SOLUTION OF DECISION MAKING PROBLEMS IN RATING OF THE LEVEL OF THE CORPORATE GOVERNANCE WITH USING THE METHOD OF MADM

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Abstract

These days we understand the importance of corporate governance and the area in which it is possible to realize it´s improvement. During evaluation of corporate governance levelwe meet with the decisive problem: which method will we use to evaluate the corporate governancelevel? On what basis will the company be classified into one of the rating groups? Ratings of companies lost credibility after the publication of the results, which did not correspond to reality.The question is: How can be the rating of corporate governance level improved?Currently it is possible to evaluate these indicators by quantitative methods.The aim of this paper is to apply MADM methods and execute an evaluation and subsequent comparison of the obtained results on the rating model specifically designed for the evaluation of the corporate governance level. Through the methods we can determine the degree of consistency, the weighting of the individual evaluation criteria of a qualitative nature and find the causal relations in the model. It should be noted that the MADM methods have not been applied,to this extent, to any of the rating models of the CGlevel yet.

Key words: Corporate governance, MADM, Decision group, Rating model ICRA´s

JEL Code: C02, M48

Introduction

Corporate governance is a new branch of science that has evolved in recent decades. We can say that it is a new phenomenon of the last fifteen years. These days we find ourselves at the beginning of the third millennium, when we fully realize the importance of corporate governance (further referred toas CG). The current time allows us to use completely new approaches, methods and techniques to ensure that bankruptcies and collapses of companies will not recur again. In an environment where global financial as well as capital markets depend on accurate and objective credit information, evaluation of the corporate governance level provides major benefits for a number of users (creditors, directors, issuers, academics,

policy makers, managers and many other stakeholders) (Hučka, Malý, Okruhlica, 2007). At this time the corporate governance level is assessed mainly through qualitative criteria. However, currently quantitative evaluation of these indicators can also be executed. This paper reflects this fact in terms of decision-making problem. The main aim of this paper is to apply selected multiple attribute decision making methods (MADM) and execute an evaluation and subsequent comparison of obtained results on the rating ICRA´s model specifically designed for the evaluation of the corporate governancelevel. For the purpose of this paper ICRA's rating model created by Moody's Company has been used and was evaluated by six experts. The subjective evaluation is the elementary basis for the application of these methods.The expert group is formed by professors at universities, authors of books dealing with this issue and employees of this rating company. Utilization of the MADM methods led to determining the degree of consistency, determination of the importance of criteria and sub-criteria of this model and determining causal relationships between criteria and sub-criteria of this model. It should be noted that the multiple attribute decision making methods have not been applied, to this extent, to any of the rating models of the corporate governancelevel yet. On the rating ICRA´s model created by Moody´s,the AHP method will be applied, which leads to determination of importance, and the DEMATEL method which by which we can define not only the importance of the group of criteria and sub-criteria, but also the causal relationships in this model. The achieved results will be comparedincluding theireconomic interpretation in the conclusion.

1   Multipleattribute decision making methods

The decision-making process can be described as a process, when we have to make a decision between minimally two or more variants (Brožová, Houška, Šubrt, 2009).In the tasks of multi-criteria decision making, we have determined the final set of n variant, which are evaluated on the basis of m criteria. The questions in the rating process are: "What is the importance of the m criteria? Are all criteria identically important? Are some criteria more important than the other?" Finding theanswers to these questionsis not easy, butthe current methodology offers amethodby whichwe canevaluate thecriteria.

Due to this, in this paper the analytical hierarchy process (AHP) will be applied for weight evaluation of criteria and the method Decision Making Trial and Evaluation Laboratory(DEMATEL), which determines the same as AHP and additionally it can be used to   determine   causal   relationships   inside   the   model.   These   methodsare

chosenbecausetheyallowa quantitative assessment ofqualitative criteria-evaluation of the corporate governancelevel is implemented on thebasis of the criteriaof a qualitative nature.

1.1 Characteristic of ICRA´s rating model

Model ICRA´s is the model, which is especially created for corporate governance rating (CGR). By usinga model ICRA´swecanindicatethelevelof theCG, whichmeansthelevelonwhichcompaniesacceptand keeptheregulationsandotherguidelinesand codes. The CG practices that are used in a company show the distribution of rights and responsibilities between the groups of participants in the company such as the board, management, shareholders and stakeholders. We can classify into CG set of practices the rules and procedures, which can be observed during the decision making process in the company. The emphasis is laid on business practices and the level of quality of disclosure, which should be reflected by the requirements of the regulators and are fair for stakeholders. The ICRA´s model is focused on stakeholder value and governance rating. On the other hand, it is focused also on value creation and value for all participants of a company.

