ECONOMIC REGULATION AND MATHEMATICAL MODELING OF INSURANCE PRODUCT COST METHOD

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Abstract

Background. The methodology and economic mechanisms for calculating the cost of a long-term insurance policy, which could optimize management of insurance companies in the Russian Federation, have not been developed. The research into this sphere is relevant under conditions when the functions of insurance supervisors are transferred to the Central Bank of Russia.

Objectives. The priority of this economic study is to establish a scientific rationale for a transfer to the actuarial cost method of an insurance contract, as this method assures a balanced solution for long-term socio-economic problems and stability of the insurance portfolio.

Results. The paper presents the theoretical provisions, methodological approaches and practical recommendations on economic regulation and management of joint business activity involving several participants (partners) in case of premature termination by one of them. This study has investigated the methodological issues of long-term insurance in the Russian Federation; it has developed the theoretical approaches to risk evaluation of premature termination of a joint project because of a participant's leaving; it has provided the scientific substantiation of and developed a conceptual economic mathematical model for calculating risks of one participant's early leaving a joint project due to external circumstances; the scientific and practical recommendations for calculation of a rate net premium have been provided using case study.

Methods. To attain the objectives set out we used probability-theoretical models and actuarial mathematical methods for calculating insured components such as computational analysis, balance and statutory methods, and others.

Conclusion. The developed economic mathematical model can be applied for calculating the cost of an insurance contract, both in case of a single insurance product and a combination of different insurance products, that could help improve an insurance company's liability for consequences of its rate policy. The proposed methods and tools allow taking into account potential risks at all the stages of solution development by an insurance company and avoiding adverse economic consequences in its business activities.

Keywords: insurance rates, net premium, distribution density, distribution function, economic mathematical model of risk insurance

JEL classification: C02

1. Introduction

From the economic point of view, insurance refers to a combination of different economic interrelationships which can be represented as a system of formation of special target financial resources (reserves) that are the source for reimbursement due to an insured event or are used for indemnification in case risks of different types occur. One of the most important types of long-term insurance is endowment insurance, it contributes to welfare of both an individual and a society, and the nation as a whole. However, personal insurance products, in particular, except life insurance, have not been developed enough in Russia until now. They

comprise only a minor part of the insurance portfolio. In this context, the relevance of this research work is to a great extent determined by the lack of methodologies and economic mechanisms for calculating the cost of a long-term insurance policy with the focus on optimizing management of insurance companies in the Russian Federation. Under conditions when the Central Bank of Russia has taken the functions of insurance supervisors, the urgency of the research becomes evident. Insurance supervision is necessary for control over insurance companies; it aims at eliminating fraud in the insurance sphere, assuring observance of insurance legislation by insurers, it provides licensing and accreditation of professional participants of the insurance market. The implementation of the long-term facultative insurance concept intends application of mathematical methods for calculating a rate net premium.

