LogForum

> Scientific Journal of Logistics <

http://www.logforum.net p-ISSN 1895-2038 e-ISSN 1734-459X

2020, 16 (4), 549-559

http://doi.org/10.17270/J.LOG.2020.504

ORIGINAL PAPER

THE ASSESSMENT OF THE LOGISTICS PERFORMANCE INDEX OF CEE COUNTRIES WITH THE NEW COMBINATION OF SV AND MABAC METHODS

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ABSTRACT. **Background:** The increase in global trade has caused logistics activities to be an important tool in providing strategic competitive advantage on a global scale. The logistics industry, which helps to facilitate the activities related to the movement of goods in the supply chain, is one of the fastest-growing sectors and has important effects on the economic performance of the countries. Measuring and evaluating the logistics performance of countries can enable them to reach their goals of achieving sustainable competitive advantage by revealing the strengths and weaknesses of logistics services in the entire supply chain. In this regard, the purpose of this study is to analyze and rank logistics performance in terms of selected 11 Central and Eastern European Countries (CEECs).

Methods: In this study, the SV (Statistical Variance) and the MABAC (Multi-Attributive Border Approximation area Comparison) methods are used to form a decision-making model in evaluating the logistic performance. In logistics performance evaluation, the SV method is used to weight the selected performance criteria, whereas the MABAC method is employed to evaluate and rank the logistics performance of CEECs.

Results: The results obtained from the SV method demonstrates that timeliness and infrastructure are the most and least significant performance criteria, respectively. According to the performance ranking of the countries by the MABAC method, the countries in the top three rankings are the Czech Republic, Poland and Hungary, respectively.

Conclusions: The fact that the ranking of the proposed hybrid model is the same as the original logistics performance index (LPI) ranking of the selected countries suggests that the proposed model is consistent.

Key words: SV, MABAC, Logistics Performance, CEECs, Multi Criteria Decision Making.

INTRODUCTION

Factors such as globalization, technological developments, the widespread use of the internet, changing consumption habits, urbanization have led to increased competition among countries. Today, as a result of increasing competition on a global scale, gaining competitive advantage is of great importance for countries to come to the forefront in international trade.

Logistics, which facilitates the mobility of goods as well as providing cost savings, comprises an important service network both within and across the countries and plays a key role in achieving competitive advantage in international markets. Moreover, logistic activities, which have significant effects on the country's foreign trade balance, have become the driving force for the growth and development of the country's economies [Erkan, 2014]. Under these conditions, countries' efforts to seek competitive advantage have raised the importance of logistics activities, which is one of the most significant factors of trade.

Effective logistics activities in international trade contribute not only to the increase of the reliability of the supply chain of countries, but

Citation: Işik Ö., Aydin Y., Koşaroğlu Ş., 2020. The assessment of the logistics performance index of CEE countries with the new combination of SV and MABAC methods. LogForum 16 (4), 549-559, http://doi.org/10.17270/J.LOG.2020.504

Received: 05.06.2020, Accepted: 05.08.2020, on-line: 18.09.2020.

also to the development of trade relations between countries, which can help countries to compete globally [Rashidi and Cullinane 2019]. Nevertheless, inefficient logistics services can damage the foreign trade balance of the countries and cause disruption of the activities of all sectors in the economy. This may mean increased operational costs and disrupted relations in the supply chain for companies as well as countries [Marti et al. 2014].

Countries should check the logistics performance index (LPI) to evaluate their performance and set their objectives in the logistics industry. The goal of the LPI data developed by the World Bank is to reveal the differences in logistics activities between countries. The LPI consisting of 6 indicators such as customs, infrastructure, international shipments, logistics quality and competence, tracking and tracing, and timeliness ranks the countries in terms of their logistics performance and guides countries aiming at improving their logistics performance. Analyzing the LPI scores in detail, countries can determine challenges and opportunities in their logistics supply chain and improve their performance.

The objective of this study is to propose a hybrid performance evaluation model based on LPI data published by World Bank for selected CEECs whose importance in world trade increases day by day.

As a result of the collapse of the Berlin-Wall in 1989, planned economies have transformed into free-market economies and the concept of transition economy has taken its place in the literature. Among the transition economies, the old planned economies in Europe are called the CEECs. CEECs have shown different development performances in the process until today. When the economic indicators are evaluated, different levels of development between these countries are clearly seen. There are also countries that have become important economies of the European Union in parallel with the increase in welfare level among CEECs. The development of CEECs can be attributed to the improvement of various economic variables, especially the increase in production. Nevertheless, it is seen that these countries' place in the world economy has become evident with their growing foreign trade volumes. Accordingly, the CEECs are distinguished from other transition economies by their stable and strong economic performance [Mıhçı 2011].

