ASYMMETRY OF RISK PERCEPTION IN VARIOUS SOCIAL ROLES

Karginova-Gubinova V.V.,
PhD of Economics Department of Regional Economic Policy, Institute of Economics of the
Karelian Research Centre of the Russian Academy of Sciences

Abstract: The behavior of economic actors is profoundly influenced by biases. An attempt was made in this study to assess how much an individual's social role influences the divergence of risk sentiment in potential gain and potential loss situations. A sociological survey was carried out, and data from the Central Bank of Russia on the borrowings of banks demonstrating different creditworthiness levels were analyzed. A technique for quantitative assessment of risk perception was suggested and applied to Russian actors. The conditions for the lowest possible asymmetry of risk perception and for its divergence in private (home and family) versus public (on-the-job) behaviors were determined. It is demonstrated how the social role influences the perception of risk premium. The results of the study can be used to correctly transfer the inferences concerning an individual's family behaviors to their on-the-job behaviours and to build models to predict actions and to choose techniques for managing them.
Keywords: Risk aversion, Probability, Risk perception, Risk premium, Bank, Creditworthiness.

Introduction. Studies by Daniel Kahneman and Amos Tversky (Tversky & Kahneman, 1981; Kahneman, 2011), continued by other researchers, have shown asymmetry to exist in risk perception in potential gain and potential loss situations. This paper investigates the risk perception asymmetry when in different social roles. Is there higher or lower willingness to take risks in private vs. public behaviors? Does the higher or lower risk tolerance augment or reduce asymmetry in risk perception? The aim of this study is to answer the questions posed.

Based on the results of own sociological research as well as data from the Central Bank of Russia on the borrowings of banks demonstrating different creditworthiness levels it was concluded that the asymmetry of risk perception is a constant value, which does not depend on the loaner's social role. Exceptions occurred in the situations where any possible outcome was probabilistic in nature. The survey also showed that a risk premium is a more significant incentive for taking the risk for individuals in family capacity than for those 'on-the-job'. The paper ends with an account of the limitations on interpretation of the results and their transfer to other sectors of the economy that do not directly deal with crediting activities.

1. Statement of a problem

A number of papers have dealt with an individual's behavior under risk, specifically under financial (e.g. Fishburn & Kochenberger, 1979; Hershey & Schoemaker, 1980; Payne, Laughhunn & Crum, 1980; Slovic, Fischhoff & Lichtenstein, 1982; Karginova, 2016a, 2016b) or social (Fischhoff, 1983; Tversky & Kahneman, 1981). Mary Douglas and Aaron Wildavsky (1982) promised a cultural theory of risk perception, according to which the decisive role is assigned to cultural traditions. Geert Hofstede (The hofstede centre) has later shown a relationship to exist between high/low uncertainty avoidance and national mentality. Paul Slovic (2000) provided a description of the three main characteristics determining our risk perception: the associated benefits, the catastrophic potential and the amount of knowledge.

In some of their experiments Daniel Kahneman and Amos Tversky revealed asymmetry in risk perception, i.e. differential subjective estimates of potential losses and gains (Kahneman, 2011). In the past, Adam Smith (1759) also arrived at a similar conclusion as applied to equivalent amounts of money. The differential estimation of gains and losses results in asymmetry of risk perception: economic actors are more likely to take risks to avoid losses than to acquire equivalent gains (Kahneman, 2011). This is also observed in riskless choice tasks such as choosing among job candidates (Highhouse & Johnson, 1996). Losses attract the greater task attention, they increase the cognitive effort compared to respective gains (Yechiam & Hochman, 2013). This, in turn, increases the sensitivity to the decision task (Yechiam, Telpaz & Hochman, 2014). An alternative explanation for avoiding losses is based on the propensity towards the status quo (Gal, 2006). People give more importance to outcomes rather than probabilities (Finucane et al., 2000). The asymmetry of risk perception is observed in many diverse spheres, for example, in investing (Stanovich, 2010), sports (Sachau, Simmering & Adler, 2012) and gambles (Conine, McDonald & Tamarkin, 2015). Nevertheless, when losses and gains are repetitive individuals mostly give equal weight to them (Erev, Ert & Yechiam, 2008).

