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Application of PROMETHEE Method in Evaluation of Insurance Efficiency in Serbia

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Izvirni znanstveni članek

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KLJUČNE BESEDE: učinkovitost, zavarovanje, PROMETHEE metoda

POVZETEK – Vprašanje ocenjevanja učinkovitosti zavarovanja na podlagi metod večkriterijske analize je zelo aktualno, kompleksno in pomembno. Zagotavlja osnovo za izboljšanje učinkovitosti zavarovanja z ustreznimi ukrepi v prihodnosti. S tem v mislih je v prispevku analizirana učinkovitost zavarovanja v Srbiji po metodi PROMETHEE. Dobljeni rezultati empirične raziskave zavarovalniške učinkovitosti v Srbiji po metodi PROMETHEE kažejo, da je bilo to najboljše v letu 2020. V zadnjem času se učinkovitost zavarovalništva v Srbiji nenehno povečuje. Na to so pozitivno vplivali številni dejavniki: gospodarska klima, življenjski standard, zaposlenost, sodobni koncepti upravljanja stroškov, prihodkov in dobička, elektronska prodaja zavarovalnih produktov in digitalizacija celotnega poslovanja. Negativni vpliv pandemije covida-19 na učinkovitost zavarovanja v Srbiji je zanemarljiv (v primerjavi z drugimi proizvodnimi dejavnostmi, kot sta turizem in gostinstvo) in se delno izravnava s povečano prodajo zavarovalnih produktov na spletu in infrastrukturnim (premoženjskim) zavarovanjem.

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KEYWORDS: efficiency, insurance, PROMETHEE method

ABSTRACT – The issue of evaluating the efficiency of insurance based on the methods of multi-criteria analysis is very current, complex and significant. It provides a basis for improving the efficiency of insurance by applying adequate measures in the future. With this in mind, the paper analyzes the efficiency of insurance in Serbia using the PROMETHEE method. The results obtained from the empirical research of insurance efficiency in Serbia using the PROMETHEE method show that it was most efficient in 2020. Recently, the efficiency of insurance in Serbia has been increasing continuously. This has been positively influenced by numerous factors: economic climate; living standard; employment; modern concepts of cost, income and profit management; electronic sales of insurance products; digitalization of the entire business. The negative impact of the COVID-19 pandemic on insurance efficiency in Serbia is negligible (compared to other production activities, such as tourism and hospitality) and is partly offset by increased sales of insurance products online and infrastructure (property) insurance. There is a growing understanding of the importance of insuring against potential risks of all kinds.

1 Introduction

The importance of evaluating the efficiency of insurance based on the methods of multi-criteria analysis is growing (Beiragh, 2020). Starting from that, the subject of this research paper is the analysis of insurance efficiency in Serbia based on the PROMETHEE method. The goal and purpose of this is to address this issue as complexly as possible using qualitative and especially quantitative methods in order to gain knowledge about the real efficiency of insurance companies in Serbia, as a star-

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ting point for future improvement by taking appropriate measures. This, among other things, reflects the scientific and professional contribution of this paper.

Lately, there is increasingly rich literature dedicated to evaluating the efficiency of all companies, which includes insurance companies, based on multi-criteria analysis. In this context, the role and importance of the PROMETHEE method is growing. In the relevant literature, there is, as far as we know, no comprehensive work dedicated to the evaluation of insurance efficiency in Serbia using the PROMETHEE method (Kočović, 2010; Lukić, 2016, 2018, 2021; Mandić, 2017; Rakonjac Antić, 2018). This gap should be somewhat filled by this paper, which, among other things, reflects its scientific and professional contribution.

The basic research hypothesis in this paper is based on the fact that continuous analysis and control of critical factors is a prerequisite for improving the efficiency of insurance in Serbia in the future by taking appropriate measures and effectively controlling their implementation. The application of the PROMETHEE method also plays a significant role in this.

The research methodology is based on the application of the AHP and PROMETHEE methods. In order to make the quantitative analysis of the researched problem as complex as possible, statistical analysis is used to some extent.

For the purpose of researching the problem addressed by this paper using the given methodology, empirical data were collected from the Serbian Business Registers Agency. They have been generated in accordance with the relevant international standards, so there are no restrictions on international comparison.

