

Limited Liability Problem, Bank Capital and Credit Cycles: A Behavioral Economic Approach

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Abstract: In this article we study the relationship between problem of limited liability in banking behavior, attitude toward credit risk and the role of bank capital in mitigating this problem through behavioral economic approach. The results of the study show that limited liability of banks significantly increases willingness to accept credit risks. An increase in capital adequacy requirements can sufficiently reduce risk-taking due to endowment effect. However, the presence of cognitive biases, in particular endowment and framing effect, in certain conditions can undermine the effectiveness of increased requirements to bank capital adequacy in mitigating excessive risk taking by banks over the credit cycle.

Key words: Credit cycle • Credit risk • Credit market • Framing effect • Endowment effect • Bank capital • Limited liability

INTRODUCTION

The Great Recession, which hit most of developed and developing countries, has made it possible to increase the relevance of research in the field of credit risk and credit dynamics. In their proposals, the Basel Committee focuses on strengthening control over the quality of granted loans, improvement of credit risk management, introduction of optimizing contracts for top management of banks. [1] However, the main theoretical pillar of the Basel Committee Accords is tightening capital adequacy requirements, in particular- an introduction of a countercyclical capital buffer. [1]

Theoretical justification of these measures can be found *inter alia* in the problem of limited liability. About its direct connection with opportunistic behavior and, as a consequence, changes in attitude toward credit risk, classics of economic thought wrote already in XVIII-XIX centuries. [2,3] Negative effects of limited liability even nowadays are often connected with the conflict of interest (principal-agent problem) and moral hazard [4-6]. Some works directly identify limited liability problem as the main cause of excessive risk-taking by banks. [6-8]

The Austrian school of economics also does not support the legislative framework of limited liability

companies' existence, though in a different way. According to some representatives, limited liability may well exist in a free market, but not by "governmental blessing of individual monopolies". [9] In this case the problem of limited liability is considered as a form of opportunistic behavior, generated by coordination failures in the credit market.

In the literature on bank credit market, the problem of limited liability is presented, among others, in two basic forms: limited liability of managers before shareholders and limited liability of banks before depositors. [6-8] The first form of conflict of interest, at least in theory, is quite successfully solvable through efficient (optimizing) contracts. Negative externalities of banks' limited liability before the economy and depositors were always considered to be 1) bankruptcy on the basis of sustainable bank panics, which are successfully resolved by the introduction of deposit insurance, which helps in removing the incentives to a classic banking panic, 2) formation of explicit or implicit guarantees that strengthen readiness to accept credit risk, as well as massive realization of accumulated losses during the crisis period. [10, 11]

One of the proposals to mitigate the problem of limited liability and the formation of moral hazard in

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creditors' behavior (in terms of enhanced willingness to take excessive credit risks) is to increase the capital adequacy ratio. A number of studies suggest that a higher rate of capital requirements *ceteris paribus* helps to reduce readiness to take excessive risks. [12] Argumentation implies that the need to bear all losses, caused by the actions of bankers, will provide sufficient incentives for reduced willingness to take risks and engagement in speculative activities. Also it is accepted that the principal-agent problem between management and owners of a bank will be solved automatically due to the need to avoid losses.

Unfortunately, much of the contemporary literature on the issue of limited liability problem in banks' behavior proceeds from the full rationality hypothesis, which implies the independence of the subjects' decisions from framing effect, does not reflect the reference dependence of choices (e.g. endowment effect), as the behavioral background of the limited liability problem, as well as the peculiarities of preferences formation under risk and uncertainty.

We set ourselves the task to experimentally evaluate the effectiveness of a requirement to increase the banks' capital adequacy ratio taking into account bounded rationality of creditors, existence of framing and to determine the impact of this measure on the attitude toward credit risk over the credit cycle.

MATERIALS AND METHODS

The methodology of this study is based on using experimental methods. For revealing the effect of endowment and assessment of its impact on the willingness to accept risk in credit relations we have developed a number of experimental settings. The first setting assumed a comparison of readiness to take risks when making a choice under risk and uncertainty. The second setting included an opportunity to earn some money through solving a number of simple arithmetic equations before the experiment. In the second part of the experiment, these funds should be used in two choice set gambles, which require making decisions under risk in different states.

The Control Group Was Asked to Make the Following Choice: A. 83% chance to win \$70, 17% chance to get nothing.