This study makes three contributions to the existing literature. Firstly, to the best of our knowledge, it is the first study that evaluates the logistics performance of selected CEECs. Secondly, this study also proposes a new combined multi-criteria decision making (MCDM) model including the SV and MABAC methods. Finally, the ranking results of the proposed hybrid model are compared with the existing LPI rankings of the countries and the consistency of the model is checked. Additionally, the findings of this study make some significant recommendations to the CEECs to improve their logistics performance.

The rest of the study is organized as follows: Section 2 presents literature review of the prior studies regarding logistics performance of the countries. Section 3 explains the proposed hybrid methodology. Section 4 gives the application results of proposed model and finally Section 5 concludes the study.

REVIEW OF THE LITERATURE

The literature review section is in threefold: (1) The Applications of the MCDM in the Logistics Performance Assessment of the Countries, (2) The Application Areas of the SV Method, (3) The Application Areas of MABAC Method.

The Applications of the MCDM in the Logistics Performance Assessment of the Countries

In the existing literature, the MCDM models are frequently used by many authors in the study of the performance evaluation. Recently, inter-country logistics performance evaluation, which is one of the dominant streams in the literature, has become the focus of attention for many researchers and academics. Recent studies in this area are summarized as follows.

Among the studies that have been focused on OECD countries, many MCDM methods such as CRITIC, SAW, TOPSIS, VIKOR and Peters' fuzzy regression methods [Çakır 2017], Fuzzy AHP and ARAS-G [Yildirim and Mercangoz 2020], Fuzzy AHP and GRA methods [Candan 2019] have been proposed to evaluate and rank logistics performance. Nevertheless, using CRITIC, SWARA, combined weighting method, and PIV method, Ulutaş and Karaköy [2019] have compared the logistics performance of the European Union (EU) countries. Based on the integrated AHP and VIKOR methods, [Bayır and Yılmaz 2017] have also evaluated logistic performance of EU countries. Similarly, Mercangöz et al. [2020] have proposed an integrated model based on the Fuzzy AHP and COPRAS-G to analyze the LPI data of 28 EU and 5 EU candidate countries from 2010 to 2018. Moreover, Marti et al. [2017] have applied a multiplier DEA input model to the LPI data set of a group of 141 countries to examine their logistics performance.

The Application Areas of the SV Method

The SV method has been employed to determine the objective weights of criteria in different MCDM problems, such as material selection [Rao and Patel 2010, Liu et al. 2013], industrial robot selection [Rao et al. 2011], risk-ranking model [Liu et al. 2016], benchmarking of product recovery alternatives in reverse logistics [Sharma et al. 2016], green supplier selection problem and strategic project selection problem [Krishankumar et al. 2019] and financial development based performance assessment [Gülençer and Türkoğlu, 2020].

The Application Areas of MABAC Method

There are many studies that use the MABAC method in the different fields. For example, Pamučar and Ćirović [2015] have used fuzzy DEMATEL and MABAC methods to rank the forklift alternatives for a logistics company. Božanić et al. [2016] have proposed fuzzy AHP-MABAC model to rank potential locations for the development of laying-up positions. Using FUCOM and MABAC methods, Nunic [2018] has evaluated and selected the PVC carpentry manufacturers among Five potential alternatives. Milosavljević et al. [2018] have used various MCDM techniques, including the MABAC method, to solve the railroad container terminal location problem. Pamučar et al. [2018] have constructed a hybrid model based on interval rough numbers consisting of AHP and MABAC for assessing university web pages. Sharma et al. [2018] have proposed a hybrid model and integrate AHP and MABAC methods in rough environment for prioritizing railway stations. Biswas and Das [2019] have developed a hybrid model for selection of electric vehicle employing the integration of fuzzy AHP and MABAC. Wei et al. [2019] have presented a hybrid method of CRITIC and MABAC under probabilistic linguistic sets to choose medical consumption product supplier. Luo and Xing [2019] have proposed a hybrid model consisting of the combination of extended BWM, PROMETHEE II and MABAC methods to solve personnel selection problem for an IT company. Muravev and Mijic [2020] have integrated BWM method and MABAC method to evaluate the providers of spare parts for transport vehicles. Rahim et al. [2020] have employed a combination of bipolar neutrosophic set and the MABAC method for sustainable energy selection problem.