2 PROMETHEE method

The PROMETHEE method is based on the comparison of paired alternatives according to each criterion. For each criterion, the decision maker considers a particular function of preference (Brans, 2010, 2016; Podvezko, 2010; Stanitsas, 2021). The preference can take a value in the range from 0 to 1. Different variants of the PROMETHEE method have been developed (I, II, III, IV, V, VI). There is also a visual interactive modulation of GAIA that represents a graphical interpretation of the PROMETHEE method. The PROMETHEE method is simple, allows partial and complex ranking of alternatives (PROMETHEE I and PROMETHEE II, respectively), and has wide practical application (in banking, investment, medicine, chemistry, trade, tourism, etc.).

The PROMETHEE method takes place in several steps (Polat, 2015; Geldermann et al., 2000; Behzadian et al., 2010; Mohammadi, 2017; Abdullah, 2019; Brans et al., 1984, 1985, 1986, 1994, 2016). Those steps are:

- Step 1: Defining the criteria ($j = 1, ..., k$) and a set of possible alternatives in decision making.

- Step 2: Determining the weight wj of the criterion. It shows the relative importance of each criterion, where the sum of the weights of the criterion equals one, i.e.:

$$\sum_{j=1}^{k} w_j = 1$$

- Step 3: Normalize the decision matrix in the interval from 0 to 1 using the following equation:

$$R_{ij} = \frac{\left[X_{ij} - \min(X_{ij})\right]}{\left[\max(X_{ij}) - \min(X_{ij})\right]} \quad (1)$$

(i = 1.2 ..., n; j = 1.2 ..., m)

where Xij is the estimated value by decision makers i = 1, ..., n, and the number of criteria j = 1, ..., m.

- Step 4: Determine the deviation of comparable pairs.

$$d_j(a, b) = g_j(a) - g_j(b) \ (2)$$

where dj (a, b) denotes the differences between the evaluations a and b of each criterion.

- Step 5: Defining the preference functions Pj (a,b)=Fj [dj (a,b)],

where Pj (a, b) represents the function of the difference between the evaluation of alternative a in relation to alternative b for each criterion in the interval from 0 to 1. A smaller number of functions indicates the indifference of decision makers. Conversely, values closer to 1 indicate greater preference.

- Step 6: Define the multi-criteria preference index

$$\pi(a, b) = \sum_{j=1}^{k} P(a, b)\, w_j \ (3)$$

where wj indicates the weight of the criterion. The symbol π (a, b) shows the degree of preference of a in relation to b for all criteria.

π (a, b) ≈ 0 implies a weak preference of a over b.

π (a, b) ≈ 1 implies a strong preference of a over b.

- Step 7: Obtain the order of preferences.

in this step, the ranking can be performed partially or completely. Partial ranking can be obtained using PROMETHEE I. In case a complete ranking is needed, it includes an additional step by applying PROMETHEE II.

Partial ranking of alternatives (PROMETHEE I):

$$\emptyset^{+}(a) = \frac{1}{n-1}\sum_{x \in A} \pi(a, x) \text{ and } \emptyset^{-}(a) = \frac{1}{n-1}\sum_{x \in A} \pi(a, x). \ (4)$$

where $\emptyset^{+}(a)$ represents a positive output flow (how many alternatives a dominate over other alternatives), and $\emptyset^{-}(a)$ represents a negative input flow (how many alternatives are preferred by all the other alternatives). An alternative with a high value $\emptyset^{+}(a)$ and a lower value $\emptyset^{-}(a)$ is the best alternative. Preferential ratio and partial rankings are performed as follows:

$$aP^{+}b: \begin{cases} P \text{iff} \emptyset^{+}(a) \succ \emptyset^{+}(b), \forall a, b \in A \\ I \text{iff} \emptyset^{+}(a) = \emptyset^{+}(b), \forall a, b \in A \end{cases}$$

$$aP^{-}b: \begin{cases} P \text{iff} \emptyset^{-}(a) \prec \emptyset^{-}(b), \forall a, b \in A \\ I \text{iff} \emptyset^{-}(a) \succ \emptyset^{-}(b), \forall a, b \in A \end{cases}$$

However, not all alternatives are comparable. It is therefore necessary to calculate the net flow in the next step.

(b) Complex ranking of alternatives (PROMETHEE II).