However, the studies of asymmetry in assessment of gains and losses have largely focused on those national economies where uncertainty tolerance is quite high (speaking, for instance, of the USA). The generally high uncertainty avoidance (as, for example, in contemporary Russia) would assumably offset risk perception asymmetry: economic actors would not accept risk in either potential gain or potential loss situation. Hence, there is a need to analyze the characteristics of and identify asymmetry in risk perception in an economy with low risk-taking predisposition. It is also necessary to decide on the approach to quantifying risk perception asymmetry and risk aversion.

One should keep in mind also that the social capacities of an economic actor alternate. Grossly speaking, there are two major groups of social roles: private (home and family) and public (on-the-job). An individual's behavior is significantly influenced by their social role. We can, for instance, look back to Gary Becker's 'rotten kid theorem', where he postulated that individuals tend to be more altruistic towards family members than towards strangers (Beck, 1986). The

risk assessment depends on the perception of fairness in allocating benefits (Linnerooth-Bayer & Fitzgerald, 1996), and the assessment of the fairness in allocating benefits at home and at work is often different. The social roles of women define their propensity to buy products and services for individual or collective use, the tendency to invest and save money (Sekścińska, Trzcińska & Maison, 2016). Chinese workers are ready to take more risks when they expect a reward from management (Choudry & Fang, 2008). Meanwhile, individuals can accept group perceptions (Cooper, 2003; Harding & Eiser, 1984). Thus, the similarities and distinctions in risk perception when in family vs. on-the-job roles need to be analyzed.

In view of the foregoing, the research hypotheses were formulated:

H1: There is a minor asymmetry of risk perception by uncertainty intolerant actors, insignificant subjective prioritization of losses over gains.

H2: A risk aversion in family capacity is higher than on-the-job roles.

2.   Methods

In 2016, to achieve the aims stated above, the author carried out a specialized sociological survey. The method was a selective questionnaire. The original dispatch was 474 e-mails at personal addresses of residents of the Republic of Karelia (a region of the Russian Federation), and 948 e-mails at corporate addresses of employees of various legal entities operating in the republic (only the messages with delivery confirmation returned were taken into account). Personal addresses were extracted from the profiles of social networks. The sample of respondents chosen included both sexes, all age groups, people with different principal occupation and affiliation.

Each addressee was asked to fill in the online questionnaire created using Google Forms. E-mails sent at personal addresses and at corporate gave links to different forms. Questions were identical, but the one sent at personal addresses suggested making choices within home and family realities, whereas the one directed at corporate addresses implied the decision-making was to be based on professional activities. The questionnaire e-mailed to legal entities is given in Appendix. The questionnaire sent at personal e-mails was lacking the question on the size of the employing organization, but offered a wider choice of options for principal occupation, and the wording was "you", "your family", and such instead of "your organization".

During the data processing stage the statistical data analysis methods were carried out, namely the method of comparing the averages for comparison family and on-the-job roles, methods for estimating the correlation dependence: the calculation of the coefficients of association and contingency, the Pearson's and Tschuprow's coefficients of contingency and the point-biserial correlation coefficient.

Verification of results was based on the data from the Central Bank of Russia. The data analysis was done using the applied statistical methods. The approximation equations for the distribution of funds on current and time deposit accounts among credit institutions with different creditworthiness levels were constructed. The approximation reliability was measured by the coefficient of determination R^2. Comparison of the family and on-the-job roles, as in the analysis of the sociological survey data, was carried out using the method of comparing the averages and the graph overlay method.

3.   Problem solving

Within the survey, 124 respondents returned their answers (63 completed questionnaires on risk perception within family roles and 61 – within on-the-job roles). For each group of roles 60 questionnaires were filled in correctly, and used further. In the course of the sample analysis, it was determined that the sample meets the requirements of the quota sample: the shares of respondents in the sample according to the criterias allocated for the study (sex, age, etc.) correspond to their shares in the population of Karelia. Accordingly, the sample obtained represents the whole population.

The results of the questionnaire survey are shown in Table 1.