As can be understood from the brief literature summary, there is no study focusing on logistics performance assessment of CEECs in the literature. This study aims to fill this gap.

PROPOSED METHODOLOGY

Based on the hybrid model, this study combines the SV and the MABAC methods to assess inter-country logistics performance. In this section the steps of allocation of these two methods are described below.

SV Method

The variance weighting as a type of objective technique is proposed by Rao and

Patel [2010]. Statistical variance is a measure that gives important information about the distribution of the data. In this study, the variance weighting technique is employed to obtain the weight coefficients of the selected criteria. The calculation procedure of this method is as follows [Rao and Patel 2010]:

Step 1. The decision matrix A is formed as shown in the Eq. (1):

$$A = [a_{ij}]_{m*n} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

$i = 1,2, \ldots \ldots m;$
$j = 1,2, \ldots n$ (1)

In the above matrix, a_{ij} is the assessment value of i-th alternative according to j-th criterion.

Step 2. Because of different units employed in the measurement of the attributes, the decision matrix must be standardized to make the attributes comparable. Hence, decision matrix is normalized employing the following equation:

$$a_{ij}^{*} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij};} i = 1,2, \ldots m; \ j = 1,2, \ldots n \quad (2)$$

a_{ij}^{*} is the normalized value of a_{ij}.

Step 3. Variance value for each criterion is calculated as:

$$\mathbf{V_j} = \left(\frac{1}{n}\right) \sum_{i=1}^{n} \left(\mathbf{a_{ij}^{*}} - (\mathbf{a_{ij}^{*}})_{\mathbf{mean}}\right)^{2} \quad (3)$$

In Eq. (3), V_j is the variance of the data corresponding to the j-th criterion.

Step 4. Weight coefficient of each criterion is computed via Eq. (4).

$$w_j = \frac{V_J}{\sum_{i=1}^{m} V_j} \quad (4)$$

In which, w_j represents the objective weight with respect to the j-th criterion.

MABAC Method

MABAC method is used to identify the logistics performance of CEECs. This method, which has been introduced to the literature by Pamučar and Ćirović [2015], is based on defining the distance of the alternatives from the border approximation area [Pamučar and Ćirović 2015]. In the following the application steps of MABAC method are given:

Step 1. The initial decision matrix A is constructed. This matrix is presented in Eq. (1).

Step 2. The decision matrix A is normalized. Eqs. (5.1) and (5.2) are employed to normalize the benefit (positive) and cost (negative) criteria, respectively.

$$a_{ij}^{*} = \frac{a_{ij} - \min(a_{ij})}{\text{mak}(a_{ij}) - \min(a_{ij})};$$

$i = 1,2, \ldots \ldots m;$

$j = 1,2, \ldots n$ (5.1)

$$a_{ij}^{*} = \frac{a_{ij} - \text{mak}(a_{ij})}{\min(a_{ij}) - \text{mak}(a_{ij})};$$

$i = 1,2, \ldots \ldots m; \ j = 1,2, \ldots n$ (5.2)

In which, a_{ij}^{*} is the normalized value of a_{ij}.

Step 3. Weighted normalized decision matrix is determined as:

$\hat{a}ij = w_j + w_j \times a_{ij}^{*};$

$i = 1,2, \ldots \ldots m; \ j = 1,2, \ldots n$ (6)

where, w_j is the weight coefficients of the attributes.

Step 4. The values of the border approximation area for each attribute are computed according to Eq. (7).

$$g_j = (\prod_{i=1}^{m} \hat{a}ij)^{1/m}; \ j = 1,2, \ldots n \quad (7)$$

where, m is the total number of alternative.

Step 5. The distance of the alternatives from the border approximation area (q_{ij}) is computed as in Eq. (8)

$$q_{ij} = \hat{a}ij - g_j;$$

$$i = 1,2, \dots \dots m; \;\; j = 1,2, \dots n \qquad (8)$$

Step 6. The total distance of each alternative from the border approximate area is calculated as:

$$S_i = \sum_{j=1}^{n} q_{ij}\,;\; i = 1,2, \dots \dots m \qquad (9)$$

Here, the alternative with the highest S_i value is considered to be the best alternative in terms of the selected evaluation criteria.

