

Professional paper

UDK: 657.3

*Paper received: 14/06/2023*

*Paper Accepted: 14/08/2023*

## **EVALUATION OF DECISION-MAKING BODIES IN INSURANCE COMPANIES IN THE REPUBLIC OF SERBIA WITH THE AIM OF REALISTIC PRESENTATION OF INSURANCE COSTS USING T-TEST AND CORRELATION ANALYSES**

***Dr. Miloš Lutovac***

*Belgrade Business and Arts Academy of Applied Studies, Belgrade, Serbia*

*milos.lutovac@bpa.edu.rs*

***Dr. Danijela Radenković***

*Belgrade Business and Arts Academy of Applied Studies, Belgrade, Serbia*

*danijela.radenkovic@bpa.edu.rs*

***Dr. Valentina Mirković***

*Belgrade Business and Arts Academy of Applied Studies, Belgrade, Serbia*

*valentina.mirkovic@bpa.edu.rs*

***Jovana Bulatović***

*Academy of Applied Studies Belgrade, Zemun, Serbia*

*bulatovicj78@gmail.com*

### **ABSTRACT:**

The authors presented the results of forecasting the total cost of the company in relation to insurance in large and medium-sized companies in the Republic of Serbia by applying multiple linear regression. This was done based on the evaluated six factors of influence after the evaluations received by the management of the administrative bodies of four insurance companies operating in the Republic of Serbia. The coefficient of determination ( $R^2$ ) of 0.441 was obtained by regression analysis, based on which it can be seen that a value of 44.1% of the total variance is obtained based on

the given prediction model. The obtained model is statistically significant, because its significance ( $p < 0.0005$ ,  $F = 19.442$ ) is lower than the observed statistical level. Therefore, a company's total insurance costs can be predicted based on six influencing factors. Then, the individual contribution of each independent variable to the prediction of the company's total cost of insurance was observed. For the prediction of the total cost of the company, all independent factors make a significant contribution, except for the analyzed factor, the satisfaction of the insured (Table 2).

**Keywords:** *management bodies of insurance companies, company size, insurance costs*

## 1. INTRODUCTION

The successful functioning of numerous heterogeneous companies in the Republic of Serbia in terms of insurance can be observed in accordance with the business conditions on the market, the business conditions that apply to the company, as well as in accordance with the reduction of potential risks related to insurance to a minimum [1-4].

The top management of numerous heterogeneous companies in the Republic of Serbia in terms of insurance can bind management in companies to the adoption of numerous management decisions in which structural insurance can be carried out against a combination of risks of one's own choice.

Insurance companies provide partial and total business insurance for numerous companies [5-8]. A minimal investment in insurance can mean a huge difference in terms of business security for many years to come [9-11]. The insurance of large and medium-sized companies should be aimed at a broader view of the business from various risks. It is intended for consideration of company management, but also for owners of other heterogeneous companies that operate successfully on the market [12-16].

There are available:

- insurance of business premises, equipment and supplies;
- business insurance against work interruptions;
- liability insurance;
- insurance of employees against the consequences of an accident (death due to an accident, disability, bone fracture);
- additional health insurance for employees (insurance against serious illnesses and surgical interventions);
- urgent interventions in your business premises that cover the costs of the arrival and work of service technicians (plumbers, carpenters, glass workers, electricians);

- other contractual relationships between the insured and insurance companies that exist registered on the market of one country [17-20] and which may influence the making of valid management decisions.

## **2. STATEMENT ON THE QUESTION OF DIFFERENCES OBTAINED ON THE BASIS OF A SURVEY OF MANAGEMENT BODIES IN INSURANCE COMPANIES AND DISPLAY OF THE RESULTS THROUGH A T-TEST**

We wanted to determine the existence of a significant difference through the research based on the results obtained by the administration of 5 insurance companies in relation to the evaluated 6 factors of possible influence regarding the observation of insurance in the Republic of Serbia in relation to the size of the company, as well as the factor at the end which is defined as a factor of the total evaluation of all previously stated values of the mentioned 6 analyzed factors of influence on the company's operations regarding the allocation of money in connection with insurance.

A total of 155 companies in the Republic of Serbia were observed, 52 large and 103 medium-sized companies. The research included the evaluations received from the management bodies by 4 insurance companies, the generalities of which the authors do not state, because they guaranteed anonymity and the obligation to use the obtained results only for the preparation of scientific studies.