For the purpose of this paper this model will be used for application of multiple attribute decision making method. Rating model ICRA´S created by Moody's was formed by seven criteria which have been further decomposed into 52 sub-criteria. For the purpose of this paper the group formed by six experts will be created for subjective evaluation of importance of sub-criteriabecause of the large number of sub-criteria. To simplify the model scoring method based on a subjective evaluation was applied. The weight of subjective evaluation was the same for each expert. During the evaluation process the evaluation of expert was created in the separation of each other.

Based on a subjective assessment, the most important criteriawas chosen, which are listed sequentially in a hierarchical structure of the model ICRA'S. Fundamental basis for the next application of the MADM methodwas then created.

Tab. 1: The scaleof subjective evaluation of experts

The score	The scale of evaluation
1	non significant criterion
2	less significant criterion
3	medium significant criterion
4	significant criterion
5	the most significant criterion

Source: own arrangement

Fig. 1: SimplifiedICRA´s model - hierarchical structure
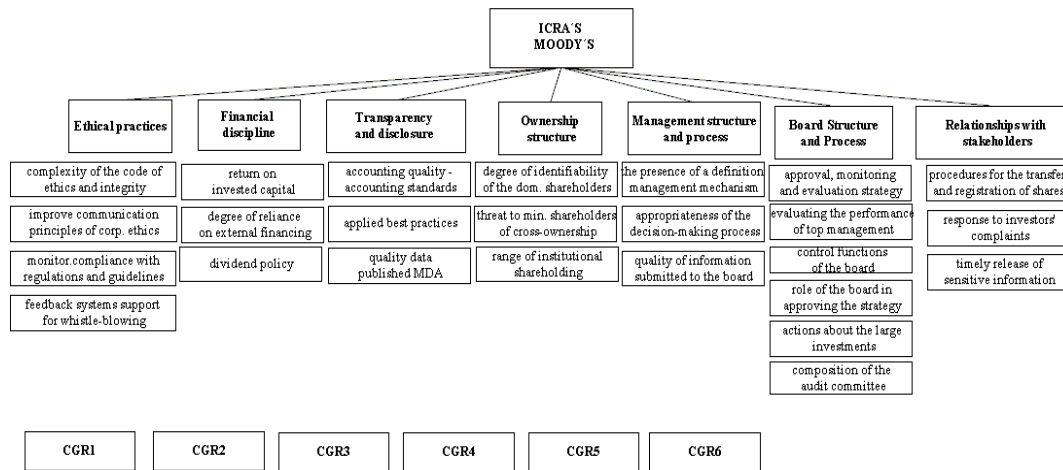
Source: own arrangement

1.2 Analytical hierarchy process (AHP)

Analytical hierarchy process (further referred to as AHP) was created by professor Saatyin 1980. AHP enables weight evaluation of qualitative criteria. This is one of the multiple attribute decision making methods. Thanks to this method, we can make effective decisions culminating inthe selection of optimal variants. Method is based onpair-wisecomparison ofcriteria andsub-criteria. AHP is decomposition method (Saaty, 1980). It means the method by which decomposing of a complex unstructured situation to subcomponents. Thanks to this, the structured system problem is generated. "Method of quantitative paired comparison – Saaty method presented subsequently is applied at each level of the hierarchical structure" (Zmeškal at al., 2013). The advantage of thismethod isthatwe do not only determineour preferencesbut also therange(strength of our preferences) vs. Fuller method (which is alsoa methodbased onpair wisecomparison), wherewe determineonly ourpreferences.For pair-wise comparison of criteria and sub-criteria is used a nine - point scale, which is recommended by professor Saaty, including Saaty matrix stated as follows.

$$S = \begin{bmatrix} 1 & s_{12} & \cdots & s_{1n} \\ 1/s_{12} & 1 & \cdots & s_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ 1/s_{1k} & 1/s_{12} & \cdots & 1 \end{bmatrix} \quad (1)$$

When we have assembled matrix of pair-wise comparison, we have to find out that, the matrix is without inconsistencies.We usually usedindex of consistency, which is defined as follows.