Tab. 1: Results of the questionnaire survey on decision-making under uncertainty

	Family roles	On-the-job roles
Sex (per cent):		
-male	41.7	45.8
-female	58.3	54.2
Average age (years)	31.0	37.3
Principal occupation (per cent):		
-pupil/student	33.3	–
-specialist	33.3	28.3
-mid-level manager	21.7	41.7
-senior-level manager	11.7	30.0
-neither work nor study	0.0	–

Size of organization (per cent):	–	
-within 15 employees	–	31.7
-16 to 100 employees	–	43.3
-101 to 250 employees	–	15.0
-over 250 employees	–	10.0
1). Where either guaranteed or probabilistic gain is possible (question 1), the choice is (per cent):		
-guaranteed gain;	80.0	86.7
-a gain 10 times that of guaranteed gain at 10 per cent probability.	20.0	13.3
2). Where a probabilistic gain is possible (question 2), the choice is (per cent):		
-gain at 90 per cent probability;	53.3	78.3
-a 10-fold higher gain at 10 per cent probability.	46.7	21.7
3). Where both gain and loss is possible (question 3), the choice is (per cent):		
-costs amounting to 10 per cent of potential gain at 40 per cent gain probability;	1.7	6.7
-refusal to carry extra costs and get the chance for reward.	98.3	93.3
4). Where loss compensation is either guaranteed or probabilistic (question 4), the choice is (per cent):		
-guaranteed compensation for 10 per cent of losses;	10.0	8.3
-full loss compensation at 90 per cent probability.	90.0	91.7
5). Where there is a chance of loss compensation (question 5), the choice is (per cent):		
-compensation for 10 per cent of losses at 90 per cent probability;	53.3	28.3
-full loss compensation at 10 per cent probability.	46.7	71.7
6). Where both winning and losing is possible in seeking for loss compensation (question 6), the choice is (per cent):		
-bearing costs at 10 per cent of total loss, with the probability of loss compensation at 40 per cent;	85.5	81.7
-refusal to carry extra costs and get the chance for compensation.	15.0	18.3

Source: compiled by the author using the results of the sociological survey

The responses to questions 1 and 4 suggest that in a national system featuring high uncertainty avoidance, when actors are placed in a situation permitting a guaranteed and a probabilistic outcome, all else equal, they are more likely to choose guaranteed gain, even if it is smaller than probabilistic gain, as well as to choose a chance of loss avoidance over the option of guaranteed partial compensation for loss. The asymmetry of risk perception can in this case be estimated at 70 per cents for family roles, and at 78.4 per cents for on-the-job roles. Risk perception asymmetry was determined as the difference between the two estimates of risk aversion. Note that the degree of risk aversion may change if the absolute magnitude of gain or loss, or their probability characteristics change.

Where both outcomes are probabilistic (questions 2 and 5), an actor is likely to choose the more probable one, even where the gain is smaller, as well as to opt for the higher loss compensation even at lower probability. The asymmetry of risk perception is 0.0 per cents for family roles and 50.0 per cents for on-the-job roles. If, however, probabilistic gain or loss compensation options are coupled with definite demand for some extra costs, actors would be more willing to bear extra costs in order to get the chance of loss compensation than to acquire gains. The asymmetry of risk perception in this case is 75.5 per cents for family roles and 73.4 per cents for on-the-job roles. Thus, the lowest risk asymmetry

was observed where all outcomes were probability dependent. Besides, this was also the case where the asymmetry of risk perception diverged considerably between family roles and on-the-job roles.

The highest risk aversion (within the values and probabilities suggested in this study it was 98.3 per cent for family roles and 93.3 per cent for on-the-job roles) was demonstrated where the actors faced the demand for bearing some definite costs in order to get a chance of gain. The lowest risk aversion (10.0 per cent for family roles and 8.3 per cent for on-the-job roles in this survey) was the lowest in the situations with a guaranteed or probabilistic amount of loss compensation.

Coefficients of association and contingency, designed for the analysis of two binary variables, were employed to determine the strength and direction of the relationship between risk perception and sex. Pearson's and Tschuprow's coefficients of contingency, which are applied to analyze multi-nominal-scale variables (more than two), were used to measure the strength and direction of the relationship between risk perception and such characteristics of the respondents as principal occupation and, for the case of on-the-job roles, size of the organization. The relationship between risk perception and the respondents' age was measured by the point-biserial correlation coefficient, which is applied where one of the variables has a dichotomous nominal scale (two attributes) and the other – interval (ratio) scale.

