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OUTSOURCING OPTIMIZATION MODEL IN THE RUSSIAN CAR INSURANCE MARKET

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Abstract. Outsourcing is a popular management strategy aimed at optimizing the operation of various organizations, including insurance companies all over the world. However, the involvement of an intermediary between insurance parties does not only serve to improve the efficiency of the insurer's business operations, but also poses extra risks. This article proposes a risk optimization model regarding the insurer's risks when outsourcing certain operations. The model was analyzed on the example of car insurance using the Russian insurance market data (the Ingosstrakh Insurance Company). To our opinion, the presented optimization model is capable of bridging the gap in the insurance theory and lay a foundation for further economic studies of insurance intermediaries. The model was tested with the data of Russian insurers and showed that outsourcing in the current insurance market of comprehensive car insurance cover is unprofitable due to a high concentration of fraud. We calculated the optimal threshold for fraudulent payouts in car insurance, which should be as low as 0.64%. The proposed hypothesis for further research consists in the following: In terms of the ratio of profitability and risk, selling insurance policies through intermediaries can be profitable for insurance companies with respect to inexpensive insurance products only.

Keywords: insurance; outsourcing; risks; optimization model; insurance intermediary; fraud; Markov analysis

1. Introduction

The effective management of the insurance company is creating an effective insurance organization and adjusting it in accordance with the changing tasks and circumstances of the insurance market. Unpredictability of a possible result, i.e. its risky nature is a characteristic feature of the insurance market. In the international market, entrepreneurs are constantly looking for ways to save money, improve the quality of their products and services, and improving their business performance in order to keep business and to compete successfully (Hilkevics, Semakina 2019; Prodani et al., 2019).

The theory of business management suggests that the majority of companies, both large and small ones, can enjoy significant competitive advantages through outsourcing (Heywood 2002, p. 37). Outsourcing is a business paradigm in which an organisation transfers part of its business processes to a service provider (Zitkiene, Dude 2018; Corrigan 2019). Outsourcing enables the insurance companies to perform their daily functions by forming a solid basis of profitability and growth (MOS Team 2019). It means that the outsourcing of various functions that are not directly related to the formation of the insurance product is used as an important factor in reducing the costs of the insurance company. In order to increase the return on capital employed, managerial accounting prefers to increase inventory turns and reduce working capital. This may, however, be achieved at a higher total direct cost where the labor is the most significant cost differentiator between the local manufacture and outsourcing to low-labor-cost regions (Newlands, AL-Husan 2019).

In reality, the insurance companies delegate some operations to other companies in pursuit of improving their operating efficiency. This delegation of some operations, the outsourcing, allows providing continuity, trancperancy and quality of the business processes. While the banking and telecommunication sectors pioneered this area, the insurance sector companies rather unwillingly consider and implement outsourcing under the market pressure, in order to improve their efficiency or even "restructure their value chains" (Vagadia 2012). Insurance coverage is a critical service that companies offer to consumers to safeguard against financial loss in the event of unforeseen circumstances such as illness, natural calamity and vehicular accidents. Property and casualty insurance (P&C) outsourcing involves providing outsourcing services such as consulting, technology enablement and managed services across areas like auto, theft, property and natural calamities (Vones et al. 2019).

A vivid example of outsourcing in the insurance sector is selling insurance products through non-salaried insurance salesmen and persons fulfilling their function. However, this poses the question whether it is reasonable to outsource elements of the main activity, but not some secondary operations, such as accounting or IT services, which is particularly relevant for SMEs (Grama, Păvăloaia 2014).

In this study, we proposed a tool for insurers to calculate the benefits of outsourcing certain operations based on the ratio of profitability of the operation and the risk posed by the intermediary involvement. The common advantages and disadvantages of the outsourcing are given in the table below (see Table 1).