2. Literature review

Nowadays insurance companies consider their work as a protection instrument for business activity and a help to insured people in case of an insured event, on the one side, and as a profitable business activity, on the other side. The main source for an increase in profit of an insurance company is insurance incomes that can be received from temporarily surplus funds placed at bank deposits, enterprises' shares, or investments (Falin G.I.) Insurance is one of the main factors of the state's socioeconomic strategy. It makes it possible to significantly reduce the state budget expenses on payments in the event of emergent technogenic and natural disasters. Due to long-term insurance the national economy gains essential amounts of funds available for investment. One of the most important types of long-term insurance is endowment insurance, which contributes to personal, public and national welfare; and yet, particularly personal insurance products, except life insurance, have not been developed enough in Russia until now. They comprise only a minor part of the insurance portfolio. Key customers applying for personal insurance are corporate clients as it is one of essential components of their employment benefits. On the Russian market, only the leading insurance companies offer annuity assurance (Dubovskikh K.I. et. al, 2014). Recently, we can observe people's growing demand for this insurance service. This fact still causes the increased liability of insurance companies for stability of their businesses and contributes to consolidation of the insurance market. In 2015 the Russian Federation enacted a new law on annuity assurance, which prescribes an obligatory pension ratio for each person. When defining time in employment, a year is measured in pension points, or an individual pension ratio. In order a person would be entitled for insurance pension, they should have at least 30 pension points, while the conditions of these points' accumulation are rather different. The people who have refused from an investment part of the state pension enjoy a priority in accumulation of the pension points. Namely, if a person maintains both the insurance and investment pension parts, then the maximum number of their points will be 6.25 a year, and in case of insurance pension only - 10 pension points a year. At the same time, the number of pension points depends on the minimum monthly wage which a policy holder gets. The people having high salaries gain a greater number of pension points and, consequently, their pension coverage would be larger in comparison with those having low incomes. The Law also prescribes an increased number of pension points (factor 1.8) for each year of compulsory military service, for caring for a person over 80 years old, a disabled person of Group I, a disabled child or the first child. If a family have more children, the multiplying coefficient for the second child is 3.6, for the third and fourth child - 5.4 (these multiplying coefficients are applied only within the first year and a half after the child birth). The people who maintain an investment part of insurance pension, but their minimum monthly wage amounts to one, run significant risks. When achieving the retirement age (in Russia the female retirement age is 55 years old and the male retirement age is 60 years old), they get deprived of insurance pension and have to continue working in order to increase the number of their pension points. According to the new pension legislation of the RF, the minimum time in employment required for retirement pension has also changed. So, before 2015 the minimum time in employment was five years, but after 2015 this period will be increased by one year annually and by the end of 2024 it will have been 15 years, after that the increase will stop. The process of pension payment indexation has undergone significant changes, too. The indexation of insurance pension is planned for every year, this would result in exceeding

pensioners' minimum level of subsistence in different regions of Russia. At the present time, in the Russian Federation beside compulsory pension insurance there is private facultative insurance. However, it exists only as an addition to a compulsory type of pension insurance; and every person sets the size of insurance premiums for this insurance type individually signing an insurance contract with an insurance company. All the pension transformations in Russia encounter a number of large-scale problems such as off-the-books employment and salary payment, accounting fraud. All this significantly decreases efficiency of the national pension system, contributes to the fall of living standards and diminishes confidence in the governmental socioeconomic policy.

3. SCOPE, OBJECTIVES AND METHODS

Mathematical estimation methods are applied for correct calculation of an insurance rate (*Sukhorukova I.V., Likhachev G.G.,* 2003). They help define the probability of an insured risk event and estimate an average cost of this risk, that is a size of an insurance indemnity paid by an insurance company due to occurrence of loss, assess correctness of insurance rate calculation when a contract between an insurance company and an insured person has been signed. An insurance company always includes its administrative expenses and profit into the cost of an insurance policy. In this contexts, the objective of a rate posteriori estimate is rather relevant.

Life insurance is one of long-term insurance products as it is related to longevity. Pension insurance in Russia has its specific features (*Siniavskaia T.G., Tregubova A.A.,* 2015). First of all, they are connected with the age (*Riabikin V.I. et. al,* 2007), when a person starts receiving guaranteed insured benefits. In the Russian Federation this age is certain, and at the moment it is 60 years old for men and 55 years old for women, for all the types of pension insurance. However, it should be pointed out that a net premium of an insurance policy for a man is much lower than for a woman of the same age (*Boikov A.V.*, 2009). An insurance rate is different as after retirement men live on average for seven years, and women for 20 years. Another essential specific feature of pension insurance in Russia is differentiated distribution of the death rate for each territorial subject of the Russian Federation. The estimated insurance rates for two men of the same age category living in different regions of Russia are different. It is conditioned by the fact that each territorial subject of the RF complies its own mortality tables representing mortality peculiarities specific for the certain region. Despite of this essential factor, practically all insurance companies use mortality tables compiled for Russia as a whole. Consequently, the rates for policy holders from other RF subjects are initially calculated incorrect, which causes violation of the equivalence principle that should be applied to obligations of the parties concerned. An insurer receives a less insurance premium that results in an increased probability of smashup of business or a policy holder pays an excessive price for the policy and, therefore, incurs financial expenses.

Scope. Economic relationships and actuarial analysis methods in risk insurance of joint business activities.