The complex ranking of alternatives can avoid incomparability.

$$\emptyset(a) = \emptyset^{+}(a) - \emptyset^{-}(a), (5)$$

where $\emptyset(a)$ denotes the net flow for each alternative. Relationship preferences are as follows:

a surpasses $b\left(aP^{(II)}b\right)$ if $\emptyset(a) \succ \emptyset(b), \forall a, b \in A$

a indifferent to $b\left(aP^{(II)}b\right)$ if $\emptyset(a) = \emptyset(b), \forall a, b \in A$

Thus, all alternatives are capable of being comparable based on the value $\emptyset(a)$. The highest value $\emptyset(a)$ indicates the most desirable alternative.

In the calculation procedure, most of the steps are fixed, except for step 5. In this step, the choice of the preference function is arbitrary depending on the characteristics of the criteria and the preference of the decision makers. Special attention is paid to the choice of the preference function because it can affect the final net value.

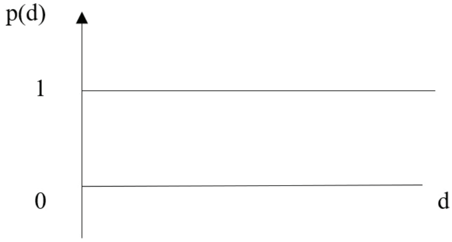
3 Preference functions

The PROMETHEE method uses preference functions to define deviations between alternatives for each criterion. The PROMETHEE method uses six preference functions to express the significance of the alternative for each criterion/factor, as well as the difficulty to express the relative importance of each criterion. These functions are:

Type I – The usual preference function is a basic type of function that does not contain any parameters and is used very rarely (Figure 1).

Figure 1

Usual Preference Function



It is defined as:

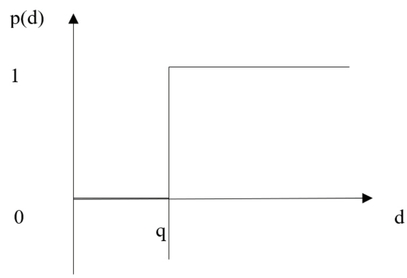
$$p(d) = \begin{cases} 0, \text{when } d \leq 0 \\ 1, \text{when } d > 0 \end{cases}$$

No parameters.

Type II – The U-shape function contains only the indifference threshold (Figure 2)

Figure 2

U-Shape Function



It is defined as

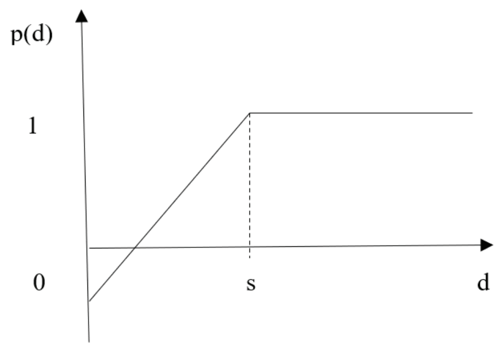
$$p(d) = \begin{cases} 0, \text{when } d \leq q \\ 1, \text{when } d > q \end{cases}$$

Parameter q.

Type III – The V-shape function contains only the preference threshold (Figure 3). It differs from the previous one because the preference is defined as the proportional deviation of the alternatives in the value range from 0 to m.

Figure 3

V-Shape Function



It is defined as

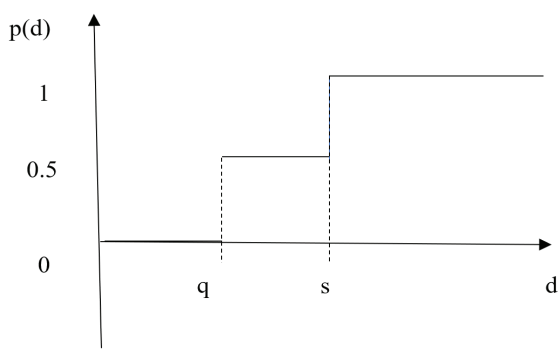
$$p(d) = \begin{cases} 0, \text{when } d \le 0 \\ \frac{d}{s}, \text{when } 0 < d \le s \\ 1, \text{when } d > s \end{cases}$$

Parameter p.

Type IV – The Level function contains the indifference threshold n and the preference threshold m.