Table 1. The advantages and disadvantages of the outsorcing

Advantages	Disadvantages
The financial benefit: there are no payments related to dismissal, compensation for unused vacation, maternity, sick leave, etc. Also, the contractor uses its own equipment, office etc.	The information leakage risk. It is quite hard to to control the safety of the confidential information in the other company (To reduce this risk the inssurance company should put it into the agreement or contract and to underline the responsibility for sharing the confidential information)
The reducing the workload of the human resources department	The reliability of the partner. If the partner will not be reliable or will go broke it wqill influene negatively on the insurance company reputation and the clients
The company is insured against suspension of services due to illness or the sudden dismissal of employees.	
It is easier to dismiss an employee who does not work fror the company directly and it is easier to find a new employee	

Source: compiled by the author

2. Literature review

The efficiency of business operations of insurance companies and methods of their improvement are the subjects of study for researchers in various countries (Chen et al., 2011; Biener et al., 2016; Hsieh et al., 2014). They consider outsourcing as one of the methods for improving operating efficiency, cost reduction, and for risk

mitigation, as well as a tool for "ensuring viability, building a system of long-term and mutually beneficial relationships in a business..." (Veretnov 2009, p. 67). Some studies deal with risk management from the quality (Mao et al. 2018) and quantity (Zou, Cadenillas 2014) points of view. It should be realized that involvement of intermediaries in the insurance business adds extra risks that require being studied additionally. Reducing the risks means the reduction of the extent of the possible damage or the possibilities of the adverse events.

Previously, Russian academic economists mostly studied outsourcing-related opportunities and risks in the insurance market by the dialectical and general scientific methods of cognition (Gukova et al. 2016), as well as surveyed the statistical data of insurance companies by the econometric approach (Trifonov 2015). This article suggests using the quantitative methods for assessing insurer's risks that arise when certain operations are outsourced to intermediaries.

3. Methodology

Considering that the market of the insurance service for the clients is developing and growing (see Table 2), the companies need the trustful instrument of growing the profits and lowering the risks.

Table 2. The profit of the insurance companies in Russia (from 2013 to 2018)

Year	Billion of rubles
2013	31.2
2014	59.7
2015	91.2
2016	82
2017	84
2018	165

Source: Central Bank, 2019

The risk management involves its identification, assessment and development of measures to reduce the likelihood of its implementation and the amount of damage that will arise in case of its implementation. We have already proposed to use Markov chain method to assess the risks arising when certain operations are outsourced by the insurer (Markov 1924; Kozminykh 2017; Troffaes et al. 2019). The method of the risk assessment, based on the usage of Markov chain, looks like the traditional analysis of the reliability, described by Terje Aven in his work: "Risk assessment and risk management: Review of recent advances on their foundation" (Aven 2016). Our analysis based on the data on the development of the Russian insurance market, as well as insurance-related fraud data on the example of the Ingosstrakh Insurance Company showed that outsourcing insurance policies is currently unprofitable in terms of revenues and risks. This is due to the high level of fraud in the insurance market (Churilov 2014; Krawczyk 2009). The quantitative (mathematical and statistical) methods of fraud detection in car insurance have been a relevant subject for research for the recent years (Nian et al. 2016; Subudhi, Panigrahi 2017).

The purpose of our study is to propose a model for optimizing profitability and risk when outsourcing certain insurers' operations. As the main indicators, we chose the ratio of profitability and risk, expressed with the coefficient of variation. The model can be formulated as follows (1):

$$|V1| <= |V2| \tag{1}$$

where V1 is the coefficient of variation for outsourcing an operation,
V2 is the coefficient of variation or the accomplishment of the operation by the insurer.

The coefficient of variation shows what share of the average value of this magnitude is comprised by its average range of variation. The coefficient of variation is found as the ratio of the standard deviation and average expected value, and can be formulated as follows (2):

$$\sigma_1 / |\bar{X}_1| <= \sigma_2 / |\bar{X}_2| \qquad (2)$$

where σ_1 is the standard deviation for outsourcing the insurer's operation;
$\bar{X}_1$ is the average expected value for outsourcing the insurer's operation;
σ_2 is the standard deviation for the accomplishment of the operation by the insurer;
$\bar{X}_2$ is the average expected value for accomplishment of the operation by the insurer.

