

## Exogenous Credit Cycles: An Experimental Study

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**Abstract:** In this article an empirical model of exogenous credit cycles is developed. Unlike in the models of financial accelerator, we assume that lenders are able to assess credit risk, tend to pseudocertainty of an outcome and in most cases are prone to loss aversion. Using experimental settings, we could not identify the mechanism of proportionality, by which the financial accelerator models explain the credit cycle. In this regard, we offer a new empirical model of exogenous credit cycles. In our opinion, exogenous credit cycle *ceteris paribus* is generated by the change in satisfied credit demand adjusted to the subjectively weighted probability of default on the loan by creditor.

**Key words:** Credit cycle • Credit dynamics • Credit risk • Credit market • Financial accelerator

### INTRODUCTION

The financial crisis that has shaken the economic systems of many countries in the world, revived interest in the analysis of the credit dynamics. Description and explanation of fluctuations in the movement of credit became essential for researchers all over the world again. However, unity of opinions concerning the phenomenon has not been reached. According to the mainstream of economic thought, the credit cycle as a change in the quantity and quality of the bank credit is a mechanical process which is based on the effect of financial accelerator [1-4]. For alternative economic schools, changes in the volume and quality of loans granted are the consequence of banks' credit policy. Excessive acceptance of credit risk (both underestimated and/or conscious) on the upward cycle phases is similar to "sowing seeds of subsequent crisis". [5-7] One of the latest achievements in the theory of credit cycles is the ascent of a new paradigm - heterogeneity of credit cycles. It states that changes between upward and downward phases of credit cycle is due to positive and negative shocks of both endogenous and exogenous nature [8-11].

At the same time, unfortunately, conventional models of exogenous credit cycles pay more attention to explanation of the impact of local shocks on the economic system in general (amplification effects), rather than explaining the dynamics of credit flows over the cycle.

Financial accelerator models lay on a number of assumptions that do not satisfy and/or inadequately describe the existing practical realities of the credit market in developing countries: 1) dynamics of credit supply is a direct function of changes in the net worth of the borrower, the market value of the collateral and/or the risk premium in the interest rate; 2) the financial accelerator models describe in most cases, "financing investment projects", i.e. first and foremost, starting a business and/or meeting the needs in fixed capital, while, in most developing countries working capital loans are more common; 3) the assumption of the accelerator models based on uncertainty, information asymmetry and agency costs, states that risk assessment by creditors is impossible or difficult, due to which, risks are fully insured by means of liquid collateral.

Thus, any credit cycle appears to be an exogenous phenomenon, which is characterized by 1) limits in the risk function of credit institutions, 2) indifference in the attitude towards risk in case of presence of liquid collateral or borrowers' high net worth, 3) the existence of proportionality mechanism: according to financial accelerator models, any positive shock that affects the value of collateral or the net worth leads to a proportional increase in the supply of credit and vice versa. Due to the negative exogenous event (a technological, demand shock), credit market suffers losses in a proportional scale.

The aim of this study is an improvement of main assumptions underlying exogenous credit cycle models. This gives rise to a number of challenges: necessity of incorporation of developing credit markets' features in conventional models, testing the mechanism of proportionality, seeking for evidence of risk indifference creditors' risk function, as well as the identification of risk patterns in terms of exogenous credit dynamics.

## MATERIALS AND METHODS

To achieve the abovementioned goals, we created an experimental setting that allowed us to reproduce the basic characteristics of an emerging credit market on the one hand and to identify creditors' attitude towards risk, as well as the mechanism of proportionality on the other.

Using the achievements of behavioral economists [12, 13], we introduced the credit market, as the number of subjects, committing a choice under risk and uncertainty. To display the features of the credit market of developing countries, we created the following context:

"Get the sum N1 with probability p1 now and sum N2 in 3 months and with probability p2 get nothing".<sup>1</sup> To display the dynamics of credit we used 10 to 15 rounds. In order to determine the presence/absence of risk indifference, risk attitude, ceteris paribus,<sup>2</sup> we modified the classic setting for revealing the effect of pseudocertainty [14].