Figure 4

Level Function



It Is defined as

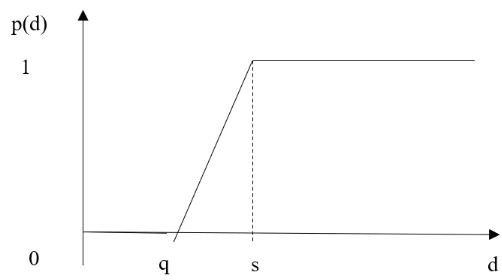
$$p(d) = \begin{cases} 0, \text{when } d \le q \\ 0.5, \text{when } q < d \le s \\ 1, \text{when } d > s \end{cases}$$

Parameters p, q.

Type V – The Linear function contains the indifference threshold n and the preference threshold m. It is proportional to the deviation of alternatives in the interval from - n - m to + n + m (Figure 5).

Figure 5

Linear Function



It is defined as

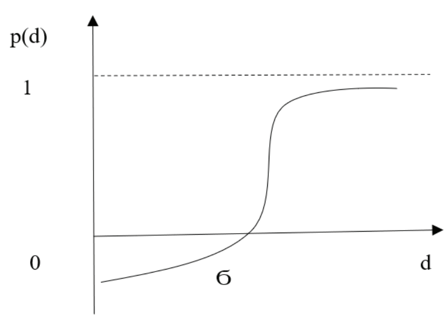
$$p(d) = \begin{cases} 0, \text{when } d \leq q \\ \dfrac{d-q}{s-q}, \text{when } q < d \leq s \\ 1, \text{when } d > s \end{cases}$$

Parameters p, q.

Type VI – The Gaussian function contains only the Gaussian threshold σ and is used less frequently (Figure 6).

Figure 6

Gaussian Function



It is defined as

$$p(d) = \begin{cases} 0, \text{when } d \leq 0 \\ 1 - \exp\left(-\dfrac{d^2}{2\sigma^2}\right), \text{when } d > 0 \end{cases}$$

Parameter s.

4 Method of analytic hierarchy process (AHP)

Considering that the weighting coefficients (weights) of the criterion when

- Step 1: Forming a matrix of comparison pairs

$$A = [a_{ij}] = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ 1/a_{12} & 1 & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ 1/a_{1n} & 1/a_{2n} & \cdots & 1 \end{bmatrix} \quad (6)$$

- Step 2: Normalizing the matrix of comparison pairs

$$a_{ij}^* = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, i, j = 1, \dots, n \quad (7)$$

- Step 3: Determining the relative importance, i. e., vector weight

$$w_i = \frac{\sum_{i=1}^{n} a_{ij}^*}{n}, i, j = 1, \dots, n \quad (8)$$

Consistency index – CI Is a measure of deviation of n From λ Max and Can be represented by the following formula:

$$CI = \frac{\lambda_{max} - n}{n} \quad (9)$$

If CI < 0.1 Is the estimated value of the coefficient Aij, then i and j are consistent, and the deviation of λ Max From n Is negligible. This Means, in other words, that the AHP method accepts An inconsistency of less Than 10 %.

The consistency index Can be used to calculate the CR = CI/RI consistency ratio, where RI Is a random index.

applying the PROMETHEE method are determined using the AHP method, we will briefly look at its theoretical and methodological characteristics.

The Analytic Hierarchy Process (AHP) method takes place through the following steps (Saaty, 2008):

5 Measuring insurance efficiency in Serbia based on AHP/ PROMETHEE methods: results and discussion

When measuring the efficiency of insurance in Serbia on the basis of the PROMETHEE method, the following criteria were used: C1 – number of employees, C2 – assets, C3 – capital, C4 – business (functional) income, C5 – net profit. Alternatives were observed in the following years: A1 – 2013, A2 – 2014, A3 – 2015, A4 – 2016, A5 – 2017, A6 – 2018, A7 – 2019 and A8 – 2020.

Table 1 shows the initial data for measuring the efficiency of insurance in Serbia for the period 2013 – 2020.