After basic mathematical transformations, the optimization model takes on the form of the following equation (3):

$$\sigma_1 * |\bar{X}_2| - \sigma_2 * |\bar{X}_1| <= 0 \qquad (3)$$

The average expected value $\bar{X}$ is calculated with the following formula (4):

$$\bar{X} = \sum X_i \cdot p_i \qquad (4)$$

where $\bar{X}$ is the average expected profit in each case under study;
X_i is the expected profit of the ith outcome, $i = 1; 2; \ldots; k$;
p_i is the probability of the ith outcome.

The standard deviation is calculated by the following formula (5):

$$\sigma = \sqrt{(\llbracket \sum ((X_i - \bar{X}))\rrbracket ^2 \cdot p_i))} \qquad (5)$$

where σ is the standard deviation,
X_i is the profit of the its outcome,
$\bar{X}$ is the average expected profit in the situation under study,
p_i is the probability of the ith outcome.

Further, we consider a specific case of the model application.

4. Research results

The insurance company decides whether to outsource the operation of selling comprehensive car insurance to an insurance intermediary or to perform it in-house. Based on the Markov analysis data, the insurer finds the probability of certain scenarios for the case of outsourced and in-house performance of the operation. The data on the possible scenarios, required for executive decision-making are provided in Table 3.

The rounded calculations performed based on Table 3 data and formulas (4) and (5) demonstrate the following:
• the average expected value for outsourcing $\bar{X}_1$ is equal to (-28.064);
• the average expected value for in-house sale of a comprehensive car insurance policy $\bar{X}_2$ is equal to 19.701;
• the standard deviation for outsourcing σ_1 is equal to 346.973;
• the standard deviation for in-house sales σ_2 is equal to 39.705;

Consequently, $\bar{X}_1 < \bar{X}_2$, $\sigma_1 > \sigma_2$. The coefficient of variation for outsourcing V1 is equal to (-12.36). The coefficient of variation for in-house fulfillment of the operation by the insurer V2 is equal to 2.02. Consequently,

|V1| > |V2|. This is inconsistent with the original proposal (see Formula 1). Using the above optimization model, we calculated the level, to which the element of fraud in car insurance should be reduced in order to make insurance policy outsourcing profitable. An essential condition for this is to ensure that the absolute value of the coefficient of variation for outsourcing (V1) does not exceed the absolute value of the coefficient of variation for in-house accomplishment of the operation by the insurer (V2). The value of V2 is equal to 2.02. |V1| <= 2.02.

Table 3. Source data for executive decision-making on outsourcing comprehensive car insurance policies

Possible scenario	Situation description	Profit (rub.)	Profit structure	Scenario probability (%)	Constituent elements of the scenario probability
			Outsourcing		
Scenario 1	The insurance intermediary sold an insurance policy, the insured event did not happen.	106.912.15	Insurance premium - Insurance premium*Intermediary's remuneration share	27	$p_1 * p_b$
Scenario 2	The insurance broker sold an insurance policy, the insured event happened.	45.630	Insurance premium - Insurance premium*Intermediary's remuneration share - Average insurance benefit	43	$p_1 * p_{(1-b)}$
Scenario 3	The insurance broker realized the risk of opportunist behavior	-1.530.988	Insurance premium - Insurance premium*Intermediary's remuneration share - Insurance benefit in the amount of the cost of the insured property	5	p_2
Scenario 4	The insurance broker failed to sell an insurance policy within the accounting period.	-5.4	Costs for issuing an insurance policy	25	p_3
			In-house sale		
Scenario 1	The insurer sold an insurance policy, the insured event did not happen.	125.779	Insurance premium	9	$p'_1 * p'_b$
Scenario 2	The insurer sold an insurance policy, the insured event happened.	64.498	Insurance premium - Insurance benefit	13	$p'_1 * p'_{(1-b)}$
Scenario 3	The insurer failed to sell an insurance policy within the accounting period.	-5.4	Costs for issuing an insurance policy	78	p'_3

Source: compiled by the author based on Kozminykh (2017).

We expressed the coefficient of variation as the ratio of the standard deviation and the absolute value of the average expected value as follows (2): $\sigma 1 / |\overline{X}1| <= 39.705 / 19.701$.

