk loving) subjects would choose $p = 0.1$ in all panels.

4 Results

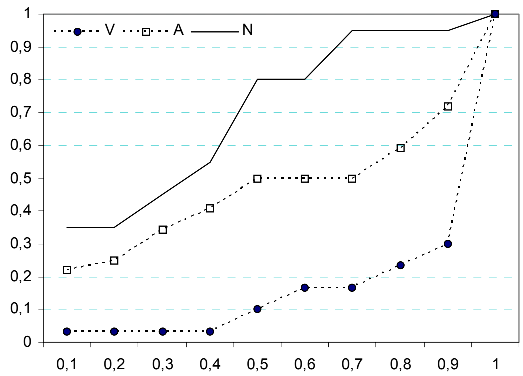
First, we study how each population behave in the referred panels, that is, a *between–subjects* analysis. Next figures 2a–c illustrate the frequency of each population throughout each panel of lotteries. We can see how a very high percentage of victims (dashed line with black dots) decide on the safe lottery ($p = 1$) regardless the panel.

We can get an indication also of how the normals (continous line) is the most risk taking subsample (see, for example, the high percentage of people choosing $p = 0.1$). Finally, in between we can find the addicts (dash line with square markers).

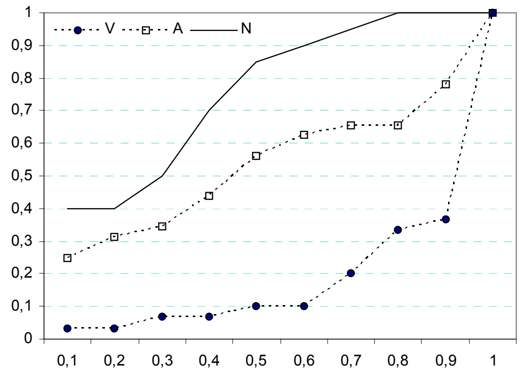
Figure 2: Cum. Freq. through lotteries



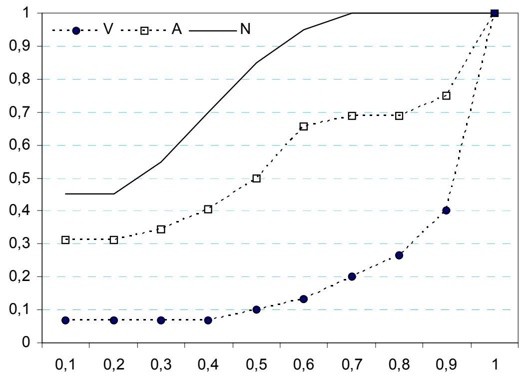
(a) Panel 1



(b) Panel 2



(c) Panel 3



(d) Panel 4

Now we check whether results are statistically different between subsamples in each panal. These results are supported by a series of Kruskal-Wallis and Median non-parametric tests for $k = 3$ unrelated samples. The null hypothesis says that the average (or the median) is the same in all the three subsamples (victims, addicts and normals). We perform the same analysis in each panel. Table 2 summarizes these tests.

Table 2: Between Subjects Analysis

	Panel 1	Panel 2	Panel 3	Panel 4
Kruskal-W χ^2.	15.48	27.62	30.74	29.87
$p-value$	0.00	0.00	0.00	0.00
Median χ^2	16.82	25.31	34.00	35.20
$p-value$	0.00	0.00	0.00	0.00

Both series of tests report identical results: *Samples are not drawn from the same population.* Neither the average nor the median can be considered the same along the three sub-samples in any lottery.Each group reported a statistically different behavior. If we consider the average behavior of each sample across panels as our risk aversion parameter we get[2] (victims = 0.867, addicts = 0.560 and normals = 0.385). Therefore we can conclude that,

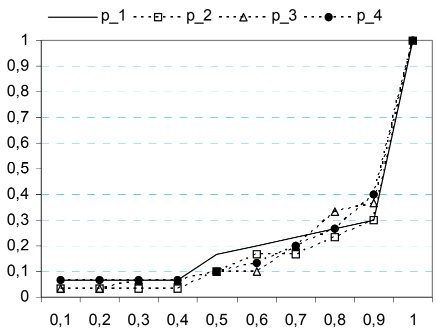
Result 1: Addicts are willing to take less risk than normal individuals.

