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DATA ENVELOPMENT ANALYSIS TECHNIQUES – DEA AND MALMQUIST INDICATORS, IN CRS MODE, FOR MEASURING THE EFFICIENCY OF ROMANIAN PUBLIC HIGHER EDUCATION INSTITUTIONS

***Abstract**. This paper presents the results of an efficiency study regarding the public universities in Romania, based on the data from 2014-2017. The study was realized using the Data Envelopment Analysis (DEA) methodology and VRS (variable return to scale) and CRS (static return to scale), oriented to the output and also to the input. The main objective is to determine technical and allocative efficiency using data obtained from the Ministry of National Education and the National Institute of Statistics, on the efficiency of public higher education institutions in Romania. The universities were also set in order using the Pareto efficiency model. The results showed that by analyzing the educational efficiency of the 49 public higher education units in Romania, the best performing state universities were: "Babeş-Bolyai" University of Cluj-Napoca (1), The University of Bucharest (2), "Alexandru Ioan Cuza" University of Iasi (3), Politehnica University of Bucharest (4), Carol Davila University of Medicine and Pharmacy Bucharest(5), while "Constantin Brancusi" University of Targu Jiu, "Valachia" University of Targoviste, The University of Petrosani, The University of Pitesti, North University of Baia Mare, "Aurel Vlaicu" University of Tirgoviste and The University of Bacau were the worst-performing state universities in Romania, in a comparative analysis.*

***Keywords**: data envelopment analysis, VRS, CRS, efficiency.*

JEL Classification: C61, C67, I21

1. Introduction

Efficiency and effectiveness (Barros , 2008) are two terms used to measure the business performance at a company. If effectiveness shows the level at which customer requirements are achieved, efficiency (Morrison et. al., 2004) estimates the amount of resources needed to provide customers a specific level of satisfaction (Zhu and Lansink, 2010).

In our analysis, we are considering only public higher education institutions, since the financial resources in the private area are different and the data comparability and implicit results cannot be ensured. (Wu et. al., 2016).

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The efficiency analysis in the public academic field reflects not only the results of education, but also the ability to use the educational resources. As a result, DEA and Malmquist index (MI) are appropriate assessment indicators for this purpose (Vitezic et al., 2016).

2. Stage of knowledge in the field

Annually, governments are increasing their budget investments in education as one of the pure factors of progress in the society (Draine, 2015), with results being differentiated in different countries, although budget contributions may have a similar structure (Lin et. al., 2010). However, governments are particularly focused on investing in educational resources, based in particular on the extensive component, given by building of structures and other material logistic components (Leiringer and Cardellino, 2011) and not focusing on human co-existence, which is essential.

Barra and Zotti (2016) show that universities must be financed according to their previous performance levels, yet there are many situations (including Romania) where the financing is made according to the number of students (state allowance per student).

The technical performance indicators (Porcelli, 2009) at the level of a firm can be defined statically (for a given time) or dynamic (Woo et. al., 2015).

The methods and techniques for assessing productive technical efficiency (Fallahi et. al., 2011; Wadud, 2003) are divided into parametric (techniques) and respectively non-parametric (Porcelli, 2009).

DEA is a proper approach for measuring the input-output efficiency, being commonly used by specialists. DEA analysis is a non-parametric method which produces an empirically effective frontier given by the data provided by the model, and the fact that it generates a single indicator of efficiency facilitates the analysis. The rate of change and the educational progress index is the aggregated production function (Cooper et. al., 2000).

DEA technique uses mathematical programming and does not require finding an explicit form of the production function, which is one of the main advantages of this method, compared to parametric methods (Battese and Coelli, 1995, 1992; Aigner et. al., 1977).

This method calculates the relative efficiency scores for a set of entities identical in the decision-making units, taking values between 0 and 1. Each entity pursuing the same goal is called DMU and has common multiple input-output variables.

Thus, a value close to 1 indicates a high efficiency of both inputs and outputs, while a value greater than 0.7 indicates a high efficiency.

Our analysis on the public universities efficiency in Romania between 2014 and 2017, specifically focuses on the breakdown of overall inefficiency in the following types: technical, administrative, scale and combined forms of inefficiency in each higher education institution.

By calculating efficiency rates and identifying the best-performing institutions will result an empirical production frontier which will serve as a reference point for inefficient institutions. For this, it is necessary to choose the proper input and output variables as they have a decisive role in the fairness of the obtained results (Podinovski and Husain, 2017; Agasisti and Dal Bianco, 2009).

