

CASCO INSURANCE STATISTICS AND INSURER'S RISK MANAGEMENT

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A complex of the expert researches and actuarial accountings directed to the analysis of the transactions of CASCO insurance in the Latvian insurance market is performed in the given paper. Opportunities of creating the uniform and general system of the insurance statistics indices taking into account all objectives and functions of CASCO insurance are considered. Such complex of researches and calculations is performed for the development of the underwriting management and underwriting risk management of the auto insurance. The statistical data of the Financial and Capital Market Commission related to the insurance market in Latvia is used.

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In the world the modern insurance relies on a strong theoretical base, which main constituent is the theory of the actuarial accounting that is a synthesis of the probability theory and insurance statistics. A peculiarity of the risk underwriting connected with the insurance of motor transport is predetermined by the distribution of these risks and amount of responsibility accounted by insurers to insured. The probabilistic characteristics of the researched process are determined on the basis of the previous experience and are relied on the results of the statistical data processing. The statistical data of the Latvian insurance market shows that almost 40% of gross-premiums and gross-payments in the market are CASCO insurance. The stability of the insurance market depends directly on the state of CASCO insurance portfolio [1]. At the modern stage in Latvia there is no general system of statistical base with the uniform indices for the accounting of the insurance rates and development of measures for the auto insurance underwriting risk management. For provision of the reasonable insurance rates both for insurers and insured, they must be calculated taking into account a maximally possible number of factors influencing on the risk insured. The basic net rate ensures (with the corresponding restrictions and reservations) the reimbursement of the insured's requirements. At the same time, an insurer bears organizational and administrative-managerial costs that are foreseen in the gross rate. The development of the general methodical base for collection, filing and processing of the gathered data assumes the creation of: the system of indices capable to reveal needs of the insurance companies visually and adequately; correction mechanism (when it is necessary); system of indices in the process of the insurance market state changing; mechanism of participation of the statistical data users in such correction. The developed system of the insurance statistics indices must meet certain requirements: to embrace all important areas of insurance; to provide the interconnection of data inside the insurance statistics system itself on the basis of a number of analytical operations revealing these connections (first of all by means of use of the uniform classifications and classifiers); to provide an opportunity of discovering specificity of the insured loss for various classes of insured [2].

In the given paper the analysis of CASCO insurance that is a voluntary type of motor transport insurance against damage and theft caused as a result of traffic accidents, unlawful acts of the third parties, natural disasters etc. is performed. The insurance statistics is based on gathering of the necessary information with the help of statistical and business accounting. The total indices generalized in the current and annual statistical accounts are analysed by attracting the business account data and are processed with the help of the statistical methods. As a result of the analysis of the literature data and information about the insurance market of Latvia the indices of the insurance transactions are revealed that are determined:

- before signing the insurance agreement;
- before the insured loss;
- after the insured loss;
- after payment;
- after denial of payment;
- after completion of agreement without losses;
- indices determined as a whole for the insurance period (a number of years).

The Latvian insurance companies have already come to understanding of the necessity to manage their own databases. However, it cannot be a full value solution of a problem because in case of such uncoordinated registration the obtained (by each insurer) information will be of a very small amount, heterogeneous and not very reliable. There is an objective necessity of creating the general database of the insurance statistics (for example, for the obligatory civil liability insurance of vehicle owners the general statistics is available, but data does not reveal information about damage caused by the initiator of the traffic accident, and this is damage that

can be covered by CASCO insurance). The insurers are already experiencing a deficit of the actuarial statistics and/or are not satisfied by the quality of the accessible (available) information. For the present moment the insurers already possess a sufficient amount of information that can be shared. For this purpose the following is necessary: to conduct a full "inventory" of the companies' available information base; to analyse the statistical indices of the companies' operating systems, to find out about an opportunity of the direct use of the statistical data after the corresponding mathematical processing etc. For the creation of the insurance statistics system taking into account all objectives and functions of insurance it is necessary: to develop the general methodical base for collection, filing and processing of the being gathered data, to determine the system of indices capable to reveal needs of the insurance companies visually and adequately; to create the correction mechanism (when it is necessary) of the system of indices in the process of the insurance market state changing [2].

The developed system of indices of the insurance statistics must meet certain requirements: to cover homogeneous objects with homogeneous risks; to provide the interconnection of data inside the insurance statistics system itself on the basis of a number of analytical operations revealing these connections (first of all by means of use of the uniform classifications and classifiers); to provide an opportunity of discovering specificity of the insured loss. The generalization of the statistical data of the insurance companies cannot be purely mechanical. For realization of the information gathering process it is expedient to provide the interested insurers with the "standard" software for creation of the integrated system of indices of the insurance statistics, which must reveal main processes relating to CASCO insurance, their interconnection and interdependences. For this purpose it is necessary to develop the general methods of the description of all used indices with the aim of their unification and comparability achieving.