Next, we built a proportion and obtained the following inequality: $\sigma 1 * 19.701 – |\overline{X}1| * 39.705 <= 0$.

Then, we determined the value of $|\overline{X}1|$ by the following formula (4): $|\overline{X}1| = |106.912.15 * 0.39 * p1 + 45.630 * (1-0.39) * p1 + (-1.530.988) * p2 + (-5.4) * 0.25 | |\overline{X}1| = | 69,530.04 * p1 – 5.4 * p2 – 1.35 |$.

Then, we determined the value of $\sigma 1$ by the following formula (5): $\sigma 1 = ((106.912.15 - \overline{X}1) \text{^2} * 0.39 * p1 + (45.630 - \overline{X}1) \text{^2} * 0.61 * p1 + (-1.530.988 - \overline{X}1) \text{^2} * p2 + (-5.4 - \overline{X}1) \text{^2} * 0.25) \text{^0.5}$

The sum of probabilities p1, p2, and p3 is equal to 1. The value of the probability that the insurance intermediary fails to sell the insurance product (p3) is fixed and equals to 25%. Consequently, the probability p2 can be found as follows: $p2 = 1 - 0.25 – p1$. $p2 = 0.75 - p1$. In this case, we should limit the values of probabilities p1 and p2. As is known, the probability value ranges between 0 and 1. $0 <= p1 <= 1$. $0 <= p2 <= 1$.

The general system of equations to be solved in order to find the optimal level of fraudulent benefits in the insurance market has the following form:

- $Ƃ1 * 19.701 - |\overline{X}1| * 39.705 <= 0. |\overline{X}1| = | 69.530.03 * p1 – 5.4 * p2 – 1.35 |$
- $Ƃ1 = ((10.612.2 - \overline{X}1)^2 * 0.39 * p1 + (45.630 - \overline{X}1)^2 * 0.61 * p1 + (-1,530,988 - \overline{X}1)^2 * p2 + (-5.4 - \overline{X}1)^2 * 0.25)^0.5. p2 = 0.75 - p1. 0 <=p1<= 1. 0 <=p2<= 1.$

According to calculations in Maple, the optimal value of the probability of successful sale of an insurance product by the insurance intermediary (p1) makes 0.7468210422. Consequently, the probability of opportunist behavior of the insurance broker (p2) is equal to 0.0032, i.e. 0.3%.

Currently, the probability of fraud in selling comprehensive car insurance policies through intermediaries equals to 5%. This value was found through the Markov analysis based on the fact that 10% of paid out comprehensive car insurance benefits are fraudulent (Kozminykh 2017, p. 24-96). Taking into account that the found value of fraud probability is equal to 0.3%, the actual probability should be reduced by 16.6 times. That is, in order to find the tolerated amount for fraudulent payouts of benefits under comprehensive car insurance, we should divide 10% by 16.6. The result is 0.64%.

5. Discussion of the results: proposal of a hypothesis for further research

It should be noted that the coefficient of variation V1 depends not only on the probability of a certain scenario, but also on the size of the expected profit or loss in case of its realization. Consequently, we can propose a hypothesis for further research: Only the outsourcing of inexpensive insurance product sales can be profitable in terms of the ratio of profitability and risk:

1. A reduction in the average expected value X1 will lead to a reduction in the coefficient of variation;
2. In case of selling insurance products, the insurance benefit for which will be significantly lower than the benefits for insuring expensive property, luxury items, or life, the intermediary or policy holder will be less interested in illegal receipt of money from the insurer.

Still the outsourcing itself may give the benefits to the insurance companies but it should take into account the development of nowadays society and the risks and should follow some certain criteri of minimization the risks. Involving the outer experts for the work with the branch net will allow increasing the competencies, getting the various professional experiences, broadening the quantity of typical and original decisions for using them in the branches and creating the instruments for the improvement of the work in the branches of the insurance company. To satisfy all these results the expert team should have the following qualities: the work experience on the Russian insurance market for the last 10 years and to have the experience of working in the TOP-10 insurance companies.