The calculations showed the relationship between risk perception and such characteristics of the actors as sex, age, principal occupation, and size of the employing organization to be insignificant. Higher coefficients of correlation and, hence, a weak relationship were observed only in a few cases. For instance, where loss compensation was either guaranteed or probabilistic, less willing to take the risk (choosing the guaranteed loss compensation option) were:

– women compared to men;
– mid-level managers compared to specialists and senior-level managers (students demonstrated the highest risk-taking predisposition);
– small organizations compared to larger ones.

Besides, actors employed by larger organizations are more likely to bear costs both to gain surplus and to get compensation for losses.

Coefficients of association and contingency were applied to test a relationship between risk perception in family and on-the-job roles. Low values of correlation coefficients prove there was no relationship. The exception is the cases where both outcomes are probability-dependent: both for the potential gain situation and for the chance of loss compensation the coefficient of association exceeded (equaled) 0.5, and the coefficient of contingency – 0.3, suggesting there was a relationship. This means that when in family capacity, an actor is equally inclined to take risks to acquire gains and to get compensation for losses, whereas in professional capacity, their willingness to take risks for a loss compensation is significantly higher than for acquiring gains. This relationship still needs to be verified and tested by building risk perception functions.

4. Discussion

To verify the conclusions and add detail let us compare the willingness to take risks among individuals and legal entities based on their decisions to invest in banks with different creditworthiness levels. Choosing a credit institution to open an account is a special case of decision-making under risk. This decision can be made within the framework of both family and on-the-job roles. At the same time, the available statistical data allows us to analyze the individual preferences without conducting surveys, using the applied statistical methods. Using different methods will ensure the complexity of the study and the reliability of the results.

There is a variety of approaches to determination of a bank's creditworthiness. This study relied on the RAEX methodology, since this is the agency that currently runs credit rating on the most complete list of Russian banks. The credit rating indicates the risk of opening an account at the bank: the highest rating of A++ denotes zero risk, and the lowest E rating points to a hundred per cent risk.

Among the assorted types of accounts that agents set up at credit institutions, one can specifically focus on current (transactional) accounts and time deposit accounts. Interest rate on current accounts is minimal, being much higher on time deposit accounts. The less creditworthy banks offer higher interest on time deposit accounts than the more creditworthy ones – see e.g. (Monitoring stavok po vkladam v bankah RF, 2016). Thus, when opening a time deposit account at a less creditworthy bank, the actor is entitled to a potential risk premium, which is not offered for a current account.

The depositing funds by the personal clients correspond to family behaviors, by corporate clients – on-the-job behaviors. The distribution of individuals' and legal entities' funds among credit institutions with different credit ratings and, hence, different risks related to their obligations was studied. Monthly data on 2011-2015 from 299 banks were analyzed. The results on current and time deposit accounts of individuals and legal entities are shown in graphs (see Fig. 1-2).

Fig. 1: Distribution of funds on current accounts among credit institutions, 2011-2015
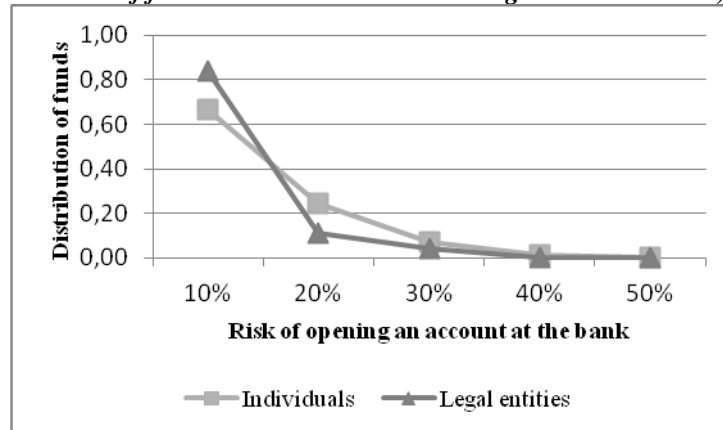
Source: plotted by the author relying on data from the Central Bank of Russia, RAEX, and banki.ru data portal