The examination of differences in relation to the size of the company using the T-test of independent samples was done based on the level of significance of the T-test. 6 factors that can affect the business of insurance companies according to the assessment of their management bodies were analyzed, namely: policyholder satisfaction, policyholder information, cooperation between insurance companies and banks and the Internet sales of insurance products, taxpayers, permanent education in the overall ratings of all 6 factors.

The presentation of the results is given in Table 1.

**Table 1:** Differences in the received evaluations of the administrative bodies of insurance companies in relation to the influencing factors and the size of the observed companies by means of a T-test

FACTORS	COMPANY SIZE	Mean	Standard deviation	T-value	p
Satisfaction of the insured	Large companies (N=52)	7.92	0.13	52.284	<0.0005*
	Medium companies (N=103)	7.11	0.09		
Informing the insured	Large companies (N=52)	6.75	0.12	51.001	<0.0005*
	Medium companies (N=103)	6.34	0.11		
Cooperation between insurance companies and banks	Large companies (N=52)	6.87	0.10	51.280	<0.0005*
	Medium companies (N=103)	6.23	0.09		
Online sales	Large companies (N=52)	6.19	0.99	52.100	<0.0005*
	Medium companies (N=103)	4.90	0.10		
Tax reliefs	Large companies (N=52)	5.12	0.12	45.999	<0.0005*
	Medium companies (N=103)	4.16	0.07		
Permanent education	Large companies (N=52)	5.28	0.12	50.050	<0.0005*
	Medium companies (N=103)	4.11	0.07		
OVERALL SCORE	Large companies (N=52)	37.80	0,26	50.452	<0.0005*
	Medium companies (N=103)	29.28	0,09		

Source: Authors (2023).

The presentation of the obtained results, visible in Table 1, shows the level of significance of the T-test.

The obtained results are lower than the threshold level of significance for all analyzed factors, as well as for the overall evaluation of all 6 analyzed factors, it can be seen that there are significant differences in the evaluations of the management bodies of 4 insurance companies for insurance observation in relation to the size of the company.

The higher rating for all factors and the overall rating is given by the management bodies of insurance companies.

### 3. MULTIPLE LINEAR REGRESSION RESULTS BASED ON FORECASTING THE TOTAL COST OF THE COMPANY ON THE ISSUE OF INSURANCE IN THE ANALYZED COMPANIES

By applying multiple linear regression in relation to predictions regarding the total cost of insurance in the analyzed companies based on the evaluation of 6 factors: policyholder satisfaction, policyholder information, cooperation between insurance companies and banks and the Internet sales of insurance products, taxpayers, permanent education in the overall ratings of all 6 fac-

tors. Possible impacts and observations of insurance in relation to the ratings obtained by the management body, which were obtained through a questionnaire from insurance companies.

The authors presented the individual contribution of independent variables in Table 2.

**Table 2.** Individual contribution of independent variables in relation to the prediction of the total cost of the analyzed companies according to the assessment of the management body of insurance companies in the Republic of Serbia

Serial number		Beta	t	p
	A constant	-	11.029	<0.0005*
1.	Satisfaction of the insured	0.024	0.347	0.729
2.	Information	0.196	2.920	0.004*
3.	Cooperation with banks	0.204	3.031	0.003*
4.	Online sales	0.266	4.133	<0.0005*
5.	Tax benefits	0.175	2.579	0.011*
6.	Insurance related education	0.325	5.115	<0.0005*

\* Statistical significance at the level of 0.05

Source: Authors (2023).

#### 4. CONCLUSION

Based on the presentation of the research results obtained in this paper, two basic conclusions can be drawn.

The first conclusion is that by examining the differences in relation to the size of the company, using the T-test of independent samples, it is possible to determine the differences that may exist based on the significant level of the T-test. Six factors that can affect the business of insurance companies according to the assessment of their management bodies were analyzed, namely: policyholder satisfaction, policyholder information, cooperation between insurance companies and banks and the Internet sales of insurance products, taxpayers, permanent education in the overall ratings of all 6 factors. The obtained results are lower than the threshold level of significance for all analyzed factors, as well as for the overall rating of all 6 analyzed factors. It can be seen that there are significant differences in the ratings of the management bodies of 4 insurance companies for observing insurance in relation to the size of the company, as well as that there are higher ratings for all factors as well as for the overall rating given by the management bodies of insurance companies of large companies.