Objectives. The goal of this paper is to develop theoretical provisions, methodological approaches and practical recommendations on economic regulation and management of joint business activity involving several participants (partners) in case of premature termination by one of them. According to this goal, the following objectives have been set out and attained: (i) - to analyze methodological issues of long-term insurance in the Russian Federation; (ii) to develop theoretical approaches to estimation of joint business termination risks due to one partner's early leaving; (iii) to provide a scientific and methodological substantiation and to develop a conceptual economic mathematical model for calculating risks of one participant's early leaving a joint project due to external circumstances; (iv) to make up scientific and practical recommendations for calculation of a rate net premium using case study.

Methodology. To attain the objectives set out we used probability-theoretical models and actuarial mathematical methods for calculating insured components such as computational analysis, balance and statutory methods, and others. The economic mathematical model of calculating a size of insurance rate for risks of one participant's early leaving a joint project due to external circumstances. Numeric calculation implies application of numerical

techniques and simulation methods, if necessary (*Katsnel'son A.A. et al*, 1995), (*Zhmurko G.P. et al*, 1997).

4. RESULTS AND DISCUSSION

Focusing on promotion and development of actuarial cost methods for risk insurance of joint business the authors of this paper consider the methods of calculating rates of two partners' life insurance. This statement can be interpreted in a wider sense as risk insurance of joint obligations arising as a result of damage caused to the life, health or property of other persons.

The developed methods are based on calculation principles applied for rates of risk insurance classes and recommended by the Federal Service for Insurance Supervision of the Russian Federation.

In Russia the actuarial activity is performed in compliance with Federal Law No.293-ФЗ of November 02, 2013 *On Actuarial Activity in the Russian Federation,*[1] the international agreements of the Russian Federation as well as according to other federal laws and legislative instruments of the Russian Federation.

Actuarial cost methods on the basis of the principle of equality of the insurer's and policy holder's obligations make it possible to find out each policy holder's share of participation in the insurance fund, that is to define the rate sizes (*Sukhorukova I.V., Serdiukova Iu.A.,* 2015) and the impact of macroeconomic factors on the insurance premium size (*Vedmed I. Iu., Vorontsov D.N.,* 2017). In order to estimate the amount which each policy holder should contribute to the insurance fund, it is important to start with the calculation of the policy holder's financial obligations or with the calculation of the accounts payable due to the insurance contracts (*Falin G.I., Falin A.I.,* 2003). The mentioned issues are widely discussed in the studies by international authors (*Bowers N.L. et al,* 1997), (*Gantenbein M., Mata M.A*, 2008), (*Panjer H.H. et al,* 1998), (*Kaas R. et al,* 2001), (*Olivieri A., Pitacco E.,* 2011), (*Black K. et al,* 2013*)*. In order to estimate the sufficient size of the insurance fund, the insurer needs the information on how many objects may be damaged or may not be damaged due to an insured event. Statistical data can be used for calculation of the amount of accounts payable. For example, on the basis of the information on population mortality it is possible to estimate the probability of surviving and death for people of different ages. These data are used for compiling mortality tables that demonstrate dynamic changes in the number of people of a particular age group. The mortality tables are used for calculating net premiums of personal life insurance contracts and pensions for people of a particular age group (*Laptev P.V.,* 2015). Taking into account the long-term nature of such investments the rates are initially reduced by the income size gained as an interest of the insurer's funds used as credit resources.

Actuarial cost methods are also applied for the economic rationale of establishing a reserve fund of an insurance company for each life insurance policy. In addition to it, actuarial cost methods are used for calculation of the reduced surrender values (*Sukhorukova I.V.,* 2006), that allows adjusting of insurance premiums in the event of alteration of life insurance policies.

This paper continues the authors' research into estimating insurance risks of premature termination of a joint project because of one participant's leaving (*Chistiakova N.A., Sukhorukova I.V.,* 2017a). The current objective can be understood as follows. It is supposed that in the beginning of a joint contract of two partners there is an insurance policy that, in case of any partner's early leaving the projects due to external circumstances, implies an insurance cover payment to the other partner for maintenance of the joint project started. In the previous paper (*Chistiakova N.A., Sukhorukova I.V.,* 2017b) the authors revealed the probability of a risk event as well as probabilities of an insurance compensation payment to each partner in dependence of the periods of their obligations arising from the project and the partners' departure intensities specifying external threats for them. The objective of this paper is to estimate the cost of such a policy.