Table 1

Initial data for measuring the efficiency of insurance in Serbia

	Number of employees	*Assets*	*The capital*	*Operating (functional) income*	*Net profit*
2013	10918	138052	28617	55424	2009
2014	11295	167768	35177	58747	2900
2015	11252	191796	44795	70572	4625
2016	11043	215589	50816	79017	6009
2017	10894	232968	53981	82209	6634
2018	10649	279227	61703	86850	9072
2019	10917	299739	72147	92194	11680
2020	11164	314197	76871	95274	13003

Note. Data are expressed in millions of dinars. The number of employees is expressed in whole numbers.

Source: Serbian Business Registers Agency

Table 2 shows the statistics of the initial data.

Table 2

Statistics

Statistics						
		Number of employees	*Assets*	*The capital*	*Operating (functional) income*	*Net profit*
N	Valid	8	8	8	8	8
	Missing	0	0	0	0	0
Median		10980.5000	224278.5000	52398.5000	80613.0000	6321.5000
Std. Deviation		215.52129	63672.36835	16892.16762	14787.73070	3976.85730
Minimum		10649.00	138052.00	28617.00	55424.00	2009.00
Maximum		11295.00	314197.00	76871.00	95274.00	13003.00
NPar Tests						
Friedman test						
Ranks						
Mean Rank		1.75	5.00	3.00	4.00	1.25
Test Statistics a						
N		8				
Chi-Square		308.00				
df		4				
Asymp. Sig.		.000				
a. Friedman Test						

Note. Author's calculation using the SPSS software program.

The data in the table above show that the values of all observed variables from 2016 were above average. This had a positive effect on the efficiency of insurance in Serbia. Seeing that Asymp. Sig. = .000 < .05, the hypotheithat the differences between the variables (measurements) are equal to zero is rejected, i.e., the hypothesis that the differences between them are statistically significant is accepted.

Table 3 shows the correlation matrix of the initial data.

Table 3

Correlation matrix

Correlations						
		1	*2*	*3*	*4*	*5*
1 Number of employees	Pearson Correlation	1	-.319	-.245	-.336	-.255
	Sig. (2-tailed)		.441	.558	.416	.541
	N	8	8	8	8	8
2 Assets	Pearson Correlation	-.319	1	.993 **	.976 **	.988 **
	Sig. (2-tailed)	.441		.000	.000	.000
	N	8	8	8	8	8
3 Capital	Pearson Correlation	-.245	.993 **	1	.982 **	.993 **
	Sig. (2-tailed)	.558	.000		.000	.000
	N	8	8	8	8	8
4 Operating (functional) income	Pearson Correlation	-.336	.976 **	.982 **	1	.960 **
	Sig. (2-tailed)	.416	.000	.000		.000
	N	8	8	8	8	8
5 Net profit	Pearson Correlation	-.255	.988 **	.993 **	.960 **	1
	Sig. (2-tailed)	.541	.000	.000	.000	
	N	8	8	8	8	8
**. Correlation is significant at the 0.01 level (2-tailed).						

Note. Author's calculation using the SPSS software program.

The correlation matrix shows that there is a strong correlation between the analyzed variables at the level of statistical significance (Sig. (2-tailed) = .000 < .05), except for the number of employees. Improving the efficiency of insurance through a more efficient management of assets, capital, business (functional) revenues and profits can have a significant impact. In this regard, it is also necessary to significantly improve the efficiency of human resource management through training, career advancement, flexible employment and working hours, and an adequate remuneration system. The sale of insurance products via the Internet also plays a significant role in all this.

The weighting coefficients (weights) of the criteria were determined using the AHP method (Saaty, 2008). They are shown in Table 4 and Figure 7.

Table 4

Weighting coefficients of the criteria

AHP With Arirthmetic Mean Method					
Initial Comparisons Matrix					
	C1	C2	C3	C4	C5
C1	1	2	2	2	1
C2	0.5	1	1	1	2
C3	0.5	1	1	0.5	1
C4	0.5	1	2	1	1
C5	1	0.5	1	1	1