"Consider the following two stage game. In the first stage, there is a 75% chance to end the game without winning anything and a 25% chance to move into the second stage. If you reach the second stage you have a choice between:

- A. a sure win of \$100 now and \$200 in 3 months
- B. 50% chance to win \$300 now and \$200 in 3 months and 50% chance to win nothing.

Your choice must be made before the outcome of the first stage is known".<sup>3</sup>

In order to identify the mechanism of proportionality, we used the shock approach so that the positive shock would lead to a substantial increase in the possible return and, consequently, lead to a proportional increase in credit supply:

"Which of the following options do you prefer?"

- A sure win of \$100 now and \$200 in 3 months;
- 50% chance to win \$200/300/1000 now and \$200 in 3 months and 50% chance to win nothing".

In case of confirmation of risk indifference of credit agents, the condition of proportionality must be viable as well.

**Model:** In this study, using experimental methods, we try to develop an empirical model for describing and explaining changes in the number and quality of loans granted by commercial banks in the absence of sufficient endogenous positive shocks.

Given that low elasticity of supply and demand corporate loans is inherent in emerging and developing markets, as well as the insignificant impact of the factors strengthening the willingness to accept the risk, we introduce a number of assumptions other than in existing models of financial accelerator: first, credit relations in most serve to meet the needs of borrowers in working capital in order to maintain continuity in the reproduction process; second, the assessment of credit risk by lenders is possible, but it is complicated due to the credit market imperfections: uncertainty, information asymmetry and associated with them adverse selection, moral hazard, etc; third, the use of security (collateral) as insurance in case of default of the borrower is difficult, due to a lower liquidity of collateral and, consequently, a higher level of the agency costs associated with enforcement of securities; fourth, we assume that loss aversion and desire for certainty (in conditions of uncertainty and risk – desire for pseudocertainty) are inherent to the greater part of credit market players; fifth, given the

<sup>1</sup>In this case, the value of collateral and borrowers' net worth do not constitute essential types of insurance against the risk, due to the peculiarities of the emerging markets, where the liquidity of collateral is sufficiently lower, and the agency costs associated with their implementation in the case of default of the borrower do not tend to zero.

<sup>2</sup>Under other equal conditions we mean the absence of destabilizing factors: competitive pressure, effects of herding behavior, loose monetary policy, abundance of liquidity, etc. These conditions were excluded in order to bring the setting to the conditions of the credit market in developing countries where the elasticity is much lower than in developed countries.

<sup>3</sup>Unlike in a classical experiment, apart from identifying the desire for certainty of outcome, we also sought to identify intermediate-run preferences related to attitudes toward risk.

differing attitudes toward risk, we reject the mechanism of proportionality used in the models of financial accelerator to explain changes in the volumes of credit and the share of non-performing loans (NPL) over the cycle; sixth, we assume that in the context of low elasticity of the market, in the frame of gains and in the absence of conditions for extracting more profit creditors prefer pseudocertain outcomes, rather than maximization of short-term outcomes (short-horizon myopia).

Given these assumptions, the credit cycle as the change in the volume of loans granted by commercial banks and the level of NPL, takes the following form: on the phase of credit expansion, most lenders prefer stability over short-term results. In other words, a risky strategy of creditors is not large-scale and sustainable. Exogenous credit cycle is characterized by the lack of positive shocks, leading to appearance of high profit rates and stability of credit expansion for most players. Credit supply is directly determined by the needs of borrowers taking into account the riskiness of the loan and not the value of the collateral or net worth of the borrower, which serve as 100% insurance against credit risk. Occurrence of exogenous negative shocks (unpredictable phenomenon of technological, political, climatic or other nature) increases the share of NPL and phase of the credit crunch begins. However borrowers' defaults are not so massive to be a serious threat to the market, in contrast to the endogenous cycle associated with massive and sustainable adoption of the excess credit risk. In the case of developed countries characterized by high elasticity of markets for corporate lending, exogenous credit cycles are not the exception, although they are extremely rare events. The absence of conditions, which increase the rate of profit, even in the case of considerable competitive pressure and prevalence of herding (frame of losses), serves as the basis of relative stability on the market.