For making the decision on giving some functions to outsourcing, of course, there should be done the economic calculation of the effectiveness of this action. Wherein it is very important correctly and objectively to take into account all the main factors, risks and effects and evaluate the benefits realistically. In this way there is a big sphere for the substitution of the insurance company services functional by the outsourcing in the insurance companies. In such case the investments into the outsourcing company's infrastructure will be made and the demand of the insurance companies for outsourcing services will increase.

Conclusions

To summarize all that has been said above one can come to the conclusion that taking into account the growth of the car insurance selling market the incurance companies in the nowadays competition circumstances should implement new tools of for the companies' profit increasing. One of these tools can be the outsourcing.

The model of the insurer's non-technical risk optimization, proposed in the article and resulting from the intermediary activity in the insurance market, is capable of bridging the gap in the insurance theory and lay a foundation for further economic studies of insurance intermediaries. Application of the model based on comparing the coefficients of variation for outsourcing and in-house accomplishment of certain operations by the insurer ($|V1| <= |V2|$) can be an efficient method for optimizing non-technical risks of the insurer in practice. Testing the proposed model with the panel data of Russian insurers showed that outsourcing in the current Russian market of comprehensive car insurance is unprofitable due to a high concentration of fraud in car insurance.

Based on a case study, we defined that the level of fraudulent payouts in the field of car insurance should be reduced to 0.64% in order to make the outsourcing of sales of comprehensive car insurance policies profitable in terms of the ratio of profit and risk. To reduce the level of fraudulent payouts the insurance companies should practice the legal agreements and contracts with their contractors and use the rational approach about searching and choosing the contractors.

References

MOS Team. 2019. Benefits of Business Process Outsourcing in the Insurance Industry. Retrieved from https://www.managedoutsource.com/blog/2019/04/benefits-of-business-process-outsourcing-in-the-insurance-industry.html

Aven, T. 2016. Risk assessment and risk management: Review of recent advances on their foundation. European Journal of Operational Research, 1, 1–13. https://doi.org/10.1016/j.ejor.2015.12.023

Chen, L. R., Lai, G. C., & Wang, J. L. 2011. Conversion and efficiency performance changes: Evidence from the U.S. property-liability insurance industry. The Geneva Risk and Insurance Review, 36(1): 1–35. Retrieved from https://link.springer.com/article/10.1057/grir.2010.3

Biener, C., Eling, M., & Wirfs, J. H. 2016. The Determinants of Efficiency and Productivity in the Swiss Insurance Industry. European Journal of Operational Research, 248(2): 703–714. Retrieved from https://doi.org/10.1016/j.ejor.2015.07.055

Central Bank, Moscow. 2019. Overview of key performance indicators of insurers https://www.cbr.ru/Content/Document/File/71180/review_insure_18Q4.pdf

Churilov, Yu. Yu. 2014. Fraud in Insurance. Rostov-on-Don: Phoenix. Retrieved from https://www.phoenixbooks.ru/books/book/O0067188/moshennichestvo-v-sfere-strahovaniya

Corrigan, K. 2019. Outsorcing. Retrieved from https://www.oberlo.com/ecommerce-wiki/outsourcing

Newlands, D. J., & AL-Husan, F. B. 2019. Sourcing and Manufacturing in the Market Region. IntechOpen. https://doi.org/10.5772/intechopen.87073

Grama, A., & Păvăloaia, V. D. 2014. Outsourcing IT – The Alternative for a Successful Romanian SME. Procedia Economics and Finance, 15: 1404–1412. Retrieved from https://doi.org/10.1016/S2212-5671(14)00605-4

Gukova, A. V., Shor, I. M., & Shor, D. M. 2016. Outsourcing in the Operating Activities of Insurance Organizations: Opportunities and Risks. Financial Analytics: Problems and Solutions, 36: 55–66. Retrived from https://cyberleninka.ru/article/n/autsorsing-v-deyatelnosti-strahovoy-organizatsii-vozmozhnosti-i-riski

Heywood, J. B. 2002. The Outsourcing Dilemma: the Search for Competitiveness. Moscow: Williams. ISBN 5-8459-0398-X