B. Sure win of \$50.

The second group of participants made the choice in the context of the embedded problem of limited liability. In this case, participants were asked to «gamble» their own

earned funds. A feature of this context is, as seen, the introduction of limited liability. While changing potential gains, the possible losses are constant and equal \$70, like in a banking industry. The task was formulated as follows:

The current status of your account is \$70. It can be changed to the following outcomes, when investing these funds on the following conditions:

A. 89% chance to get \$120 and 11% chance of losing \$70;

B. 52% chance to get \$1200 and 48% chance of losing \$70.

The third (fourth, fifth) group's participants made a choice under risk, but in this case we introduced the condition of losses' differentiation associated with decisions made, as well as the framing effect (frame of gains for the fourth group, frame of losses for the fifth).

For the group with the differentiation of the results (endowment effect status) the set was constructed in a following way:

The current status of your account is \$70. It can be changed to the following outcomes with the following ratio of gains and losses:

A. 89% chance to get \$120 and 11% chance of losing \$70;

B. 52% chance to get \$1200 and 48% chance of losing \$1000.

In a group tested for endowment effect (limited liability) in frame of gains:

The current status of your account is \$70 (Current interest income of the 21st Century Moscow Bank is \$70). It can be increased up to the following amounts under the following conditions:

A. 89% chance to increase the sum up to \$190 and 11% chance of losing \$70 (\$70);

B. 52% chance to increase the sum up to \$1270 and 48% chance of losing \$1000 (\$70).

In a group tested for endowment effect (limited liability) in frame of losses:

The current status of your account is negative and equals - \$70 (Net interest losses are -\$70). It can be improved up to the following amounts under the following conditions:

A. 89% chance to reduce the losses to -\$50 and 11% chance of losing another \$50;

B. 52% chance to reduce the losses to \$0 and 48% chance of losing another \$100.

Empirical Model: The theoretical background of our model holds on three assumptions, rising from prospect theory in particular and from behavioral economics in general.

Assumption 1. It is assumed that there is a relationship between the type of funds' property lent by commercial banks and willingness to take risks.

Today a large number of studies confirm the existence of the endowment effect. [13, 14] Based on this effect, we extend its qualities not only on material objects and determination of their value, but also on money resources and especially on the readiness of their use in risky terms. In other words, we assume that in the case of lending her own funds willingness to accept credit risk of the decision-maker is reduced to the same extent as owners of goods are ready to sell them for a price substantially higher than subjects who are willing to buy them.

Assumption 2. It's assumed that the attitude toward credit risk is affected by framing of the choice. The existence of a relation between risk attitude and the format of choice is a well-documented fact, although the number of papers arguing in favor of importance of framing in the credit market is extremely scarce. Only in a few works, emphasizing the importance of this effect for credit market, an experimental evidence of its importance and its impact on the attitude to credit risk is presented [15-18]. We assume that in frame of gains when granting a loan *ceteris paribus* willingness to accept risks will be substantially lower than when lending depositors' funds. In frame of losses, willingness to lend their own funds will be significantly higher than when lending depositors' funds.

Assumption 3. It's assumed that in the conditions of a substantial increase in the rate of return, willingness to accept credit risk will skyrocket regardless of property's type of funds lent. However, in case of lending own funds willingness to accept credit risk will be lower in frame of gains. In frame of losses - the relationship is reversed. It's a well-known fact that many of credit bubbles were accompanied by significant technological revolutions, rapid economic growth and/or sufficient capital inflows. According to the prospect theory, willingness to accept high risk in frame of gains exists then and only then when the potential gains are far above average. [19] In the case of significant growth in the rate of return in a particular sector of economy or in economy in general, the level of risks accepted increases, regardless of the property's type of funds lent.

Thus, we assume that a substantial increase in capital requirements (e.g. from 20% to 80%) has the effect of credit risk deterrence only 1) in case, when a decision is made in frame of gains and if 2) in relations with borrowers, banks adhere the principle of pseudocertainty (the willingness to accept credit risk tends to minimal values).

In all other cases, an increase in capital adequacy ratio doesn't seem to be an efficient instrument to solve the problem of banks' limited liability. In cases when 1) decisions are made in frame of losses and 2) rate of return exceeds the long-run market trend, endowment effect begins to play a role of a specific amplifier, which pushes willingness to accept risks by bankers up.