$$CI = \frac{(\lambda_{max} - n)}{(n-1)}, \qquad (2)$$

$$CR = \frac{CI}{RI}, \qquad (3)$$

The matrix is consistentin the case that the condition CI < 0,1 is met. Index of consistency can be mildly higher in practice. We have several ways to estimate the weights v_j. These methods are relatively simple. When we calculated the weights of criteria and sub-criteria, we often used the method of logarithmic least squares (normalized geometric mean of Saaty´s matrix rows). This solution can be used to calculate the geometric mean of S matrix rows.

$$v_i = \frac{\left[\prod_{j=1}^{n} s_{ij}\right]^{1/n}}{\sum_{i=1}^{n}\left[\prod_{j=1}^{n} s_{ij}\right]^{1/n}} \qquad (4)$$

1.3   Decision Making Trial and Evaluation Laboratory(DEMATEL)

Decision Making Trial and Evaluation Laboratory (DEMATEL) is used to find capture relationships among the criteria and to find the main criteria, which shows the efficiency of factors/aspects in practice. DEMATEL has been used in many fields such as systems of management, group decision making and marketing strategies (Anuntavoranich,2013). This method allows its users to find out the complex relationships and set the criteria influence and also determine the level of influence of separate elements over others. Application of DEMATEL method is constituted of six steps listed in the following figure 2.

The method has been successfully applied by many authors, i.e. in the area of marketing strategies, control systems, safety, managers' competency models etc. (Chiu a kol., 2006; Wu and Lee, 2007; Lin and Wu, 2008).The combination with AHP/ANP method was e.g. described by Tzeng et al (2007) in the area of e-learning and Liou at al (2007) in the area of airlines safety.

Fig. 2: Steps implemented in the application DEMATEL method
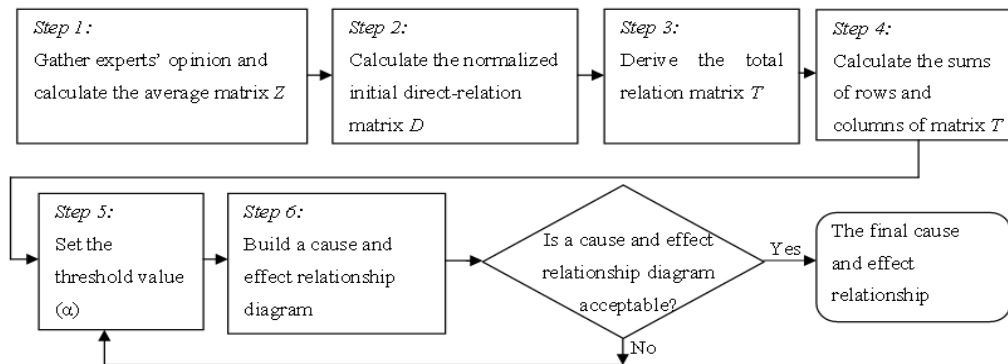
Source: Anuntavoranich, 2013

Each of the six experts determined the level of direct effect between two criteria on the basis of pair-wise comparison. The established level shows, how factor j is influenced by factor I (Kashi, Franek, 2014). Each of the expertshad to choose from the scale 0 (no influence), 1(weak influence), 2(medium influence), 3 (high influence) and 4 (very high influence). Experts had constructed matrix n x n in advance. After that we had to calculate the initial influence of the matrix. Through normalization of the average matrix A, we determined the initial direct impact of the matrix X.After that we calculated the total impact of matrix X, which is reflective of the total relationship between each pair of systemic factors.Finally we calculate the sum of each row and the sum of each column of the T matrix at overall impact matrix T, when the sum of each row and the sum of each column are represented by vectors r and c.

$$r = \left[r_i \right]_{n \times 1} = \left(\sum_{j=1}^{n} t_{ij} \right)_{n \times 1}, \text{ for} i (3)$$

$$c = \left[c_j \right]'_{1 \times n} = \left[\sum_{j=1}^{n} t_{ij} \right]'_{1 \times n}, \text{ for} j \ (4)$$

Subsequently, $(r_i + c_i)$ when $i = j$ (this is the sum of row and column of the unit) indicator shows influences is given and received, it means that $(r_i + c_i)$ shows the relevance of i factor of the problem. If $(r_i - c_i)$ is positive, then i factor influences other factors, and if $(r_i - c_i)$ is negative, then i factor is affected by other factors. Next we establish the thresholder value α and thereafter will be created the map of influence, which is based on a

graph X, Y. The borderline value must be set to filter those factors of T matrix, which have insignificant influence.