Hilkevics, S.; Semakina, V. 2019. The classification and comparison of business ratios analysis methods, Insights into Regional Development, 1(1), 48-57. https://doi.org/10.9770/ird.2019.1.1(4)

Hsieh, S. H., Liu, C. T., & Tzeng, L. Y. 2014. Insurance marketing channel as a screening mechanism: Empirical evidences from Taiwan automobile insurance market. The Geneva Papers on Risk and Insurance – Issues and Practice, 39(1): 90–103. https://doi.org/10.1057/gpp.2012.52

Kozminykh, O. V. 2017. Markov Chains as a Tool for Assessing Risks of Insurance Companies, Arising at Function Outsourcing. Russian Entrepreneurship, 18(17): 2491–2504. Retrieved from https://cyberleninka.ru/article/n/markovskie-tsepi-kak-instrument-otsenki-riskov-strahovyh-kompaniy-voznikayuschih-pri-peredache-funktsiy-na-autsorsing

Krawczyk, M. 2009. The Role of Repetition and Observability in Deterring Insurance Fraud. The Geneva Risk and Insurance Review, 34(1): 74–87. Retrived from https://link.springer.com/article/10.1057/grir.2009.1

Mao, H., Carson, J., & Ostaszewski, K. 2018. Is Risk Taking Beneficial to the Insured and to Society? Journal of Insurance Issues, 41(2): 215–230. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1887425

Markov, A. A. 1924. Assessment of Probabilities. Moscow: State Publishing House. Retrieved from http://books.e-heritage.ru/book/10070454

Nian, K., Zhang, H., Tayal, A., Coleman, T., & Li, Y. 2016. Auto insurance fraud detection using unsupervised spectral ranking for anomaly. The Journal of Finance and Data Science, 2(1): 58–75. Retrieved from https://doi.org/10.1016/j.jfds.2016.03.001

Official website of the Ingosstrakh Insurance Company. Retrieved from https://www.ingos.ru

Prodani, R., Bushati, J., Andersons, A. 2019. An assessment of impact of information and communication technology in enterprises of Korça region. Insights into Regional Development, 1(4): 333-342. https://doi.org/10.9770/ird.2019.1.4(4)

Subudhi, S., & Panigrahi, S. 2017. Use of optimized Fuzzy C-Means clustering and supervised classifiers for automobile insurance fraud detection. Journal of King Saud University – Computer and Information Sciences. Retrieved from https://doi.org/10.1016/j.jksuci.2017.09.010

Trifonov, B. I. 2015. Issues of High Loss Ratios of Insurance Companies. Finance and Credit, 10(634): 56–64. Retrieved from https://cyberleninka.ru/article/n/o-problemah-vysokoy-ubytochnosti-strahovyh-kompaniy.pdf

Troffaes, M. C., Krak, T. E., & Bains, H. 2019. Two-State Imprecise Markov Chains for Statistical Modelling of Two-State Non-Markovian Processes. Proceedings of Machine Learning Research, 103: 394–403. Retrieved from http://proceedings.mlr.press/v103/troffaes19b.html

Vagadia, B. 2012. Outsourcing within Industry Verticals. In: Strategic Outsourcing. Management for Professionals. Springer-Verlag Berlin Heidelberg. Retrieved from https://doi.org/10.1007/978-3-642-22209-2_5

Veretnov, V. I. 2009. Outsourcing in the Development of New Insurance Business Management Systems. Management in Insurance Companies, 2: 67–73. Retrieved from https://www.lawmix.ru/bux/27210

Vonesh, J., Dharshan, N., & Winkler, D. 2019. Insurance BPO Digital Services 2019 — Life, Property & Casualty. Information Services Group, Inc. All Rights Reserved. Retrieved from https://isg-one.com/docs/default-source/default-document-library/insurance_bpo_study_brochure_(eng)_2019.pdf?sfvrsn=6cd2cd31_2

Zou, B., & Cadenillas, A. 2014. Optimal Investment and Risk Control Problem for an Insurer: Expected Utility Maximization. Quantitative Finance. Retrieved from https://arxiv.org/abs/1402.3560?context=q-fin.RM

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