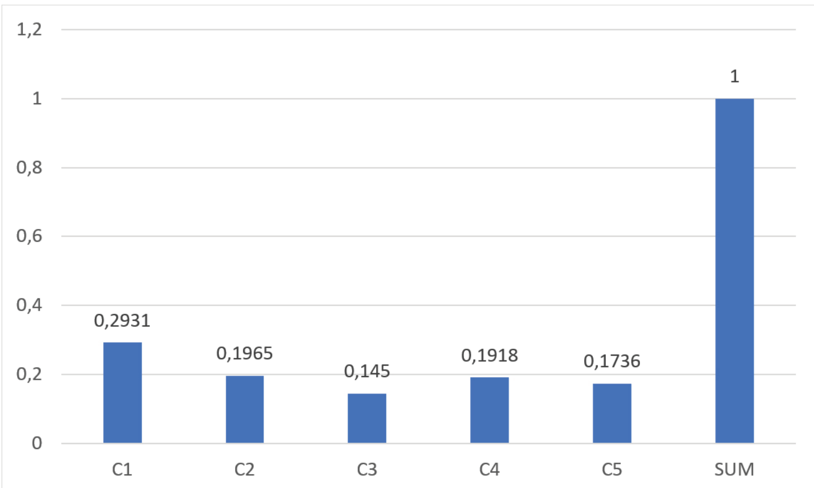
SUM	3.5	5.5	7	5.5	6

Normalized Matrix						
	C1	*C2*	*C3*	*C4*	*C5*	*Weights of Criteria*
C1	0.2857	0.3636	0.2857	0.3636	0.1667	0.2931
C2	0.1429	0.1818	0.1429	0.1818	0.3333	0.1965
C3	0.1429	0.1818	0.1429	0.0909	0.1667	0.1450
C4	0.1429	0.1818	0.2857	0.1818	0.1667	0.1918
C5	0.2857	0.0909	0.1429	0.1818	0.1667	0.1736
					SUM	1
Consistency Ratio	0.0483	COMPARE WITH 0.1; IT SHOULD BE LESS THAN 0.1.				

Note: Author's calculation using AHPSoftware-Excel software

Figure 7

Ranking of criteria



Source: Author's picture

Ranked in first place is the criterion of the number of employees. It is followed by the criteria of assets, operating (functional) income, net profit and capital. This indicates that more efficient human capital management can, among other things, significantly influence the achievement of the target insurance efficiency in Serbia.

Table 5 shows the initial matrix of the PROMETHEE method.

Table 5

Initial matrix

φ 0.2					
	C1	*C2*	*C3*	*C4*	*C5*
Type	*max*	*max*	*max*	*max*	*Max*
Type P. Function	*1st type*	*1st type*	*1st type*	*1st type*	*1st type*
Weight	0.2931	0.1965	0.1450	0.1918	0.1736
A 1	10918	138052	28617	55424	2009
A 2	11295	167768	35177	58747	2900
A 3	11252	191796	44795	70572	4625
A 4	11043	215589	50816	79017	6009
A 5	10894	232968	53981	82209	6634
A 6	10649	279227	61703	86850	9072
A 7	10917	299739	72147	92194	11680
A 8	11164	314197	76871	95274	13003

Note: Author's expression

Table 6 shows the flows of the PROMETHEE method.

Table 6

Flows

	Fluxes			
		F +	*F-*	*F*
2013	A 1	0.1256	0.8744	-0.7488
2014	A 2	0.3941	0.6059	-0.2118
2015	A 3	0.4532	0.5468	-0.0936
2016	A 4	0.4704	0.5296	-0.0591
2017	A 5	0.4458	0.5542	-0.1084
2018	A 6	0.5049	0.4951	0.0099
2019	A 7	0.6897	0.3103	0.3793
2020	A 8	0.9163	0.0837	0.8325

Note: Author's expression

Table 7 shows the summary result of the PROMETHEE method - ranking of alternatives.