Another conclusion is that multiple linear regression can be applied to predict the total cost of the company based on the evaluated six factors of influence on the observation of insurance based on the survey obtained by the management body of 4 insurance companies. The coefficient of determination (R<sup>2</sup>) of 0.441 was obtained by regression analysis, on the basis of which we conclude that the obtained prediction model accounts for 44.1% of the total variance. The obtained model is statistically significant because its significance ( $p < 0.0005$ ,  $F = 19.442$ ) is lower than the observed statistical level, on the basis of which we conclude that the total costs of the company can be predicted based on the six factors of influence on insurance observation. All independent factors except the satisfaction of the insured have a significant contribution to the prediction of the total cost of the company (Table 2).

## REFERENCES

1. Liao, X., Chen, G., Ku, B., Narula, R. & Duncan, J. (2020) Text Mining Methods Applied to Insurance Company Customer Calls: A Case Study, *North American Actuarial Journal*, 24:1, 153-163, DOI: [10.1080/10920277.2019.1649155](https://doi.org/10.1080/10920277.2019.1649155)
2. Katzew, J. (2021) The role of insurance at the intersection of Covid-19 and inequality through the lens of the cases: *Cafe Chameleon CC v Guardrisk Insurance Company Ltd and Ma-Afrika Hotels (Pty) Ltd v Santam Limited*, *South African Journal on Human Rights*, 37:4, 492-511, DOI: [10.1080/02587203.2022.2094829](https://doi.org/10.1080/02587203.2022.2094829)
3. Pons-Pons, J. & Vilar-Rodríguez, M. (2019) The genesis, growth and organizational changes of private health insurance companies in Spain (1915–2015), *Business History*, 61:3, 558-579, DOI: [10.1080/00076791.2017.1374371](https://doi.org/10.1080/00076791.2017.1374371)
4. Shi, P. & Shi, K. (2022) Non-Life Insurance Risk Classification Using Categorical Embedding, *North American Actuarial Journal*, DOI: [10.1080/10920277.2022.2123361](https://doi.org/10.1080/10920277.2022.2123361)
5. Shi, P. & Lee, G. (2022) Copula Regression for Compound Distributions with Endogenous Covariates with Applications in Insurance Deductible Pricing, *Journal of the American Statistical Association*, 117:539, 1094-1109, DOI: [10.1080/01621459.2022.2040519](https://doi.org/10.1080/01621459.2022.2040519)
6. Pons, J. & González, P. (2021) Distribution channels and growth strategies in Spanish insurance: from networks of agents to branch offices (1870–1940), *Business History*, DOI: [10.1080/00076791.2021.1979516](https://doi.org/10.1080/00076791.2021.1979516)
7. Cole, C. Fier, S. (2021) An Empirical Analysis of Insurer Participation in the U.S. Cyber Insurance Market, *North American Actuarial Journal*, 25:2, 232-254, DOI: [10.1080/10920277.2020.1733615](https://doi.org/10.1080/10920277.2020.1733615)
8. Benlagha, N. & Hemrit, W. (2023) Does investment in insurance stocks reap diversification benefits? Static and time varying copula modeling, *Communications in Statistics - Simulation and Computation*, 52:4, 1384-1402, DOI: [10.1080/03610918.2021.1884713](https://doi.org/10.1080/03610918.2021.1884713)
9. Popović, S., (2014) *Socio-ekonomski faktori ograničenja razvoja agrara*, Univerzitet Privredna akademija u Novom Sadu, monografija, ISBN 978-86-87619-555
10. Bakmaz, O., Bjelica, B. & Vitomir, J. (2023). Application of software solutions in companies that strive to achieve increased financial stability in their regular business, *Temel-IJ*, Vol.7.Iss.1. (Mar.2023) 13 - 20 <https://doi.org/10.52576/TEMEL237.1013b>
11. Bakmaz, O., Bjelica, B., Ivić, Lj., Volf, D. & Majstorović, A. (2017). The significance of the audit profession in the financial analysis of agricultural companies of the Republic of Serbia. *Annals of the „Constantin Brâncuși” University of Târgu Jiu, Economy Series*, pp. 117-123, ISSN 2344 – 3685/ISSN-L1844–7007.