$$\alpha = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} \left[t_{ij} \right]}{N}, \qquad (5)$$

1.4   Applicationof MADM methods inthe ICRA's rating model

For the solution of the problem of establishingthe level of CG, the ICRA's rating model mentioned above has been used.In this part of the paperwe will beworkingwith the simplified ICRA'smodelwhosehierarchical structureis shown inthe fig. 1. In this figure we see the hierarchical structure created by seven criteria which are further decomposed into 25 sub-criteria. The modelhas been simplifiedthrough ascoring methodbased on a subjectiveevaluation ofthe group of experts. Pair-wise comparisonswere executed on the basis of Saaty´s matrix (1).

In this section method AHP will be used in the ICRA´ssimplified model. The main aim of this paper was to determine the significance of individual criteria and sub-criteria in ICRA'S rating model because of that the AHP will be terminated on the step, when we determine the level of importance of criteria and sub-criteria of this model. In the following section, will be criteria pair-wise comparison on the first level of hierarchical structure. It meanspair-wise comparison relates to thesecriteriaC1:EthicalpracticesC2:Financial discipline, C3: Transparency and disclosureC4:Ownership structure, C5: management structureandmanagementprocesses, C6:BoardStructureandProcess, C7: relationships with stakeholders. In the next table you can see pair-wise comparison of criteria in model ICRA´s.

Tab. 2: Pair-wise comparison of criteria in ICRA´smodel

ICRA´s MODEL	(C1)	(C2)	(C3)	(C4)	(C5)	(C6)	(C7)
Ethical practices (C1)	1	1/7	1/3	1/3	1/7	1/7	1/3
Financial discipline (C2)	7	1	1/3	2	3	1/3	5
Transparency and disclosure (C3)	3	3	1	1/3	3	1/3	3
Ownership structure (C4)	3	1/2	3	1	3	1/3	3
Management structure and processes (C5)	7	1/3	1/3	1/3	1	1/5	2
Board structure and processes (C6)	7	3	3	3	5	1	5
Relationship with stakeholders (C7)	3	1/5	1/3	1/3	1/2	1/5	1

	100%	$l_{max}=$	7.9541
RI=	1.32	CI=	0.1590
N=	7	CR=CI/RI	**0.1205**

Source: Own elaboration

RI and CI index was calculated on the basis of (2), (3) mentioned above. The same procedure is applied in the case of pair-wise comparison on the second hierarchical level with superior criteria.

Tab. 3: The results achieved by AHP method

Criteria group	Weights of criteria's	Criteria	Local weights	Global weights
ETHICAL PRACTICES	0.0294	monitoring compliance with regulations and guidelines	0.5563	0.0164
		complexity o the code of ethics and integrity	0.2488	0.0073
		improve communication principles of corporate ethics	0.0808	0.0024
		feedback systems support for whistle-blowing	0.1142	0.0034
FINANANCIAL DISCIPLINE	0.1701	return on invested capital	0.5591	0.0951
		dividend policy	0.3522	0.0599
		degree of reliance on external financing	0.0887	0.0151
TRANSPARENCY AND DISCLOSURE	0.1485	accounting quality – accounting standards	0.6694	0.0994
		applied best practices	0.2426	0.0360
		quality data published MDA	0.0879	0.0131
OWNERSHIP STRUCTURE	0.1573	degree of identification of the dom. shareholders	0.3487	0.0549
		threat to min. shareholders of cross-ownership	0.4836	0.0761
		range of institutional shareholding	0.1677	0.0264
MANAGEMENT STRUCTURE AND PROCESSES	0.0785	quality of information submitted to the board	0.6833	0.0536
		the presence of a definition management mechanism	0.1998	0.0157
		appropriateness of the decision-making process	0.1168	0.0092
BOARD STRUCTURE AND PROCESSES	0.3632	evaluating the performance of top management	0.4178	0.1518
		actions about the large investments	0.2259	0.0821
		approval, monitoring and evaluation strategy	0.1164	0.0423
		control functions of the board	0.1259	0.0457
		role of the board in approving the strategy	0.0504	0.0183
		composition of the audit committee	0.0635	0.0231
RELATIONSHIPS WITH STAKEHOLDERS	0.0530	procedures for the transfer and registration of shares	0.4836	0.0256
		timely release of sensitive information	0.3487	0.0185
		response to investors complaints	0.1677	0.0089

Source: Own elaboration

In this section has been achieved a weight evaluation (determining importance) of criteria and sub-criteria of this model. The results were arranged to the simple table, which you can see above for clarity. The most important group of criteria is "Board structure and process", which weight is 0.3632, which has the highest number of weight of criteria groups.