Table 7

Result - Ranking of alternatives

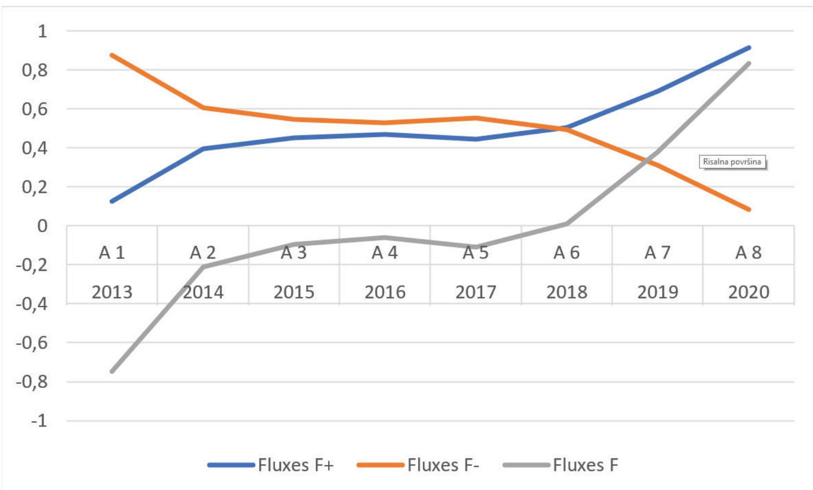
Method	*Promethee I*	*Promethee I*	*Promethee II*	*Promethee II*	*Promethee III*	*Promethee III*
Direction	↓	↑	↓	↑	↓	↑
1	A 8	A 8	A 8	A 8	A 8	A 8
2	A 7	A 7	A 7	A 7	A 7	A 7
3	A 6	A 6	A 6	A 6	A2 A3A 4 A 5 A 6	A2 A3A 4 A 5 A 6
4	A 4	A 4	A 4	A 4	A 1	A 1
5	A 3	A 3	A 3	A 3		
6	A 5	A 5	A 5	A 5		
7	A 2	A 2	A 2	A 2		
8	A 1	A 1	A 1	A 1		

Note: Author's presentation of results

Figure 8 shows the flows of the PROMETHEE method.

Figure 8

Flows



Source: Author's picture

The results obtained from the empirical research of insurance efficiency in Serbia in the period 2013 – 2020 using the PROMETHEE method show that it has been continuously increasing in recent years. It was the most efficient in 2020. Such a trend of insurance efficiency in Serbia was influenced by numerous macro and micro factors, such as: economic climate; employment; interest rate; exchange rate; inflation; a growing understanding of the importance of insurance against potential risks of all kinds; digitalization of the entire business, etc. The impact of the COVID-19 pandemic on insurance efficiency in Serbia is negligible. It is largely neutralized by selling insurance products electronically.

6 Conclusion

Based on the results obtained from the empirical research of insurance efficiency in Serbia in the period 2013 – 2020 using the PROMETHEE method, it can be concluded that it has been continuously increasing in recent years. It was the most efficient in 2020. Such a trend of insurance efficiency in Serbia was influenced by numerous macro and micro factors, such as: economic climate; employment; interest rate; exchange rate; inflation; a growing understanding of the importance of insurance against potential risks of all kinds; digitalization of the entire business, etc. The impact of the COVID-19 pandemic on insurance efficiency in Serbia is negligible. It is largely neutralized by selling insurance products electronically.

In order to increase the efficiency of insurance in Serbia in the future, it is necessary to manage human resources, assets, capital, sales of insurance products, and profits as efficiently as possible. The digitalization of the entire business also plays an important role in this.

The application of the PROMETHEE method in analyzing insurance efficiency in Serbia provides more reliable results in relation to the ratio analysis as a basis for future improvements by taking appropriate measures and adequately controlling their implementation. Therefore, it should be used especially in combination with other methods of multi-criteria decision making (TOPSIS, ARAS, AHP, etc.).

Dr. Radojko Lukić

Uporaba metode PROMETHEE pri ocenjevanju učinkovitosti zavarovanja v Srbiji

Pomen vrednotenja učinkovitosti zavarovanja na podlagi metod večkriterijske analize narašča (Beiragh, 2020). Izhajajoč iz tega je predmet raziskave v prispevku analiza učinkovitosti zavarovanja v Srbiji po metodi PROMETHEE. Cilj in namen tega je čim bolj kompleksno obravnavati to problematiko kvalitativno in predvsem kvantitativno, da bi pridobili znanje o resnični učinkovitosti zavarovalnic v Srbiji kot izhodišču za prihodnje izboljšave z ustreznimi ukrepi. To med drugim odraža znanstveni in strokovni vidik tega prispevka.

V zadnjem času je vse bogatejša literatura, posvečena ocenjevanju učinkovitosti vseh podjetij, kar pomeni za zavarovalnice ocenjevanje na podlagi večkriterijske analize. V tem kontekstu naraščata vloga in pomen metode PROMETHEE. V relevantni literaturi, kolikor nam je znano, ni celovitega dela, posvečenega vrednotenju

zavarovalne učinkovitosti v Srbiji po metodi PROMETHEE (Kočović, 2010; Lukić, 2016, 2018, 2021; Mandić, 2017; Rakonjac Antić, 2018). To vrzel bi moral prispevek nekoliko zapolniti, kar med drugim odraža njegov znanstveni in strokovni prispevek.