We can introduce the necessary notations ensuring consistency with our previous paper. We consider that the moment of the insurance contract signing coincides with the beginning

[1] Federal Law No.293-ФЗ of November 02, 2013 *On Actuarial Activity in the Russian Federation* (amended).

of the project. It is a begin time. The periods of obligations of the first and second partners can be expressed as T_1 and T_2, respectively. The prior duration period of the project is $\max\{T_1, T_2\}$; however, as external circumstances may cause an early individual leaving of the project by any of the partners, then the duration time of each partner's work in the project is a random variable. Therefore, we can introduce the τ_1 and τ_2 random variables referring to the work time of the first and second partners, respectively (*Chistiakova N.A., Sukhorukova I.V.,* 2017a). It is evident that the duration period of the insurance contract does not exceed the $\min\{T_1, T_2\}$ value as an insured event can occur only within the time of the partners' joint work $(0, \min\{T_1, T_2\})$. Let us assume that the following parameters are specified as the initial data: (T_1, T_2) - the vector of temporary obligations of the project partners, μ_x and $\tilde{\mu}_y$ - the partners' departure intensities given as the functions of the current time of work in this joint project, $x \in (0, T_1)$, $y \in (0, T_2)$, and describing external threats (risks) for the partners. Each of the introduced values can be defined in the following way.

The first partner's departure intensity at the x moment is the function $\mu_x = \lim_{\Delta \to 0+} \frac{1}{\Delta} P(\tau_1 < x + \Delta | \tau_1 > x), 0 < x < T_1$. The second partner's departure intensity at the y moment is defined similarly: $\tilde{\mu}_y = \lim_{\Delta \to 0+} \frac{1}{\Delta} P(\tau_2 < y + \Delta | \tau_2 > y), 0 < y < T_2$.

Then, there is a relation between the departure intensity, the distribution function $F_{\tau_1}(x) = P(\tau_1 < x)$ and the survival function $S_{\tau_1}(x) = P(\tau_1 > x)$ of the τ_1 random variable:

$$\mu_x = \lim_{\Delta \to 0+} \frac{1}{\Delta} P(\tau_1 \le x + \Delta | \tau_1 > x) = \frac{F'_{\tau_1}(x)}{S_{\tau_1}(x)} = \frac{-S'_{\tau_1}(x)}{S_{\tau_1}(x)}.$$

We can find the solution of the differential equation $\mu_x = \frac{-S'_{\tau_1}(x)}{S_{\tau_1}(x)}$ (*Katsnel'son A.A. et al, 1995),* it is $S_{\tau_1}(t) = e^{-\int_0^t \mu_x dx}$

Then, we obtain the particular densities of the τ_1 and τ_2 random variable distribution:

$$f_{\tau_1}(t) = -S'_{\tau_1}(x) = \mu_t S_{\tau_1}(t) = \mu_t e^{-\int_0^t \mu_x dx}, t < T_1,$$

$$f_{\tau_2}(s) = \tilde{\mu}_s e^{-\int_0^s \tilde{\mu}_y dy}, s < T_2. \quad (1)$$

Further, the external reasons of the contract termination allow considering the τ_1 and τ_2 random variables to be independent events. This circumstance provides us with the opportunity to find the density value of joint distribution of the random vector (τ_1, τ_2). In accordance with the equations (1) it looks like:

$$f_{(\tau_1, \tau_2)}(t, s) = f_{\tau_1}(t) f_{\tau_2}(s) = \mu_t e^{-\int_0^t \mu_x dx} \cdot \tilde{\mu}_s e^{-\int_0^s \tilde{\mu}_y dy}, \ 0 < t < T_1, \ 0 < s < T_2. \quad (2)$$

Now, we have prepared all the parameters necessary for calculation and can find out the cost of the above-mentioned insurance contract. First of all, it is needed to consider in more detail the approaches to definition of the amounts payable to the partners as insurance compensations by occurrence of the insured event. As the partners' shares in the joint project are originally different, it is natural to make the assumption that these compensation amounts are different for the partners participating in the joint project. In our statement of the problem

we believe that at the beginning moment the partners' shares in the project should be agreed by the participants and included into the agreement provisions. We can denote the reimbursement amount at the moment of the first partner's early leaving as S_1 and the reimbursement amount at the moment of the second partner's early leaving as S_2. It is a vector of parameters for the problem considered.