Fig. 2: Distribution of funds on time deposit accounts among credit institutions, 2011-2015
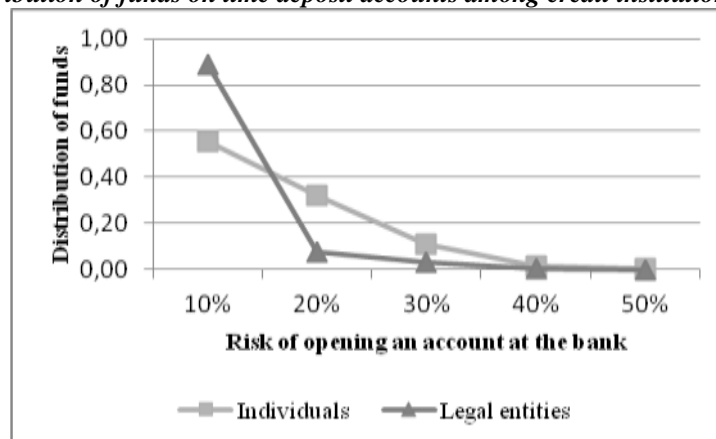
Source: plotted by the author relying on data from the Central Bank of Russia, RAEX, and banki.ru data portal

The author ran approximations for each of the resultant curves. The choice from among the exponential, linear, logarithmic, polynomial and power curves was the polynomial curve for individuals and the exponential – for legal entities (see Tab. 2). These were the curves with the highest values of the coefficient of determination R^2 (measure of approximation reliability). The values of the coefficient of determination R^2 in Table 3 point to the model's high goodness-of-fit.

Tab. 2: Approximation equations for the distribution of funds among credit institutions, 2011-2015

Category of economic actors	Approximation equation		
	Total funds	Current accounts	Time deposit accounts
Individuals	$y = 4.26x^2 - 3.98x + 0.93$	$y = 6.65x^2 - 5.55x + 1.13$	$y = 3.97x^2 - 3.79x + 0.90$
Legal entities	$y = 6.58e^{-19.48x}$	$y = 7.95e^{-19.88x}$	$y = 5.71e^{-19.30x}$

Source: calculated by the author

Tab. 3: Values of the coefficient of determination for the approximation equation for the distribution of funds among credit institutions, 2011-2015

Category of economic actors	R^2 values for the approximation equation		
	Total funds	Current accounts	Time deposit accounts
Individuals	1.00	0.99	1.00
Legal entities	0.98	0.97	0.98

Source: calculated by the author

The data collected in this study suggest the following:

1). When depositing their funds, both personal and corporate clients demonstrate risk aversion (in 2011-2015 on average, 56.6 per cent of personal savings – family behaviors – and 87.0 per cent of corporate savings – on-the-job behaviors – were deposited at the most secure banks, default risk within 10 per cent). A similar conclusion was made based on answers to the second question of sociological research.

As when choosing a lottery type (sociological survey), and when choosing an investment option, the degree of risk aversion was lower for personal accounts (see Fig. 1-2). When choosing an investment option, this was, no doubt, partly due to the existing system of deposit insurance. In the event of the credit institution's default or license revocation, the sum deposited shall be reimbursed to an individual within a certain limit, although the process may take a while. And the delay may be critical.

The very form of the curves proves however that the differences in risk perception cannot be explained by the deposit insurance system alone: the curves for individuals and for legal entities differ not only in the position with respect to axes but also in convexity. The distribution of legal entities' funds on current and time deposit accounts is represented by curves that are more convex downwards: where the risk of default is from 0 to 30 per cent, legal entities demonstrate higher risk aversion.

2). A risk premium makes individuals in family capacity more risk tolerant, but has practically no effect on corporate placements (on-the-job behaviours) (see Fig. 3-4). Again, this corresponds to the respondents' answers to the second question of socio-logical research: an alternative with greater risk and with a higher risk premium was chosen by 46.7 per cents of respondents in family roles and only 21.7 in on-the-job roles. Hypothetically, for the risk premium to be able to modify the behavior of legal entities, it has to be much greater than for individuals.