Osnovna hipoteza raziskave obravnavane problematike v prispevku temelji na dejstvu, da je nenehna analiza in obvladovanje kritičnih dejavnikov pogoj za izboljšanje učinkovitosti zavarovanja v Srbiji v prihodnosti z ustreznimi ukrepi in nadzorom njihovega učinkovitega izvajanja. Pri tem ima pomembno vlogo tudi uporaba metode PROMETHEE.

Raziskovalna metodologija te domneve temelji na uporabi metod AHP in PROMETHEE. Da bi bila kvantitativna analiza obravnavane težave v prispevku čim bolj kompleksna, se do neke mere uporablja statistična analiza.

Za namene raziskovanja problematike, obravnavane v prispevku, so bili z uporabo podane metodologije zbrani empirični podatki Agencije za poslovne registre Republike Srbije. Predstavljeni so v skladu z ustreznimi mednarodnimi standardi, tako da ni omejitev za mednarodno primerjavo.

Pri merjenju učinkovitosti zavarovanja v Srbiji na podlagi metode PROMETHEE so bila uporabljena naslednja merila: C1 – število zaposlenih, C2 – sredstva, C3 – kapital, C4 – poslovni (funkcionalni) dohodek, C5 – čisti dobiček. Alternative so bile opazovane v letih: A1 – 2013, A2 – 2014, A3 – 2015, A4 – 2016, A5 – 2017, A6 – 2018, A7 – 2019 in A8 – 2020.

Statistika začetnih podatkov v podani tabeli kaže, da so bile vrednosti vseh opazovanih spremenljivk iz leta 2016 nadpovprečne. To je pozitivno vplivalo na učinkovitost zavarovanja v Srbiji. Tako je Asimp. Sig. = ,000 <,05. Hipotezo, da so razlike med spremenljivkami (meritvami) enake nič, zavrnemo, torej sprejmemo hipotezo, da so razlike med njimi statistično pomembne.

Korelacijska matrika kaže, da obstaja močna korelacija med analiziranimi spremenljivkami na ravni statistične pomembnosti (Sig. (2-tailed) = ,000 <,05), razen za število zaposlenih. Izboljšanje učinkovitosti zavarovanja z učinkovitejšim upravljanjem premoženja, kapitala, poslovnih (funkcionalnih) prihodkov in dobičkov ima lahko pomemben vpliv. V zvezi s tem je treba tudi bistveno izboljšati učinkovitost upravljanja s človeškimi viri z izobraževanjem, kariernim napredovanjem, fleksibilnim zaposlovanjem in delovnim časom ter ustreznim sistemom nagrajevanja. Pri vsem tem pomembno vlogo igra tudi prodaja zavarovalnih produktov preko spleta.

Utežni koeficienti (uteži) kriterijev so bili določeni po metodi AHP (Saaty, 2008).

Na prvem mestu je merilo število zaposlenih. Potem so tu še: sredstva, poslovni (funkcionalni) prihodki, čisti dobiček in kapital. To kaže, da lahko učinkovitejše upravljanje s človeškim kapitalom med drugim pomembno vpliva na doseganje ciljne zavarovalne učinkovitosti v Srbiji.

Dobljeni rezultati empirične raziskave zavarovalniške učinkovitosti v Srbiji v obdobju 2013–2020 po metodi PROMETHEE kažejo, da se ta v zadnjem času nenehno povečuje. V letu 2020 je bila najboljša. Na takšen trend zavarovalniške učinkovitosti v Srbiji so vplivali številni makro in mikro dejavniki, kot so: gospodarska klima, *zaposlenost, obrestna mera, devizni tečaj, inflacija, vse večje razumevanje pomena zavarovanja pred morebitnimi tveganji vseh vrst, digitalizacija celotnega poslovanja itd. Vpliv pandemije covida-19 na učinkovitost zavarovanja v Srbiji je zanemarljiv. V veliki meri se nevtralizira z elektronsko prodajo zavarovalnega produkta.*

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