12. Radović, M., Vitomir, J., Laban, B., Jovin, S., Nastić, S., Popović, V. & Popović S. (2019). Management of joint stock companies and farms by using fair value of agricultural equipment in financial statements on the example of IMT 533 Tractor, *Economics of Agriculture*, 1: 35-50.
13. Popović, S., Novaković, S., Đuranović, D., Mijić, R., Grublješić, Ž, Aničić, J. & Majstorović, A. (2017). Application of international accounting standard-16 in a public company with predominantly agricultural activities, *Economic Research-Ekonomska Istraživanja*, 30(1):1850–1864.
14. Radović, M., Vitomir, J. & Popović, S. (2021). Impact of internal control in companies founded by local self government units: the case of Republic of Serbia, *Inzinerine Ekonomika-Engineering Economics*, 32(1): 82–90.
15. Vitomir, J., Laban, B., Bakmaz, O., Nikolić, N., Čolović, M. (2019). Audit as a possible way to improve corporate governance with an overview of possible models of determining the risk interval and some of the basic impact factors identified by top management. *Annals of the „Constantin Brâncuși” University of Târgu Jiu, Economy Series, Issue 2/2019, ISSN 2344 – 3685/ISSN-L 1844 – 7007.*
16. Bakmaz, O., Bjelica, B. & Vitomir, J. (2023). Application of internal audit in processes of reducing corruption in a transitional economy like the Republic of Serbia, *Temel-IJ, Vol.7.Iss.1. (Mar.2023) 36 - 42 <https://doi.org/10.52576/TEMEL237.1036b>*
17. Bojović, R., Popović, V., Ikanović, J., Živanović, Lj., Rakašćan, N., Popović, S., Ugrenović, V. & Simić, D. (2019). Morphological characterization of sweet sorghum genotypes across environments, *The Journal of Anim.Plant Sciences*, 29 (3): 721-729.
18. Bjelica, B., Bakmaz, O. & Vitomir, J. (2023). The importance of accounting policy in the context of strengthening financial stability in a company that previously implemented internal audit as a mechanism of regular business decision-making, *Temel-IJ, Vol.7.Iss.1. (Mar.2023) 57 - 63 <https://doi.org/10.52576/TEMEL237.1057b>*
19. Popović, S., Đuranović, D., Jovin, S., Popović, V., Filipović, V., Grublješić, Ž. (2017). Census work for financial reporting of agricultural companies in Serbia, *Poljoprivredna Tehnika*, 4: 21–26.
20. Popović, S., Tošković, J. & Grublješić, Ž. (2014) Environmental-Economic Model of Developing Composters in Parks, Protected Areas and City Limits in the Republic of Serbia, *ProEnvironment* 7: 213-217.

## EVALUACIJA ORGANA ODLUČIVANJA U OSIGURAVAJUĆIM DRUŠTVIMA U REPUBLICI SRBIJI U CILJU REALNE PREZENTACIJE TROŠKOVA OSIGURANJA POMOĆU T-TESTA I KORELACIJSKE ANALIZE

### SAŽETAK RADA:

Autori su prikazali rezultate predviđanja ukupnih troškova poduzeća u odnosu na troškove osiguranja u velikim i srednjim poduzećima u Republici Srbiji primjenom višestruke linearne regresije. Analiza je provedena na temelju šest faktora procjene utjecaja, nakon što su dobili rezultate od strane rukovodstva četiri osiguravajuća društva koja posluju u Republici Srbiji. Upotrebom regresijske analize dobiven je koeficijent determinacije ( $R^2$ ) od 0,441, što pokazuje da je vrijednost od 44,1% ukupne varijance dobivena na temelju danih modela predviđanja. Dobiveni model je statistički značajan jer je njegov rezultat ( $p < 0,0005$ ,  $F = 19,442$ ) niži od promatranog statističkog nivoa. Dakle, ukupni troškovi osiguranja kompanije mogu se predvidjeti na temelju šest utjecajnih faktora. Nakon toga, promatran je individualni doprinos svake nezavisne varijable na ukupne troškove osiguranja. Zaključeno je da svi nezavisni faktori imaju značajan doprinos pri predviđanju ukupnih troškova kompanije, osim analiziranog faktora "zadovoljstvo osiguranika".

**Ključne riječi:** *organi upravljanja osiguravajućih kompanija, veličina kompanija, troškovi osiguranja.*