APPLICATION OF THE PROPOSED HYBRID MODEL FOR THE EVALUATION OF LOGISTICS PERFORMANCE

In this section, the proposed hybrid SV-MABAC model is applied to the sample consisting of the 2018 LPI data of CEECs. The 2018 LPI data for CCE countries are retrieved from World Bank. The criteria set regarding LPI data used in the evaluation process consists of 6 criteria such as Customs(C1), Infrastructure(C2), International Shipments (C3), Logistics Competence (C4), Tracking & Tracing (C5), and Timeliness (C6). These criteria have recently been used by researchers to determine the logistics performance of one country compared to that of other countries.

Determination of Criteria Weights with SV

The initial decision matrix, which takes into account the 2018 LPI data of CEECs in calculating the objective weights of the performance criteria, is presented in Table 1.

Table 1. Decision Matrix

	C1	C2	C3	C4	C5	C6
Bulgaria	2.937588	2.762986	3.233723	2.881315	3.015289	3.313491
Croatia	2.978555	3.012820	2.929487	3.096154	3.012820	3.593939
Czech Republic	3.286673	3.464600	3.746009	3.715632	3.703427	4.133620
Estonia	3.322037	3.098638	3.262154	3.147851	3.206675	3.798684
Hungary	3.354866	3.270945	3.221880	3.213207	3.670508	3.785941
Latvia	2.796570	2.983000	2.744904	2.692550	2.787563	2.878851
Lithuania	2.846491	2.729618	2.789990	2.955624	3.123323	3.646595
Poland	3.253458	3.208902	3.678499	3.580044	3.505663	3.954262
Romania	2.580718	2.906903	3.176497	3.073653	3.264727	3.681887
Slovak Republic	2.789011	3.000000	3.101099	3.139194	2.985348	3.139194
Slovenia	3.418681	3.261905	3.187912	3.052381	3.266667	3.695238

Table 2. Normalized Decision Matrix

	C1	C2	C3	C4	C5	C6
Bulgaria	0.087520	0.081987	0.092202	0.083401	0.084837	0.083628
Croatia	0.088741	0.089400	0.083527	0.089620	0.084768	0.090706
Czech Republic	0.097921	0.102806	0.106809	0.107551	0.104199	0.104327
Estonia	0.098974	0.091947	0.093013	0.091116	0.090222	0.095874
Hungary	0.099952	0.097060	0.091864	0.093008	0.103272	0.095552
Latvia	0.083319	0.088515	0.078264	0.077937	0.078430	0.072658
Lithuania	0.084806	0.080997	0.079550	0.085552	0.087877	0.092035
Poland	0.096931	0.095219	0.104884	0.103626	0.098634	0.099800
Romania	0.076888	0.086257	0.090570	0.088969	0.091855	0.092926
Slovak Republic	0.083094	0.089020	0.088421	0.090866	0.083995	0.079229
Slovenia	0.101854	0.096792	0.090896	0.088353	0.091910	0.093263

As shown in Table 2, the Initial decision matrix is normalized employing Eq. (2).

After forming the normalized decision matrix, variance and weight values for each criterion are calculated according to Eqs. (3) and (4). The results for these calculations are presented in Table 3. The order of criteria with respect to priority weights is C6>C3>C1>C4>C5<C2. Hence, the results reported in Table 3 indicate that Timeliness (C6) and Infrastructure (C2) are the most and least significant performance criteria, respectively.

Table 3. The Variance and Weight of the Criterion

	C1	C2	C3	C4	C5	C6
Variance	0.000066	0.000040	0.000073	0.000064	0.000062	0.000076
Weight	0.171761	0.105975	0.191793	0.168824	0.161768	0.199880

Ranking of the LPI-Performance of CEECs with MABAC

In the second stage of the proposed model, we perform a ranking of the countries with respect to logistics performance through the application of the MABAC method. Firstly, Eq. (5.1) is applied to the decision matrix shown in Table 1 because of the fact that we have only benefit type criteria. Thus, a normalized decision matrix is formed for the MABAC method. This matrix is indicated in Table 4.

Table 4. Normalized Decision Matrix

	C1	C2	C3	C4	C5	C6
Bulgaria	0.425878	0.045400	0.488279	0.184506	0.248646	0.346390
Croatia	0.474767	0.385318	0.184379	0.394498	0.245950	0.569896
Czech Republic	0.842466	1.000000	1.000000	1.000000	1.000000	1.000000
Estonia	0.884668	0.502080	0.516679	0.445029	0.457614	0.733070
Hungary	0.923845	0.736517	0.476450	0.508910	0.964057	0.722914
Latvia	0.257591	0.344746	0.000000	0.000000	0.000000	0.000000
Lithuania	0.317166	0.000000	0.045036	0.257139	0.366605	0.611861
Poland	0.802828	0.652103	0.932565	0.867471	0.784068	0.857059
Romania	0.000000	0.241210	0.431117	0.372505	0.520999	0.639987
Slovak Republic	0.248571	0.367876	0.355802	0.436567	0.215955	0.207483
Slovenia	1.000000	0.724218	0.442519	0.351713	0.523117	0.650627