Result 1b: However, the large majority of victims reports themselves unwilling to take any risk at all.

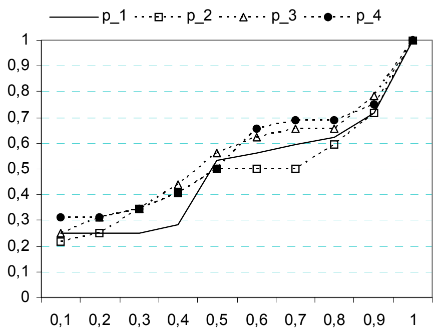
Now we explore *within–subjects* behavior across lotteries. Next figures, 2a-c show cumulative distributions across panels for each subsample. Here we can observe how behavior does not seem to vary across panels for victims (2-a) and maybe for addicts (2-b) while normals (2-c) seem to behave differently across lottery panels.

[2] To compute this value we use the mean of the four average of each sample in each panel.

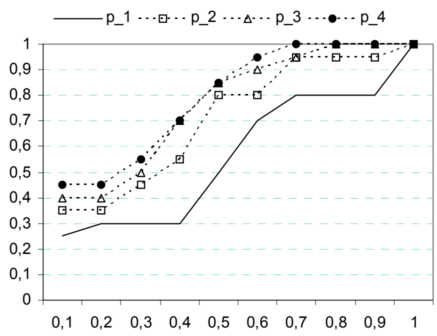
Figure 3: VICTIMS, NORMAL & ADDICTS (CUM. FREQ.)



(a) Panel 1: Victims



(b) Panel 2: Addicts



(c) Panel 3: Normals

Our tests also support what figures indicate. We now test whether there is any difference across panels within each population, that is, we will check how sensitive each subsample is to the risk-return tradeoff.

VICTIMS: Clearly, we do not observe any variation among panels; on average their choices are 0.85 (panel 1, hereafter $p1$), 0.89 ($p2$), 0.87 ($p3$) and 0.86 ($p4$). Both the Friedman ($\chi_3^2 = 2.65; p = 0.44$) and Kendall ($\chi_3^2 = 2.65; p = 0.44$) tests for $k = 4$ related samples do not reject the null hypothesis of equal distribution, then all samples are drawn from the same population. Hence, victims did not react to the risk-return tradeoff.

ADDICTS: The constant average behavior observed in the previous group is also common within addicts. The average behavior does not varies across panels: 0.59 ($p1$), 0.59 ($p2$), 0.53 ($p3$) and 0.53 ($p4$). Both the Friedman ($\chi_3^2 = 2.62; p = 0.45$) and Kendall

($\chi_3^2 = 2.62; p = 0.45$) do not reject the null. Hence, addicts did not varied their behavior across panels.

NORMALS: In contrast to the other samples, these normal individuals reacted to the risk-return tradeoff. In the first panel (mean = 0.52) they behaved similarly to the former sample (addicts), however they varied their choices when they observed an increasing return. In the following panels, average clearly falls: $0,38$ ($p2$), $0,33$ ($p3$) and $0,30$ ($p4$). In contrast to victims and addicts, both the Friedman ($\chi_3^2 = 8.84; p = 0.03$) and Kendall ($\chi_3^2 = 8.84; p = 0.03$) reject the null, so normals did varied their behavior across panels.

Where these differences arise? From panel 1 to the following panels significant differences appear [Z-Wilcoxon tests for p1 vs. p2: -1.97 ($p = 0.04$); p1 vs. p3: -2.24 ($p = 0.02$); p1 vs. p4: -2.52 ($p = 0.01$)]. However, the remaining comparisons do not support any difference [Z-Wilcoxon tests for p2 vs. p3: -1.26 ($p = 0.20$); p3 vs. p4: -0.59 ($p = 0.55$); p2 vs. p4: -1.64 ($p = 0.10$)]. Then, subjects are *only* sensitive to large increases in returns.