In order to estimate the cost of the above-mentioned insurance service we can assume that the policy holder makes a one-time payment for it at the beginning moment of time. As the process is dynamically developing in time, it is necessary to introduce a compound interest rate valid over the period of the contract term. It is traditionally denoted as *i%* per annum. Then, the corresponding present value factor can be expressed as $\nu = (1+i)^{-1}$. The cost of the insurance contract can be calculated applying the actuarial cost method through equalizing the mathematical expectations of the expenses born by the policy holder and the insurer.

In order to estimate the cost of the above-mentioned insurance contract we need to find out the current cost of the policy holder's obligations (i.e. the cost at the moment of the contract signing). As the time periods of the first and second partners' participation in the joint project are the τ_1 и τ_2 random variables (*Zhmurko G. et al,* 1997), respectively, then the required current cost of the contract is a random variable too, it can be expressed as:

$$A = A(\tau_1, \tau_2) = \begin{cases} S_1 \cdot \nu^{\tau_1} \text{ at } \left\{\tau_1 < \min\{T_1, T_2\}_1 \bigcap \tau_2 > \tau_1\right\} \\ S_2 \cdot \nu^{\tau_2} \text{ at } \left\{\tau_2 < \min\{T_1, T_2\} \bigcap \tau_1 > \tau_2\right\} \\ 0 \quad \text{in the other cases} \end{cases} \tag{3}$$

This equation takes into account two mutually exclusive reasons for payment of the insured amount when the first partner leaves the project and when the second partner does. According to the equivalence principle of the insurer's and policy holder's obligations the A mathematical expectation represents the cost of the above-mentioned insurance contract. We can obtain it from the above equation (3) applying the formula of mathematical expectation to the function of a random vector using the found density (2) of the joint distribution of the (τ_1, τ_2) random vector. Figures 1 and 2 represent the (τ_1, τ_2) value ranges where it is necessary to perform the integration at $T_1 \le T_2$ and at $T_1 \ge T_2$, respectively. In the both cases they form a rectangle divided into a triangle and a trapezoid according to the equation (3).