In the following analysis, an output orientation will be chosen here, since to improve performance of an inefficient university it is more logical to increase the outputs than to reduce the existing resources, ensuring a better allocation of human and financial resources (Barra and Zotti, 2016). However, neither the input will not be neglected.

Simultaneously, this kind of study could encourage a healthy competition between higher education institutions, which would result in an increased efficiency and in improved training standards of students from state universities in Romania. All findings in this paper can be used for a better allocation of the public resources for higher education in Romania.

3. Used method - enveloping techniques

3.1 General aspects. About enveloping surfaces

Charnes , Cooper and Rhodes (1978) described the DEA methodology in a mathematical programming applied to some observed data on multiple units decision process. Empirical estimates of maximum input or output relationships are thus obtained such as production functions or possible efficiently production areas, in the input and / or output space, fundamental concepts of the modern economic analysis.

It is known that in the classical microeconomic theory, the production function represents the basis of describing the input-output relationships at the level of a production unit.

On the other hand, the production function, in the classical definition, is a production frontier for the multitude of production possibilities, and the production efficiency calculations can be made relative to this border (obviously if this is known). In the Practice there is only data for each decision unit (DMU) indicating the output levels obtained with the given inputs.

Therefore, the first purpose in studying efficiency is to determine those units (DMU) of the observed set, which determines the empirical production function or the enveloping surface at the level of the problem under consideration. Although extremely varied, each of the data recovery analysis templates tries to

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determine which of the decision units generate a surface area. This surface is also referred to as empirical production or the efficiency limit.

Relative to the production scale there are two types of enveloping surfaces and: surfaces corresponding to the variable yield on scale (VRS - Variable Returns-to-Scale) and surfaces corresponding to the constant yield on a scale (CRS) - Constant Returns-to-Scale.

3.2 DEA model, CRS case

We will consider *n* DMUs to be evaluated, and each DMU consumes different amounts of m inputs to produce different quantities of p outputs, which are supposed to be known. The decision unit *k* consumes $r_{ik} > 0$ from the input *i* and produces the y_{jk} > 0 quantity from the output *j*. So, r_k and y_k will be marked as the input and output vectors for the decision unit *k* (DMU_k).

Assuming the most general case, where returns to the scales are variable, an enveloping surface in this case consists of portions of hyperplanes defined in the space R^{m+p}, which form the particular facets of the convex enveloping of the set of points (r_k, y_k), for $k = \overline{1,n}$.

The equation of such a hyperplane defined on R^{m+p} with coefficients $-\gamma_i$, $i = \overline{1,m}$, and λ_j, $j = \overline{1,p}$ is reduced to:

$$-\sum_{i=1}^{m} \gamma_i r_i + \sum_{j=1}^{p} \lambda_j y_j = 0 \qquad (1)$$

Such a hyperplane forms a facet of the enveloping surface with constant yield on scale if and only if:

$$\sum_{j=1}^{p} \lambda_j y_{jk} - \sum_{i=1}^{m} \gamma_i r_{ik} \leq 0, \text{ for } k = \overline{1,n} \qquad (2)$$

and the relation is made with equality only for certain values of *k*.

In this case, the problem with multipliers for the decision unit *k*, (DMU_k) is written as the following one:

$$\max_{\gamma_i, \lambda_j, \theta} \left\{ -\sum_{i=1}^{m} \gamma_i r_{ik} + \sum_{j=1}^{p} \lambda_j y_{jk} \right\}$$

$$-\sum_{i=1}^{m} \gamma_i r_{ik} + \sum_{j=1}^{p} \lambda_j y_{jk} \leq 0, \text{ for } k = \overline{1,n} \qquad (3)$$

$$\gamma_i \geq 1, \text{ for } i = \overline{1,m}$$

$$\lambda_j \geq 1, \text{ for } j = \overline{1,p}$$

A complete envelope analysis also involves resolving linear programming problems of form (3), one for each decision unit *k*, (DMU_k), which is taken as an assessor.

The optimal solution to the multiplier problem for the decision unit *k*, (DMU_k), is reflected by the γ^k vector (*m*-dimension) and by the λ^k vector (*p-dimension*). For a constantly-scale rolling surface, the decision unit k, (DMU_k), is effective if it is situated on a hyperplane of form $-\gamma^k r+\lambda^k y=0$, called support-hyperplane, which defines a facet of the enveloping surface.