Result 2: Both addicts and victims maintain their choices invariant across different scenarios concerning the risk-return tradeoff. However normal subjects are sensitive to *large* return variations.

Finally, we study the determinants of individual decisions across the four panels. To perform this analysis we are required to define, first, our dependent variable. In order to extract the maximum level of information we define 4 possible dependent variables: (1) the *average* choice of each $i-$individual across panels ($\widehat{P} = \frac{1}{4}\sum_j p_{i,j}$; $i = 1, ..., 82$; $j = 1, ..., 4$); (2) the *choice on panel 1* of each $i-$individual (P_i^1); (3) we define *sensitivity* to the difference between choices in panel 1 and panel 4, *Sensitivity* (S_i)=$|P_i^4 - P_i^1|$; (4) *Variance* (σ^2) of the four choices of each individual.

The set of independent variables we used is the following. *Addict*, which takes value 1 if the subject is a pathological gambler and 0 otherwise; *Affected*, which takes value 1 if the subject is directly (or indirectly) affected by gambling and 0 otherwise; *Age*; and *Male* (0 otherwise). Also, previous dependent variables are considered as independent.

Columns 1 to 5 in table 3 show several estimations. The $*$ symbol illustrates the level of significance where $*$ denote significant for $\alpha < 1\%$; $**$ for $\alpha < 5\%$; $***$ for $\alpha < 10\%$; and "no-sign" means not significant.

The first estimation (column 1) analyses the effect of gambling and individual features on (average) risk choice. As expected those subject who are *affected by gambling are willing to take less risk*. However this is not completely true because those subjects affected but with a compulsive gambling pathology (*addicts*) are willing to take more risk. Interestingly male are willing to take more risk than females and older people than younger, although this last parameter is nearly marginal.

The introduction of any measure of sensitivity to the risk-return tradeoff in the specification of the equation does not increase our knowledge. Column 2 show that neither sensitivity nor variance are significant.

Columns 3 estimates the same model than 1 with the only difference that the dependent variable is P^1 instead of $\widehat{P}$. Results are not so different to those reported previously and do not need further explanation.

Result 3: Belonging to the Affected group increases risk aversion

Result 3b: Addiction and male decrease risk aversion.

Table 3: Individual behavior

	$\widehat{P}$	$\widehat{P}$	P^1	Sensitivity	σ^2
	(1)	(2)	(3)	(4)	(5)
Addict	-0.26^{*}	-0.27^{*}	-0.22^{*}	$+0.14^{*}$	$+0.03^{*}$
Affected	$+0.51^{*}$	$+0.51^{*}$	$+0.38^{*}$	-0.30^{*}	-0.06^{*}
Age	-0.00^{**}	-0.00^{**}	-0.00^{**}	$+0.00$	$+0.00$
Male	-0.07^{*}	-0.07^{*}	-0.07^{*}	$+0.00^{***}$	-0.00
Sensitivity		-0.15			
σ^2		$+0.78$			
P^1				$+0.28^{*}$	$+0.07^{*}$
c	$+0.63^{*}$	$+0.64^{*}$	$+0.85^{*}$	$+0.04$	-0.02
$\overline{R}^2$	40.8	39.7	26.4	18.2	18.0

But, are these variables able to explain why subjects react (or not) to the risk-return tradeoff? Columns 4 and 5 give an interesting picture about this. Using *sensitivity* as dependent variable or the directly the *variance* as dependent, the message is the same: those subjects who are *affected by gambling are not very sensitive to the risk-return trade off but addicts are!.*

Furthermore, those subjects who chosen low-risky lotteries in panel 1 are willing to react positively to the risk-return tradeoff.

Result 4: The risk-return tradeoff is diminished by Affected but enlarged by both Addicts and first (safe) choice.