Figure 1 The (τ_1, τ_2) value range for the integral evaluation at $T_1 \le T_2$

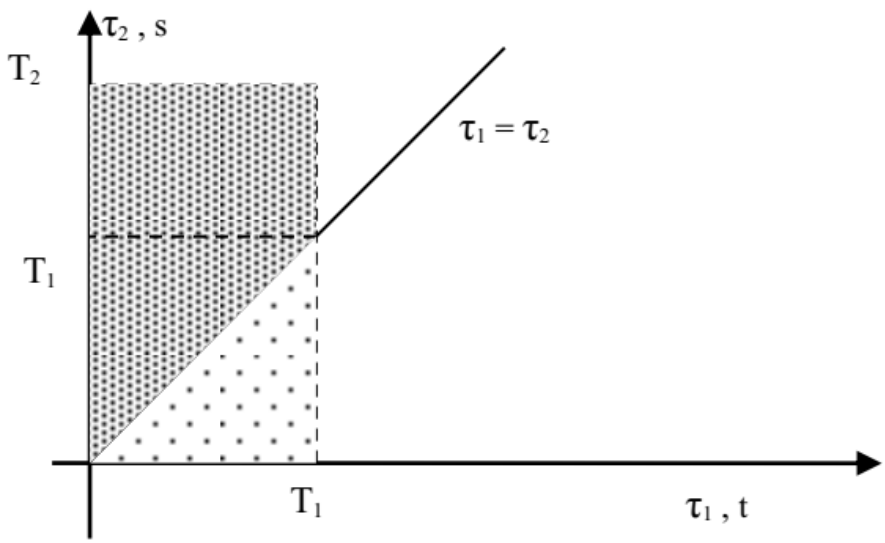
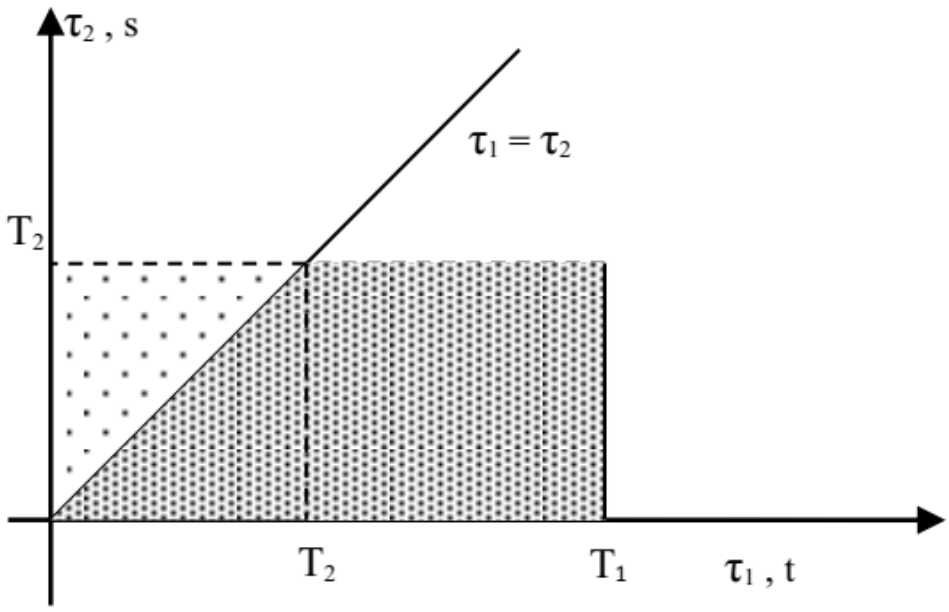


Figure 2 The (τ_1, τ_2) value range for the integral evaluation at $T_1 \geq T_2$



After integration we obtain

$$MA=\begin{cases}\int_0^{T_1} S_1 v^t \cdot \mu_t e^{-\int_0^t \mu_x dx} dt \int_t^{T_2} \tilde{\mu}_s e^{-\int_0^s \tilde{\mu}_y dy} ds + \int_0^{T_1} \mu_t e^{-\int_0^t \mu_x dx} dt \int_0^t S_2 v^s \cdot \tilde{\mu}_s e^{-\int_0^s \tilde{\mu}_y dy} ds & \text{at } T_1 \leq T_2, \\ \int_0^{T_2} \tilde{\mu}_s e^{-\int_0^s \tilde{\mu}_y dy} ds \int_0^s S_1 v^t \cdot \mu_t e^{-\int_0^t \mu_x dx} dt + \int_0^{T_2} S_2 v^s \cdot \tilde{\mu}_s e^{-\int_0^s \tilde{\mu}_y dy} ds \int_s^{T_1} \mu_t e^{-\int_0^t \mu_x dx} dt & \text{at } T_1 \geq T_2, \end{cases} \quad (4)$$

The contract cost is obtained. To illustrate this computation by a numeric example we can assume $T_1 = T_2 = 1$ and $S_1 = S_2 = S$ for clearness and simplicity. In addition to it, for simplicity let us assume that the partners' departure intensities due to the external reasons are equal and at the x moment of the project duration can be expressed as $\mu_x = \tilde{\mu}_x = \frac{1}{1-x}, x \in (0,1)$. Now, we can calculate the contract cost for this example introducing all the parameters into the equation (4). In this case when $T_1 = T_2 = 1$ and $S_1 = S_2 = S$ the both formulas in the equation (4) provide the same result, therefore in the purpose of clearness let us write down the first of them and we obtain the following:

$$MA=\int_0^1 S v^t \frac{1}{1-t} e^{-\int_0^t \frac{1}{1-x} dx} dt \int_t^1 \frac{1}{1-s} e^{-\int_0^s \frac{1}{1-y} dy} ds + \int_0^1 \frac{1}{1-t} e^{-\int_0^t \frac{1}{1-x} dx} dt \int_0^t S v^s \frac{1}{1-s} e^{-\int_0^s \frac{1}{1-y} dy} ds =$$