For the *n*-problems, the optimal solutions are given by the (γ^k,λ^k) pairs, for $k=\overline{1,n}$, defining the support hyperplanes of the enveloping surface.

The dual problem with multipliers in CRS is constructed by analogy to the VRS problem and has the following form:

$$\min_{\beta_i,\alpha_j,\delta_k} -\left(\sum_{i=1}^{m}\beta_i+\sum_{j=1}^{p}\alpha_j\right)$$

$$-\sum_{j=1}^{n} r_{ik}\delta_k-\beta_i=-r_{ik}\text{, for } i=\overline{1,m},\ k=\overline{1,n}$$

$$\sum_{j=1}^{n} y_{jk}\delta_k-\alpha_j=y_{jk}\text{, for } j=\overline{1,p},\ k=\overline{1,n} \qquad (4)$$

$$\beta_i\geq 0\text{, for } i=\overline{1,m};$$

$$\alpha_j\geq 0\text{, for } j=\overline{1,p};$$

$$\delta_k\geq 0\text{, for } k=\overline{1,n}.$$

The optimal solution of this problem (4) for the decision unit *k*, (DMU_k),is given by the m-dimensional vector β^k, which expresses the excess of input used in the unit *k* over the hyperplane support, by the p-dimensional vector α^k which expresses the deviations of the decision unit *k*, (DMU_k), in the output components relative to the hyperplane, and the n-dimensional vector ϕ.

For each $\phi>0$, the corresponding dual restriction must be checked with equality, so $-\gamma^k r_j+\lambda^k y_j=0$. Thus, the decision-making units *j* for which $-\gamma^k r_j+\lambda^k y_j=0$ are efficient and are found on the hyperplane, which passes

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through the origin and defines a facet of the enveloping surface. If the decision unit *k*, (DMU_k), is effective, it has to be found on this facet.

Same as in the variable yield scale, the δ^k vector defines a point $\left(r_k^*, y_k^*\right) = \left(\sum_{j=1}^{n} \delta_j^k r_j, \sum_{j=1}^{n} \delta_j^k y_j \right)$ which is on the enveloping surface. However, in the case of a enveloping with constant yields on a scale, the point $\left(r_k^*, y_k^*\right)$ is only a linear combination of efficient units that belong to a facet of the enveloping surface, as opposed to the enveloping with variable yields to, where the point $\left(r_k^*, y_k^*\right)$ is a convex combination of efficient units.

For an inefficient decision unit (not on the enveloping surface), the point $\left(r_k^*, y_k^*\right)$ is a projected point. As a result, for an efficient unit we have the coincidence $\left(r_k^*, y_k^*\right) = \left(r_k, y_k\right)$, and in this case, the projected point can be expressed by the vectors β^k and α^k, as in the following example:

$$\left(r_k^*, y_k^*\right) = \left(\sum_{j=1}^{n} \delta_j^k r_j, \sum_{j=1}^{n} \delta_j^k y_j \right) = \left(r_k - \beta^k, y_k + \alpha^k\right) \qquad (5)$$

This last relationship explains the previous statements about the β^k vector, which indicates the surplus (excess) in the use of the input, while the vector α^k indicates a minus in the output.

It is also noticed that the expression $-\gamma^k \beta^k - \lambda^k \alpha^k$ expresses the value of the objective function of the primary (or dual) problem.

4. Used methodology

This study aims to measure the efficiency of educational resources using educational analysis for input / output variables, using DEA and Malmquist (MI) for the 49 state universities in Romania. An educational analysis based on input-output variables further evaluates the effects of educational efficiency on national competitiveness and can be expanded using regressions with fixed effects and mixed effects on data in the national panel chosen. This study is divided into three stages :

- in the first step, the educational efficiency is calculated by using the educational input and output indicators;
- at the second stage, the effects of the chosen factors (inputs) on educational effectiveness are identified using the data available (2014-2017);
- the third step is based on different levels of competitiveness of the different Romanian state universities, which we have further categorized, offering

multiple possibilities to determine the extent of the impact on educational efficiency at national level.

Firstly, we have calculated DEA and IM as indicators of educational efficiency through educational input and output indicators (values are scaled up in the 10-20 range).