Now DEMATEL method will be applied to the simplified ICRA's model.

Tab. 4: Average matrix Z created on the subjective evaluation of experts

ICRA´s MODEL	(C1)	(C2)	(C3)	(C4)	(C5)	(C6)	(C7)
Ethical practices (C1)	0	4	4	3	4	3	4

Financial discipline (C2)	3	0	4	4	4	4	3
Transparency and disclosure (C3)	1	3	0	2	2	2	4
Ownership structure (C4)	4	3	4	0	3	2	4
Management structure and processes (C5)	3	3	4	2	0	2	3
Board structure and processes (C6)	2	4	4	4	3	0	3
Relationship with stakeholders (C7)	2	2	3	1	1	1	0

Source: Own elaboration

Tab. 5: The calculated matrix T

ICRA´s MODEL	(C1)	(C2)	(C3)	(C4)	(C5)	(C6)	(C7)
Ethical practices (C1)	0.888	1.268	1.480	1.065	1.155	0.977	1.397
Financial discipline (C2)	1.033	1.119	1.501	1.120	1.171	1.027	1.378
Transparency and disclosure (C3)	0.627	0.840	0.850	0.696	0.727	0.683	0.965
Ownership structure (C4)	0.979	1.135	1.366	0.851	1.031	0.863	1.294
Management structure and processes (C5)	0.832	1.003	1.209	0.833	0.783	0.763	1.107
Board structure and processes (C6)	0.920	1.191	1.389	1.041	1.049	0.788	1.274
Relationship with stakeholders (C7)	0.523	0.631	0.774	0.509	0.535	0.467	0.606

Source: Own elaboration

In the next stepwe shouldset the threshold value for eliminationof criteria, which havelow significance. This stepisnot implemented, due to the factthatthe elimination has beenmadealready –now we are workingwith a simplifiedmodelcontainingthe most importantcriteria according to thesubjective evaluation ofexperts.

Tab. 6: The importance of criteria in ICRA´s model

IMPORTANCE OF FACTOR´S	(ri+ cj)	(ri- cj)
Ethical practices (C1)	14.0306	2.4275
Financial discipline (C2)	15.5369	1.1627
Transparency and disclosure (C3)	13.9116	-3.2257
Ownership structure (C4)	13.6354	1.4051
Management structure and processes (C5)	12.9805	0.0780
Board structure and processes (C6)	13.1738	2.1293
Relationship with stakeholders (C7)	12.0655	-3.9768

Source: Own elaboration

For clarity, the results are presented in tabular form above, from which it is clear that the most important criterion in ICRA´s model is the "Financial discipline" according to the DEMATEL method with the value of the significance of 15.5369. The criterion with the greatest influence on other criteria is the criterion of Ethical practices. According to the table above, it can be stated that the criteria which acquires positive values has an impact on other criteria, while criteria with negative value do not affectother criteria. In the last step we created the map of influence, which follows.

Fig. 3: Map of influence among the groups of criteria in ICRA´s model
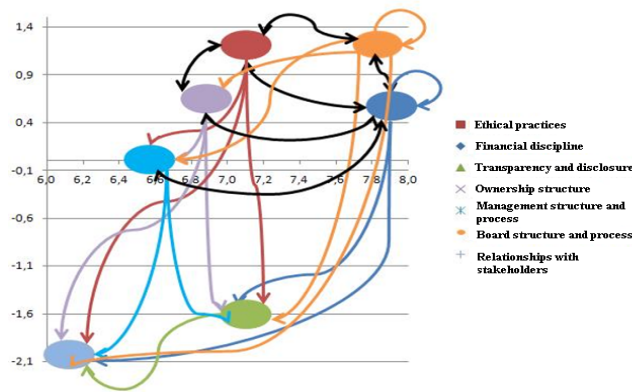
Bi-directional arrows marked with black colour shows that the criteria interact with each other. Feedback for the factor means that the criterion is impacted by itself. One-way arrows show that one factor affects another factor, but is not affected by it. Further, the calculations of significance and influence of sub-criteria will be indicated which are subordinate to a particular criterion. The process of applying the DEMATEL method, which consists of six steps, is repeated on the other criteria with superior criterion. Due to this paper's extent limitations, only the following results are discussed.