Table 5. Weighted normalized decision matrix

	C1	C2	C3	C4	C5	C6
Bulgaria	0.244910	0.110786	0.285441	0.199973	0.201991	0.269117
Croatia	0.253307	0.146808	0.227155	0.235425	0.201555	0.313791
Czech Republic	0.316464	0.211949	0.383585	0.337648	0.323536	0.399760
Estonia	0.323713	0.159182	0.290888	0.243956	0.235795	0.346406
Hungary	0.330442	0.184027	0.283172	0.254740	0.317721	0.344376
Latvia	0.216005	0.142509	0.191793	0.168824	0.161768	0.199880
Lithuania	0.226238	0.105975	0.200430	0.212235	0.221073	0.322179
Poland	0.309656	0.175081	0.370651	0.315274	0.288605	0.371189
Romania	0.171761	0.131537	0.274477	0.231712	0.246049	0.327801
Slovak Republic	0.214456	0.144960	0.260033	0.242527	0.196702	0.241352
Slovenia	0.343522	0.182723	0.276664	0.228202	0.246391	0.329927

Weighted normalized decision matrix is formed using Eq. (6) and presented in Table 5.

The next step within the MABAC method is to compute the values of border approximation area matrix using Eq. (7). Table 6 indicates the results related to these calculations.

Table 6. Border approximation area matrix

	C1	C2	C3	C4	C5	C6
g_j	0.262167	0.150996	0.270890	0.238664	0.235131	0.309686

Table 7. The distance from the border approximate area

	C1	C2	C3	C4	C5	C6
Bulgaria	-0.017257	-0.040210	0.014551	-0.038691	-0.033141	-0.040570
Croatia	-0.008860	-0.004187	-0.043735	-0.003240	-0.033577	0.004105
Czech Republic	0.054297	0.060953	0.112695	0.098984	0.088404	0.090074
Estonia	0.061546	0.008187	0.019998	0.005291	0.000664	0.036720
Hungary	0.068275	0.033031	0.012282	0.016076	0.082590	0.034690
Latvia	-0.046162	-0.008487	-0.079098	-0.069840	-0.073363	-0.109806
Lithuania	-0.035929	-0.045021	-0.070460	-0.026429	-0.014059	0.012493
Poland	0.047489	0.024085	0.099761	0.076610	0.053474	0.061503
Romania	-0.090406	-0.019459	0.003587	-0.006953	0.010917	0.018115
Slovak Republic	-0.047711	-0.006036	-0.010857	0.003863	-0.038429	-0.068334
Slovenia	0.081355	0.031727	0.005774	-0.010463	0.011260	0.020241

After computing the value g_j of each criterion, we obtain the values of the distance of the alternatives from the border approximation area via Eq. (8).

The last step within the MABAC approach is to identify the total distance of each alternative from the border approximate area. These calculations are carried out through Eq. (7) and the results are indicated in Table 8. The rankings of CEECs are as follows; Czech Republic, Poland, Hungary, Slovenia, Estonia, Romania, Croatia, Bulgaria, Slovak Republic, Lithuania and Latvia according to the S_ivalues from the Table 8. So, among the CEECs, the most successful country in terms of logistics performance is the Czech Republic.

As seen in the last column of Table 8, the order of the proposed model is the same as the original order. The fact that both rankings give the same results reveals that the proposed model is consistent.

Table 8. The Results of the Proposed Model

	S_i Values	Ranking of the proposed model	Original ranking among CEECs	Original ranking among all countries
Bulgaria	-0.155317	8	8	52
Croatia	-0.089493	7	7	49
Czech Republic	0.505407	1	1	22
Estonia	0.132405	5	5	36
Hungary	0.246943	3	3	31
Latvia	-0.386756	11	11	70
Lithuania	-0.179406	10	10	54
Poland	0.362921	2	2	28
Romania	-0.084198	6	6	48
Slovak Republic	-0.167505	9	9	53
Slovenia	0.139895	4	4	35

CONCLUSIONS

Given today's global competitive business environment, it is possible to state that the success of the supply chain considerably depends on the effectiveness of logistics activities. Playing a leading role in delivering the goods safely to the final customers, the logistics sector supports various activities that generate the supply chain and contributes to the growth and improvement of national economies. In this context, countries can determine their competitive positions in the global market in terms of logistics services by comparing their logistics performance with those of other economies.