$$= S\left[\int_0^1 v^t \frac{1}{1-t}(1-t)\,dt \int_t^1 \frac{1}{1-s}(1-s)\,ds + \int_0^1 \frac{1}{1-t}(1-t)\,dt \int_0^t v^s \frac{1}{1-s}(1-s)\,ds\right] =$$

$$= S\left[\int_0^1 v^t (1-t)\,dt + \int_0^1 \frac{v^s}{\ln v}\Big|_0^t dt\right] = S\left[\frac{v^t}{\ln v}\Big|_0^1 - \int_0^1 v^t t\,dt + \int_0^1 \frac{v^t - 1}{\ln v} dt\right] =$$

$$= S\left[\frac{v-1}{\ln v} - \frac{t \cdot v^t}{\ln v}\Big|_0^1 + \int_0^1 \frac{v^t}{\ln v} dt + \frac{v^t}{\ln^2 v}\Big|_0^1 - \frac{t}{\ln v}\Big|_0^1\right] = S\left[\frac{v-1}{\ln v} - \frac{v}{\ln v} + \frac{v-1}{\ln^2 v} + \frac{v-1}{\ln^2 v} - \frac{1}{\ln v}\right] =$$

$$= S\left[\frac{-1}{\ln v} + \frac{v-1}{\ln^2 v} + \frac{v-1}{\ln^2 v} - \frac{1}{\ln v}\right] = 2S\left[\frac{v-1}{\ln^2 v} - \frac{1}{\ln v}\right] = 2S\left[\frac{v-1-\ln v}{\ln^2 v}\right]$$

As the present value factor satisfies the constraint $v = (1+i)^{-1} \in (0,1)$, it is easy to show positivity of this expression.

Applying the specific values of the interest rate we can compile the contract cost table for illustrative purposes. Table 1 below shows the insurance contract cost values at the corresponding annual interest rate values taken for this example.

Table 1 The insurance contract cost in relation to the interest rate

Interest rate, i	Present value factor, v	Insurance contract cost, MA
0.03	0.970874	S*0.990219
0.04	0.961538	S*0.987054S
0.05	0.952381	S*0.983933S
0.06	0.943396	S*0.980857
0.07	0.934579	S*0.977823
0.08	0.925926	S*0.974832
0,09	0.917431	S*0.971882
0.1	0.909091	S*0.968973

It is evident for this example that the cost is high as the duration period of the project is short enough and such departure intensities imply the obligatory reimbursement.

It is obvious that generally in order to make practical numeric forecasts on the probability of compensation payments by the insurance company and to calculate the insurance contract cost it is necessary to thoroughly select the probability parameters characterizing the partners' external threats. In this context, accumulation of appropriate statistical data by the top insurance companies offering such an insurance product as well as application of numerical techniques and simulation methods could be useful.

5. CONCLUSION

It is supposed that each partner has the obligation to accomplish its share of participation in the joint project within the certain period of time. The paper presents the developed theoretical provisions, methodological approaches and practical recommendations on economic regulation and management of joint business activity involving several participants (partners) in case of premature termination by one of them. This study has investigated the methodological issues of long-term insurance in the Russian Federation; it has developed the theoretical approaches to risk evaluation of premature termination of a joint project because of a participant's early leaving; it has provided the scientific substantiation of and developed a conceptual economic mathematical model for calculating risks of one participant's early leaving a joint project due to external circumstances; the scientific and practical recommendations for calculation of a rate net premium have been provided using case study. To achieve the objectives set out we used probability-theoretical models and actuarial mathematical methods for calculating insured components such as computational analysis, balance and statutory methods, and others. The analytical expression of the rate net premium of reimbursement payable to each partner in case of the other partner's early leaving the project due to the external circumstances has been obtained.

Conclusions. The outcomes of this study provides the analytical expressions for calculating insurance rates as one-time payments. The practical significance of the study outcomes is related to the possibility of applying the developed economic mathematical model for calculating the cost of an insurance contract, both in case of a single insurance product and a combination of different insurance products, that could improve an insurance company's liability for consequences of its rate policy. The proposed methods and tools allow taking into account potential risks at all the stages of solution development by an insurance company; avoiding adverse economic consequences in its business activities.

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