Fig. 3: Distribution of individuals' funds among credit institutions, 2011-2015
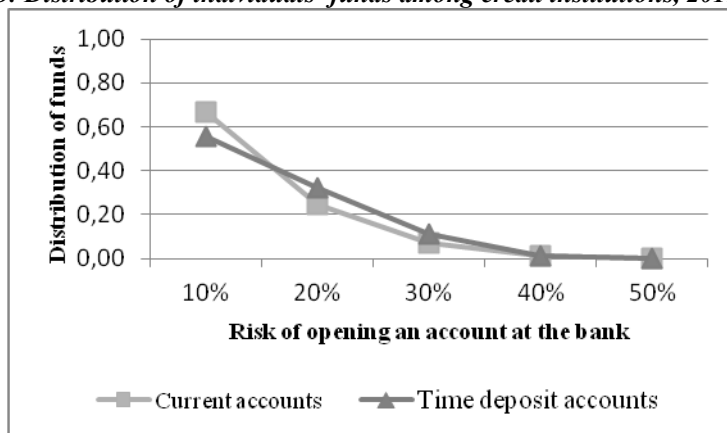
Source: plotted by the author relying on data from the Central Bank of Russia, RAEX, and banki.ru data portal

Fig. 4: Distribution of legal entities' funds among credit institutions, 2011-2015
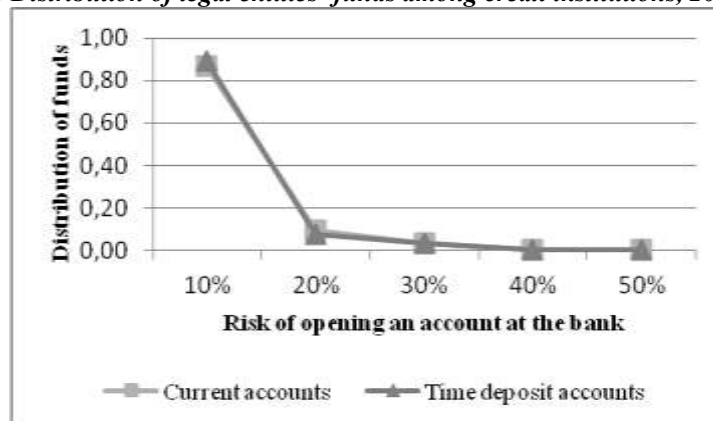
Source: plotted by the author relying on data from the Central Bank of Russia, RAEX, and banki.ru data portal

Thus, the analysis of the actors' decision making on deposition of their funds confirmed that risk perception differed between private (individuals) and public (legal entities) roles where all the suggested options were probabilistic. It was demonstrated, in particular, that the chance of getting a risk premium promotes the willingness to take risks more significantly in private roles than in public roles.

5.   Limitations

To interpret the results correctly, one should remember that when taking the decision on setting up a current or a time deposit account at a credit institution, some economic actors are not governed by creditworthiness considerations. For instance, individuals may choose a nearby bank and public institutions may opt for the regional banks in full or partial ownership of the region, represented by its executive authorities.

Also, it should be noted that the research findings are based on a limited number of responders within a questionnaire survey. This limitation is partially offset by the representativeness of the sample and analyzing the data from the Central Bank of Russia. Similarly, in the study the employing organizations were divided into categories based on their size, other characteristics (e.g. type of ownership) were not taken into account. The impact of those characteristics will be investigated in the future.

Conclusion

Thus, the findings from this study are the following:

1). Along with high uncertainty avoidance, Russian economic actors, irrespective of sex, age, occupation and size of the employing organization, demonstrate risk aversion. To wit, they tend to choose those behavioral strategies that lead to guaranteed gain. The highest level of risk aversion is observed where guaranteed costs are required to get a chance for a gain, and the lowest – where the actor chooses between guaranteed and probabilistic amounts of compensation for loss.

2). Both the economic actors with high uncertainty avoidance and the more uncertainty tolerant ones demonstrate asymmetry of risk perception, more specifically attributing higher subjective value to losses over gains. This means that the loss of a unit of wealth is more emotionally colored than the gain of an equivalent amount of wealth. This result allows us to reject the hypothesis H1 about minor asymmetry in risk perception by uncertainty intolerant actors. The asymmetry of risk perception is the lowest in situations where all possible outcomes are probability-dependent.