Tab. 7: TheresultsachievedbyDEMATELmethod

Criteria group	importance of groups of criteria	influence of groups of criteria	influence of groups of criteria	Criteria	Importance of criteria	influence of criteria	influence of criteria
ETHICAL PRACTICES	7.116	1.2414	affects other factors	monitoring compliance with regulations	9.8462	0.31	affects other factors
				complexity o the code of ethics and integrity	7.2564	1.5	affects other factors
				improve communication principles of corporate ethics	7.5744	-0.8	not affect other factors
				feedback systems support for whistle-blowing	9.5692	-1	not affect other factors
FINANANCIAL DISCIPLINE	7.9313	0.5826	affects other factors	return on invested capital	24	0	affects other factors
				dividend policy	22	0	affects other factors

				degree of reliance on external financing	22	0	affects other factors
TRANSPARENCY AND DISCLOSURE	7.0812	-1.665	not affect other factors	accounting quality – accounting standards	16.36	-0.8	not affect other factors
				applied best practices	17.2	1.92	affects other factors
				quality data published MDA	13.96	-1.1	not affect other factors
OWNERSHIP STRUCTURE	6.9343	0.6619	affects other factors	degree of identification of the dom. shareholders	5.3636	1.36	affects other factors
				threat to min. shareholders of cross-ownership	5.8545	-1.7	not affect other factors
				range of institutional shareholding	5.5818	0.38	affects other factors
MANAGEMENT STRUCTURE AND PROCESSES	6.5848	0.0112	affects other factors	quality of information submitted to the board	13.0857	0	affects other factors
				the presence of a definition management mechanism	13.1429	1.31	affects other factors
				appropriateness of the decision-making process	13.1429	-1.3	not affect other factors
BOARD STRUCTURE AND PROCESSES	7.8277	1.2106	affects other factors	evaluating the performance of top management	8.6586	-1.3	not affect other factors
				actions about the large investments	7.273	-1.6	not affect other factors
				approval, monitoring and evaluation strategy	8.2591	-0.5	not affect other factors
				control functions of the board	8.5285	1.72	affects other factors
				role of the board in approving the strategy	7.3814	1.07	affects other factors
				composition of the audit committee	8.8933	0.56	affects other factors
RELATIONSHIPS WITH STAKEHOLDERS	6.0959	-2.0428	not affect other factors	procedures for the transfer and registration of shares	6.5417	0.21	affects other factors
				timely release of sensitive information	9.25	1.25	affects other factors
				response to investors complaints	8.2083	-1.5	not affect other factors

Source: Own elaboration

Conclusion

When we are looking at the individual results of these methods, we can say that the results are relatively similar.Differences can be attributed to the fact that the DEMATEL method reflected relations prevailing among the criteria and sub-criteria in contrast to the AHP method. Subsequently in the following table the main groups of criteria of the ICRA´s model are ranked fromthe most significant to least significant according to weight evaluation of both methods for clarity.

Tab. 8: Theresultsachievedbyusing MADMmethods

Seq	IMPORTANCE BY AHP	weig	Seq	IMPORTANCE BY	weight	influen
1	Board structure and processes	0.363	1.	Financial discipline (C2)	7.9313	1.2414
2.	Financial discipline (C2)	0.170	2.	Board structure and processes	7.8277	1.2106
3.	Ownership structure (C4)	0.157	3.	Ethical practices (C1)	7.116	1.2414
4.	Transparency and disclosure	0.148	4.	Transparency and disclosure	7.0812	-
5.	Manag. structure and	0.078	5.	Ownership structure (C4)	6.9343	0.6619
6.	Relationship with stakeholders	0.053	6.	Manag. structure and	6.5848	0.0112
7.	Ethical practices (C1)	0.029	7.	Relationship with stakeholders	6.0959	-

Source: Own elaboration

The main difference in the sequence is caused by criterion ethical practices.This isdue to the factthat this criterionisone of the criteria which have he most impact on theother criteria.According to the results it can be concluded that the DEMATEL method gives precision to the results of the AHP method.It must be noted that it should be applied during the rating system approach, where it is necessary to pay attention to the causal relationships in the model.

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