5 Conclusions

Thus paper explores attitudes toward risk among two very salient populations: pathological gamblers under psychological treatment ("addicts") and gamblers' relatives ("victims"). We compare these samples to normal (as far as gambling is considered) individuals. To make this study we use variations of ternary lotteries. Our main results are:

- Addicts are willing to take less risk than normal individuals.
- The large majority of victims reports themselves unwilling to take any risk at all.
- Both addicts and victims maintain their choices invariant across different scenarios concerning the risk-return tradeoff.
- In contrast, normals behave as expected.

References

[1] Albers, W., Albers, G.. On the Prominence Structure of the Decimal System, in: Scholz, R. W. (Eds), *Decision Making under Uncertainty*. Elsevier North Holland, 271-287, 1983.

[2] Battalio, R.C., Kagel, J. et al.. A Test of Consumer Demand Theory Using Observations of Individual Consumer Purchases. *Western Economic Journal*, 11, 411-428, 1973.

[3] Byrnes, J. P., Miller, D.C. & Schafer, W. D. Gender Differences in Risk Taking: A Meta-Analysis, *Psychological Bulletin* 125(3), 367-383, 1999.

[4] Cross, S.E., Morris. M. L. & Gore, J. S. Thinking about oneself and others: The relational-interdependent self-construal and social cognition. *Journal of Personality and Social Psychology*, 62, 399–418, 2002.

[5] Darbyshire, P. The Experience of Pervasive Loss: Children and Young People Living in a Family Where Parental Gambling Is a Problem, *Journal of Gambling Studies* 17(1):23-45, 2001.

[6] Frost, R. O. Obsessive-Compulsive Features in Pathological Lottery and Scratch-Ticket Gamblers, *Journal of Gambling Studies* 17(1):5-19, 2001.

[7] Gaboury, A. & Ladouceur, R. Erroneous perceptions and gambling. *Journal of Social Behavior and Personality*, 4 (4), 411–420, 1989.

[8] Georgantzís, N.; García-Gallego, A.; Sabater-Grande, G.; Genius, M. Lottery-specific risk attitudes: Probability and reward attraction vs. risk-return tradeoffs. Universitat Jaume I, mimeo, 2004.

[9] Jiménez, F. Does familiar environment affects individual risk attitudes? *Cuadernos de Economía*, forthcoming.

[10] Murningham, J. K., Roth, A. E., & Schoumaker, F. Risk aversion in bargaining: An experimental study, *Journal of Risk and Uncertainty* 1, 101-124, 1988.

[11] Olsen, R. A. & Cox, C. M. The influence of gender on the perception and response to investment risk: The case. of professional investors, *The Journal of Psychology and Financial Markets* 2(1), 29-36, 2001.

[12] Pope, R. *Attractions to and Repulsions from Chance.* In: Leinfellner, W., Köhler E. (Eds.), Game Theory, Experience, Rationality. Kluwer, Dordrecht, pp. 95-107, 1998.

[13] Pope, R. Evidence of Deliberate Violations of Dominance due to Secondary Satisfactions –Attractions to Chance, *Homo Economicus* XIV(2), 47-76, 2000.

[14] Roth, A. & Malouf, MWK. Game–theoretic models and the role of bargaining, Psychological Review 86, 574-594, 1979.

[15] Sabater-Grande, G. & Georgantzis, N. Accounting for risk aversion in repeated prisoners' dilemma games: an experimental test, *Journal of Economic Behavior and Organization*, 48(1), 37-50, 2002.

[16] Toneatto, T. Cognitive Distortions in Heavy Gambling, *Journal of Gambling Studies* 13(3):253 - 266, 1999.

[17] Toneatto, T. Cognitive psychopathology of problem gambling. *Substance Use and Misuse*, 34 (11), 1593–1604, 1999.

[18] Tversky, A. & Kahneman, D. *Availability: A heuristic for judging frequency and probability.* D. Kahneman, P. Slovic, & A. Tversky (Eds.). Judgment Under Uncertainty: Heuristics and Biases (pp 163-178). Cambridge UK: Cambridge University Press, 1982.

[19] Weinstein, N.D. Unrealistic optimism about future life events. *Journal of Personality & Social Psychology*, 39 (5), 806–820, 1980.