3). An actor's risk perception when in family roles corresponds to that in on-the-job roles. The exception is the situations where all options are probability-dependent. In this case there was higher risk aversion when in family capacity and lower asymmetry of risk perception (the subjective significance of losses was at par with the significance of gains). Furthermore, an increase in risk premium promoted risk-taking willingness in actors in family roles more significantly than in on-the-job roles. Thus, the hypothesis H2 about higher risk aversion when in family roles as compared to on-the-job roles also was not confirmed: the higher risk aversion in family roles is only in situations where all options are probability-dependent. Hence, there are constraints on transferring the conclusions concerning the behavior of economic actors in family capacity to the professional sphere. Note here that the conclusions above apply only to risk perception. Other aspects of individuals' behavior may differ more or less significantly.

The approximation equations built for the banking sphere are the simplest functions of risk perception, and can be used to model and predict the behavior of actors in other sectors of the economy as well.

There are plans to continue the study by investigating other factors influencing risk perception by actors. The findings from this study are to be kept in mind in economy regulation to facilitate steady and extended reproduction of systems.

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Appendix

Questionnaire e-mailed at corporate addresses (see Fig. 5).

Fig. 5: Example of questionnaire

Sociological survey "Decision-making under uncertainty"

Sex:
– male;
– female.
Age: ___
Principal occupation:
– specialist;
– mid-level manager;
– senior-level manager.
The size of your organization is:
– within 15 employees;
– 16 to 100 employees;
– 101 to 250 employees;
– over 250 employees.

1). Your organization has been paying electricity bills on time, and the utilities company offers a choice between two options of monetary reward to you. What would you choose:
– monetary amount equivalent to 3-day electricity consumption;
– to enter a draw to win an amount equivalent to a month's consumption, 10 per cent chance of winning.

2). A similar situation: your organization has been paying electricity bills on time, and the utilities company offers you to take part in one of the two draws. What would you choose:
– to enter a draw to win the reimbursement of the value of 3-day electricity consumption, 90 per cent chance of winning;
– to enter a draw to win the reimbursement of the value of a month's consumption, 10 per cent chance of winning.

3). Another variant of this situation: your organization has been paying electricity bills on time from January through November. You know that if the organization pays on time also in December, it will be entitled to taking part in a draw. To be able to pay on time, however, your organization will have to take out a loan. What would you choose:
– to take out a loan, pay the electricity bill on time and take part in the draw. Considering the loan repayment timeline, the cost of the loan for your organization will amount to 10 per cent of the potential gain. The chance of winning is 40 per cent.
– not to take out a loan, pay the electricity bill with a delay and lose the chance to take part in the draw. Within the promotion campaign, there is no penalty on the delay in December.

4). Property damage has been inflicted on your organization (e.g., after replacement of plumbing one of the new pipes burst, flooding the premises). The provider firm agrees to compensate for the losses only partially, but you can go to court to try to get full compensation. The lawyer you've consulted warned you, however, that there is a chance of losing the case in court. If you do file for a trial, your counterpart is determined to refuse paying anything amicably. What would you choose:
– to get 10 per cent compensation for the losses without going to court;
– to file a lawsuit in court and get a 90 per cent chance of getting full compensation for the losses, with a 10 per cent probability of losing the case and getting nothing.

5). A similar situation: a counterpart has inflicted property damage on your organization. You've filed a lawsuit, but the counterpart promises to pay you 10 per cent of the losses if you withdraw the lawsuit. The withdrawal must be done today, but the counterpart will only have the money tomorrow. You're not allowed to refile the lawsuit. What would you choose:
– to withdraw the lawsuit and get 10 per cent compensation for the losses the next day. You estimate the probability that the counterpart keeps the promise at 90 per cent.
– to go for the court trial, where you either get full compensation if you win or get nothing if your lose. The probability of winning the case is 10 per cent.

6). Another variant of a similar situation: a counterpart has inflicted property damage on your organization, but does not admit guilt and has no intention to compensate for any losses amicably. You know that you have no chance of winning the case with *pro se* representation. What would you choose:
– to contract a lawyer, who charges 10 per cent of the claimed amount and estimates the chances of winning the case at 40 per cent;
– not to appeal to court and not to claim for compensation for losses.

Source: plotted by the author