A peculiarity of risk underwriting connected with the motor transport insurance is predetermined by risk distribution and their assumed combination as well as by conditions of insurance. A solution of these tasks initially depends on types of risks and amount of responsibility accounted by an insurer to insured. An insurer marks out main and additional risks of coverage. Main risk coverage of loss payment includes risks that have appeared under the influence of the following factors: the traffic accident risk; risks connected with fire, losses, which are a result of impact of fire, smoke or soot, risks as a result of the unlawful acts of the third parties. An amount of CASCO insurance premium depends on the following factors: mark and model of a vehicle; cost of a vehicle; year of issue of a vehicle; a purpose of use of a vehicle; choice of own risk; age (to 25 and more); driver's practice; insurance history; chosen schedule of payment (a list and importance are determine by each insurer). The conditions of CASCO insurance characterize the following indices, by which they are distributed by classes of risks: sum insurance; the deductible; territory of coverage, personal data of a driver. The underwriting for such types of insurance as CASCO insurance has some peculiarities, and it is connected: with relatively low capacity of the direct insurers, with the requirement of cost restrictions for the insurance products, with possible accumulation of the insurance losses (i.e., their growth as a snow ball) [3]. For determination of the insurance premium for CASCO insurance it is necessary to take into account the general dynamics of traffic accidents. The dynamics of traffic accidents in view of their consequences is characterized by certain regularity. It is confirmed by the dynamics of the loss indices of CASCO insurance approximated by the equation of line. Therefore, the given indices vary in the difference of the arithmetic progression, and all further payments of an insurer are in certain interconnection. It is known that a general value of the expected payment (W) for all t years equals a sum of the year's expected payments:

$$W = St[q + (t - 1)b], \quad (1)$$

where S – amount of sum insurance, q – loss index, t – number of years, b – annual increase of loss index.

For an insurer in the first year of insurance the mathematical expectation of payment of some sum equals product of S to q ; in the second year, in view of some increase of the loss index due to intensification of traffic, the mathematical expectation of payment will compile $S(q + b)$, in the third year - $S(q + 2b)$, in the t -th year - $S[q + (t - 1)b]$.

An amount of the necessary (minimal) payments for insured is calculated and compared with the sum calculated according to the basic rates. Really, to the probable sum of the insurer's payments in the first year of insurance a certain sum of the insured's payments - a_1 , in the second year - a_2 , etc. must correspond. To the general sum of the insurer's contributions for t years a sum of the insured's' payments must correspond:

$$a_1 + a_2 + a_3 + \dots + a_t = \bar{a}t, \quad (2)$$

where \bar{a} – average annual payment, t – a number of years.

The average payment of an insurer must not be less than

$$\bar{a} = \frac{S[q + (t - 1)b]}{2}. \quad (3)$$

In the given model the most unstable value is a coefficient of the arithmetic progression. Therefore as far as information about frequency and consequences of accidents is accumulated it is necessary to define more precisely the forecast calculation or to apply to other forms of dependency of the insurance events. On the basis of such calculations an underwriter forms the tariff policy. The estimation of the basic rates for CASCO insurance (and also other types of risk insured) is performed on the basis of the loss index of the sum insurance:

$$I_{losses} = I_{shares} I_{mean\ insurance\ indemnity} / I_{mean\ sum\ insurance}, \tag{4}$$

where I_{losses} – index of loss, I_{shares} – shares of damaged objects, $I_{mean\ insurance\ indemnity}$ – mean insurance indemnity and $I_{mean\ sum\ insurance}$ – mean sum insurance.

The basic rate consists of the net rate (net premium) determined directly according to the index of loss and its increase (load) that is calculated on the basis of the insurer’s expenditures calculation. In the net rate a net value of the expected insurance indemnity is revealed, and its increase is foreseen for coverage of the insurance authorities’ expenditures for various preventive measures, administrative costs, formation of reserve fund, and also for realization a profit. In calculation of rates certain actuarial principles are put.

The loss index equals a product of share (probability) of the insurance events to their heaviness. If the average heaviness $W/S = I$ (equals one), then the index of loss q characterizes probability (chance) of some complete loss and complete reimbursement of the sum of the insured motor transport. Accordingly, the probability that such loss will not happen equals $p = (1 - q)$. Since it is a question of two opposite probabilities of the insurance events, then the theoretical distribution of such cases must obey to the known binomial expansion $(p + q)^n$ with arithmetic mean Nq and dispersion value $\sigma = Npq$.