Also there is a number of other limitations of this tool that are worth noting: first, even considering the fact that the endowment effect increases loss aversion and reduces the willingness to accept risks, in case of their underestimation under the influence of heuristics and cognitive biases, the effectiveness of this instrument is ambiguous; secondly, if the commercial banks lend their own funds, the probability of an increase in the risks accepted in frame of gains not only reduces the exposure to volatility of credit dynamics, but enhances it.

RESULTS AND DISCUSSION

Research results generally confirm our assumptions and act as an indirect evidence for theoretical pillars of behavioral economics. Indeed, endowment effect influences the attitude toward credit risk.

In the control group the results of the choices made by the participants confirmed the existence of the desire for certainty: 87% of respondents chose a certain result (option B), while 13% preferred to take a chance (option A).

Results of the participants in the state of limited liability confirm the existing theoretical provisions of this hypothesis: given limited maximum losses, the willingness to accept risk, accompanied by an increase in the rate of return, increases. Option A with minimal gains and risk was chosen by 38% of respondents. Risky option B was chosen by 62% of respondents.

Thus, on the basis of these results, the assumption about the importance of the effect of limited liability in shaping the attitude toward credit risk can be considered viable (Tab.1)

Introduction of an endowment effect in different experimental settings affected willingness to accept risks in different ways. In the condition when participants made a choice using own funds (endowment group), willingness to accept credit risk was even more closely correlating with the desire for certainty of outcome and aversion towards uncertainty. E.g., option A with the lowest level of risk was chosen by 74% of respondents and high risk gamble (option B) was chosen only by 26%.

Table 1: Results of choice settings, %

	Limited liability	Limited liability (frame of gains)	Limited liability (frame of losses)	Endowment effect	Endowment effect (frame of gains)	Endowment effect (frame of losses)
Risk aversion (A)	38	31	28	74	73	18
Risk seeking (B)	62	69	72	26	27	82

These results speak in favor of the prospect theory, according to which the readiness to accept the risk increases in case of a substantial increase in the expected gains relative to the reference point (Tab.1).

In the group with an embedded frame of gains, significant changes in the distribution of risk attitude were not found. In other words, in a situation where risk is associated with substantial losses of own funds, the perception of choice in terms of gains does not appear to be a significant mitigating factor. However, the situation is reversed in the case of lending out depositors' funds. In these conditions, framing effect serves as an accelerator of readiness to take risks. (Tab.1)

In the group, which made a decision in frame of losses and used their earned funds, a general pattern was revealed - willingness to accept more risk was significantly higher due to desire to avoid losses at all costs (Tab.1). In case of using depositors' funds this pattern was also identified, however the magnitude of risk preferences was weaker.

CONCLUSION

The results of the study confirm the importance of the proposed instrument (capital requirements) for optimization of control over credit dynamics. In particular, quite often mentioned among the expert and academic communities idea about the need to increase capital adequacy requirements (in some cases up to 100% and abolishment of fractional reserve banking) may be considered as an effective tool for curbing the credit cycle. Especially important result of such regulation is considered to be maintaining a reasonable level of credit risks taken by commercial banks.

One of the main problems of modern banking is considered to be an issue of limited liability of credit institutions. An increase in responsibility of shareholders through amplification of potential losses that they would incur in the event of bankruptcy of the credit organization, can serve as an effective preventive mechanism in combating with excessive credit risk taking by management. Indeed, results of our study confirm that an increase in monetary liability of bankers launches behavioral effects of endowment, influencing the attitude toward credit risk and willingness to accept it. On the

other hand, the results show that in frame of gains provided substantial increase in rate of return, willingness to accept risks will still rise, albeit to a lesser extent than in condition of limited liability. This result is in theoretical unity with the provisions of the prospect theory on the one hand and also gets support from history of credit bubbles even in cases when capital requirements for banking industry were extremely high.

In case, when activities of bankers involve a high level of competitive pressure (when decisions are made in a frame of losses), desire to «save their own funds» encourage the adoption of even greater credit risk than in case of lending depositors' funds.

Thus, given the significant positive effect of stricter monetary responsibility requirements of banks before the society, behavioral peculiarities of decision-making under risk should be considered as the possible negative consequences of the application of such regulation methods.

It is also worth noting that the problem of limited liability even with the introduction of the endowment effect may not be effectively solved due to, on the one hand, existence of explicit and implicit guarantees, which reduce to zero the effect of using this instrument. On the other hand, containing a speculative sentiment in the context of high market rate of return should also be an issue of concern to regulators.

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