The objective of this study as mentioned above is to propose a new combined model forming from SV and MABAC methods to evaluate the logistics performance of selected 11 transition economies in 2018. According to the results based on the SV weighting method, the order of the criteria is as follows: Timeliness, International Shipments, Customs, Logistics Competence, Tracking & Tracing, and Infrastructure. This result showing that timeliness is the most significant component of LPI is similar to that of Bayır and Yılmaz [2017] but different from those of Rezaei et al. [2018], Yildirim and Mercangoz [2019] and Ulutaş and Karaköy [2019]. The possible reason for this may be attributed to the subjective weighting methods used in these studies.

The ranking of the countries by MABAC method taking into account the weights found in the previous step is as follows: Czech Republic, Poland, Hungary, Slovenia, Estonia, Romania, Croatia, Bulgaria, Slovak Republic, Lithuania and Latvia. Thus, the results show that the countries in the top three rankings are the Czech Republic, Poland and Hungary, respectively. So the countries that fall outside the top three in logistics performance assessment should both strengthen the supply chain and take into account the order of importance of LPI criteria when determining their competitive strategies. More clearly, they should increase their investments that will facilitate logistics operations by focusing more on logistics processes to achieve the level of success of the top three countries and to have a larger share from world trade.

Even though this study presents a new model to the literature in performance evaluation, it has some limitations. Firstly, the results of this study should be interpreted only in terms of CEECs and should not be generalized in terms of other transition economies. Secondly, using only LPI data in 2018 is another limitation of this study. In future studies, researchers can expand the analysis by using methods involving fuzzy or gray numbers in logistics performance evaluation. In addition, the proposed performance evaluation model of this study may be applied to other companies or sectors in future studies.

ACKNOWLEDGMENTS AND FUNDING SOURCE DECLARATION

The authors received no financial support for the research, authorship, and/or publication of this article.

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OSZACOWANIE WSPÓŁCZYNNIKA DZIAŁALNOŚCI LOGISTYCZENJ KRAJÓW EUROPY ŚRODKOWO-WSCHODNIEJ ZA POMOCĄ NOWEJ KOMBINACJI METOD SV ORAZ MABAC

STRESZCZENIE. **Wstęp:** Wzrost globalnego handlu jest przyczyną wzrostu ważności działalności logistycznej jako narzędzia służącego do uzyskiwania przewagi konkurencyjnej na globalną skalę. Branża logistyczna, która wspomaga wszelkie czynności związane z przepływem towarów w obrębie łańcucha dostaw, jest jednym z najszybciej rosnących sektorów i ma istotny wpływ na ekonomiczne wyniki krajów. Pomiar oraz ocena sprawności logistycznej krajów umożliwia im osiągnięcie postawionych celów w uzyskaniu zrównoważonej przewagi konkurencyjnej poprzez ujawnienie słabych i mocnych stron swoich usług logistycznych w obrębie całego łańcucha dostaw.
Celem pracy jest analiza i stworzenie rankingu działalności logistycznej wybranych 11 krajów Europy Środkowo-Wschodniej.

Metody: W pracy zastosowano metody SV (Statistical Variance) oraz MABAC (Multi-Attributive Border Approximation area Comparison) dla zbudowania modelu podejmowania decyzji odnośnie oceny działalności logistycznej. Dla oceny działalności logistycznej, metoda SV została zastosowana do wyznaczenia wagi poszczególnych kryteriów oceny, podczas gdy metoda MABAC została używana do oceny i tworzenia rankingu działalności logisty stycznej krajów Europy Środkowo-Wschodniej.
Wyniki: Wyniki uzyskane przy użyciu metody SV pokazują, że terminowość oraz infrastruktura jest najważniejszymi kryteriami oceny działalności. Zgodnie ze stworzonym rankingiem przy pomocy metody MABAC, najwyżej ocenionymi krajami były: Czechy, Polska i Węgry.
Wnioski: Ranking uzyskany za pomocą opracowanej metody jest taki sam jak przy użyciu oryginalnego współczynnika działalności logistycznej (LPI), co dowodzi poprawności wypracowanego modelu.

Słowa kluczowe: SV, MABAC, działalność logistyczna, kraje Europy Środkowo-Wschodniej, wielokryterialne podejmowanie decyzji

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