### RESULTS

The results of the carried out experimental researches confirm our hypothesis. First, we could not confirm the assumption of financial accelerator models about the indifference toward risk (Table 1). According to this assumption, the credit risk is insured by the highly liquid collateral or reduced by taking into considerations high net worth of the borrower. At the same time it is worth noting that in the presence of two borrowers with equally high value of the collateral/book value, preference is

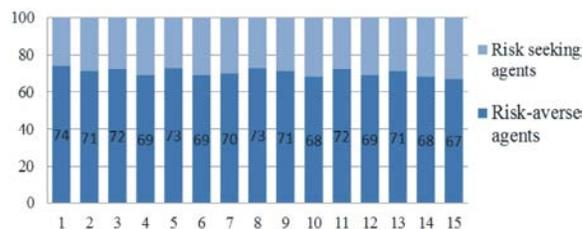


Fig. 1: Pseudocertainty and willingness to accept risk: reaction to medium positive shock

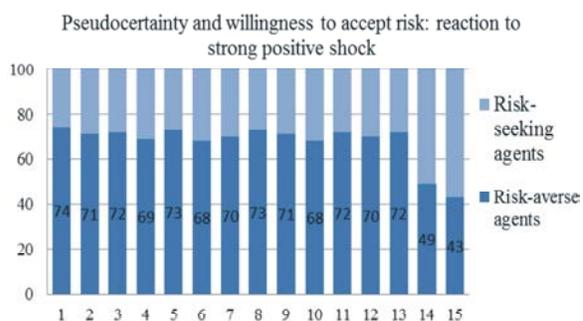


Fig. 2: Pseudocertainty and willingness to accept risk: reaction to strong positive shock

Table 1: Risk indifference test

Risk indifference test		
	Risk averse agents' share	Risk seeking agents' share
11-15 stage		
Average for 15 stages	71%	29%

given to that which subjectively estimated quality is higher. The results of our testing are also an argument in favor of the basic tenets of prospect theory, in part of pseudocertainty effect as private form of subjects' tendency to certain outcomes [14]. The second conclusion of this test is determination of shares of risk attitude. The results suggest that in the absence of a positive shock and factors that increase the willingness to accept the risk, most creditors will strive for the stability of the outcome.

Secondly, the study showed that the mechanism of proportionality, functioning through the channels of the collateral, the risk premium and expectations, designed to explain the changes in the volume and quality of credit granted, in the lab, wasn't revealed. In terms of exogenous theories of credit cycle, any increase in the value of the collateral, the book value should lead to a proportional response of the credit supply. In the lab, we have recreated the decision making process to satisfy the demand for credit within 15 rounds (Figure 1, 2). The higher rates of return in any proportion should lead to a corresponding change in the willingness to accept risk.

In the first case, we have increased the rate of return in 14 and 15 rounds by 50%, in the second case - increased in 5 times. An increase of potential profits by 50% did not lead to any significant changes in the willingness to accept risk, while increasing the rate of return in 5 times led to a sharp increase in credit risk acceptance (willingness to accept the risk increased from 28% to 57%).

This result also serves as an indirect argument in favor of prospect theory: in frame of gains only a substantial increase in income contributes to the formation of willingness to accept the risk. In particular, in the experimentally designed credit market we have shown that “losses actually loom larger than gains”.

### CONCLUSION

This study aims to improve the existing theoretical and empirical models designed to describe and explain the specifics of credit dynamics in the short and medium term. Conventional models of financial accelerator are built on a number of non-valid assumptions: absolute liquidity collateral, the inability to assess the credit risk (indifference), mechanism of proportional changes in the availability of credit, which describes credit dynamics as changes in the value of collateral, net worth of the borrower and other.

Given the advances in behavioral economics, as well as the need to comply with the principle of prevailing realistic models over their elegance, we have set a task to develop an empirical model of exogenous credit cycles. Distinctive features of our empirical model are the possibility of credit risk assessment and the desire of creditors to the certainty of outcome. In this model, the supply of credit is a function of demand, taking into account subjectively weighted probability of the default by the creditor. Only in case of significant growth in the rate of return in the market, under other equal conditions, the willingness of banks to take risks increases dramatically.

Therefore, exogenous credit cycle is the basis for the emergence of endogenous credit cycle, when there is a jump in the rate of return sufficient to sow the seeds of the subsequent crisis.

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