Therefore a variation of the loss index as some share or chance of the motor transport loss is within the limits:

$$q = \pm t'' \sqrt{\frac{q(1-q)}{N}}, \tag{5}$$

where t'' — the Laplace number, which value is predetermined by the probability of assessment of this confidence interval (for prevention of the insurer’s losses during rate making (net) a minus sign in the given formula is almost never used.).

The produced formulas are of fundamental importance for the assessment of the insurance case stability and practice of the net rates making. A ratio of standard deviation to arithmetic mean gives a variation index, which in this case characterizes the financial stability of the insurance case that increases with decrease of the variation coefficient and decreases with increase of the variation coefficient. The given coefficient depends on the value of the loss index and the amount of agreements that are interconnected: if a value of loss is stable, and the amount of agreements is increasing, then the financial stability increases; if the amount of agreements is stable and the index of loss is increasing, then the variation coefficient decreases and the financial stability is increasing. A practical idea of these changes is different: in the first case the increase of the financial stability is provided owing to the increase of the amount of agreements; in the second case — owing to increase of the payment rate that is economically inequivalent. In practice, a value of standard deviation is usually added to the mean rate, and as a result a rate can unreasonably increase the index of loss. The estimation of such deviations demands studying the methods of net rates calculation of the insurance payments. So, a formula of the binomial expansion that is quite often used for the analysis of the insurance events and the payment rates, assumes a complete independence between chances of destruction for the insured motor transport. Meanwhile, such independency cannot exist. Besides, mean insurance indemnity \bar{W} is not equal to the mean sum insurance \bar{S} , and it means that the coefficient of the heaviness of the loss case W/S is not equal to one. The index of loss is not a synonym of events probability and it serves as some substitute of this probability that depends: on nature of the loss case, rules of insurance established by the insurer.

During the development and testing of the insurance payment rates it is possible to use another method of calculation (first of all when we deal with a big portfolio of the insurance agreements such as CASCO insurance). When the reporting data about the loss indices for a number of years is available, it is possible to calculate a mean index of loss (as the arithmetic mean) and a value of standard deviation by the actual indices of loss. By adding it to the average annual index of loss, it is possible to exclude the unfavourable changeability of this index. The general scheme of the given calculation is very simple. If, for example, for a number of years t there are actual indices of loss $q_1, q_2, q_3, \dots, q_n$, then we calculate sequentially:

$$\begin{aligned} \text{❖ mean index of loss} & - \bar{q} = \frac{\sum_{t=1}^n q_t}{t}; \\ \text{❖ standard deviation} & - \sigma = \sqrt{\frac{\sum_{t=1}^n (q_t - \bar{q})^2}{n-1}}; \end{aligned}$$

$$\diamond \text{ value of rate (net) } - u'' = \bar{q} + t'' \sigma,$$

where t'' — the Laplace number.

Thus about the stability of the insurance case one can judge by comparing the actual payments of the insurance indemnity to each 100 m.u. of the sum insurance with the established rate (net). For this purpose, also the index of payments of the insurance indemnities W/V serves, which amount depends on the growth speed of payments V of the insurance indemnity W . Since payments and indemnity depend on the initial amount of agreements and the sum insurance, then this index reveals the interconnection of many factors. For their analysis it is appropriate to use the regression models. In particular, with reference to the voluntary insurance of property the connection between W and V is possible to present in the form of the equation of line: $W = a + bV$, where a and b — parameters of the equation.

For estimation of the insurance transactions quite simple indices of the payment level and payment level norms are used:

$$L = \frac{W}{A} \quad (6)$$

and

$$L_n = \frac{W}{A} 100\%, \quad (7)$$

where L – level of payment, L_n – norm of payment level, A – gathered payments – insurance premiums.

To a number of the enlisted factors the qualitative methods of the analysis are quite applicable, but to the majority – just qualitative, for example, the expert assessments, which can be performed by a group of specialists in the beforehand coordinated staff. In case of the group fewness in the process of underwriting usually there is a consensus of opinion in relation of the investigated risk, and, then, the additional analysis is not required. But, if to assume that the assessment is performed by a large number of experts, then a complete coincidence of opinions is unlikely, i.e. as a result of questioning of experts we will receive some statistics of the distribution of opinions, in particular, of forecasting character. They become a basis for the risk pricing.

Conclusions

In the paper the statistical data collected for 2006 including 2007 concerning the insurance market of Latvia has been used. A complex of researches and actuarial accountings directed to the analysis of CASCO insurance transactions has been performed. Such complex of researches and accountings is performed for the development of the instruction for underwriting and risk management of the insurance underwriting. A scientific novelty of this paper is in the integrated approach to the analysis of the optimal strategy of an insurer when choosing a policy of underwriting of CASCO insurance agreements. The results of the research can be used by the insurance companies for the elaboration of the underwriting policy for CASCO insurance and by the Financial and Capital Market Commission for risk management of the Latvian market of CASCO insurance.

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