- indicators of total public expenditure in education, at the public university level (as a percentage of GDP); the total public expenditure in education, at the public university level, per resident, the number of students assigned to a teacher in public higher education, the budget allowance per student in Romanian higher education can be selected as educational input indicators;
- in terms of educational performance indicators (output), the number of graduates in state higher education (%) in the specific age group can be selected, the share of the number of public higher education graduates in the total number of students or the share of graduates of public higher education in the total number of students attending the courses at each level of public higher education (DMU_k , for $k = \overline{1,49}$ in this case).

We compared and analyzed educational efficiency among Romanian state universities, by measuring using DEA techniques and determining subsequent effects.

It has been found that the higher the per resident GDP, the higher the level of state involvement in the public university system.

5. Results and discussions-analysis of the educational efficieny

The input-output efficiency of education at the level of higher education institutions in Romania was calculated by using the data from 2014-2017, taking into account the average level of the obtained values.

According to the average results of educational efficiency using the DEA technique (O*x* axis) and continuous educational progress, through MI (O*y* axis), we built a matrix with the 49 higher education units in Romania.

This matrix was used to analyze the effectiveness of input-outputs of education in different higher education units in Romania.

In the following, we will illustrate how the DEA model works with constant yields on a scale, using observations on the 49 state universities (decision-making units) in Romania, for which two inputs are (the number of students belonging to a teacher in public higher education, the budget allocation per student in Romanian public higher education) and an output (the share of the number of graduates of public higher education in the total number of students attending the

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courses at the level of each unit higher education (DMU_k , for $k = \overline{1{,}49}$ in this case). We choose the 35th decision unit as the evaluator ($k = 35$).

The data on the activity of the 49 state universities are presented in Table A1 of Annex 1 (values are scaled in the 10-20 range).

By scrolling the data, it is clear that units **14, 15, 16, 35, 36, 41** and **42** are dominated by the other units, namely units **1, 5, 6, 7, 20, 21, 29, 31, 32, 46** and **48**, which are more efficient because they use lower inputs compared to higher output levels.

By solving the first and dual linear programming problems presented above (problems (1) and (2) respectively), for the decision unit *k* = 35 we obtain the data presented in table 1 (in the line corresponding to the unit 35) and also for the other decision units reported to it (DMU_k , for $k = \overline{1{,}49}$ in this case).

Table 1. Optimal solutions for models with constant return on scale

Decision Unit	λ_1	γ_1	γ_2	$\sum^k$	δ_k	α	β
1	1,000	1,000	1,000	0,0	$\delta_1 = 1$	0	(0;0)
2	1,000	1,000	1,231	0,0	$\delta_2 = 1$	0	(0;0)
3	2,000	2,000	1,000	0,0	$\delta_3 = 1$	0	(0;0)
4	1,000	1,000	1,000	0,0	$\delta_4 = 1$	0	(0;0)
5	1,000	1,000	1,134	0,0	$\delta_5 = 1$	0	(0;0)
6	1,000	1,000	2,000	0,0	$\delta_6 = 1$	0	(0;0)
7	3,000	1,000	1,000	0,0	$\delta_7 = 1$	0	(0;0)
8	2,000	1,300	1,000	0,0	$\delta_8 = 1$	0	(0;0)
9	4,000	1,000	1,000	0,0	$\delta_9 = 1$	0	(0;0)
10	3,000	1,000	1,000	0,0	$\delta_{10} = 1$	0	(0;0)
11	1,000	1,000	1,000	4,0	$\delta_{11} = 1$	0	(0;0)
12	1,000	1,000	1,000	0,0	$\delta_{12} = 1$	0	(0;0)
13	1,000	1,000	1,131	0,0	$\delta_{13} = 1$	0	(0;0)
14	**1,182**	**1,000**	**1,000**	**3,19**	$\delta_{20} = 0{,}398$	0	**(2,34;2,85)**
15	**1,329**	**1,000**	**1,000**	**3,43**	$\delta_{20} = 0{,}321$	0	**(2,34;2,85)**
16	**1,526**	**1,000**	**1,000**	**2,98**	$\delta_{20} = 0{,}318$	0	**(2,14;2,32)**
17	1,000	1,000	1,000	0,0	$\delta_{17} = 1$	0	(0;0)

18	3,000	1,000	1,000	0,0	$\delta_{18}=1$	0	(0;0)
19	2,000	1,300	1,000	0,0	$\delta_{19}=1$	0	(0;0)
20	2,000	1,000	1,000	0,0	$\delta_{20}=1$	0	(0;0)
21	3,000	1,000	1,000	0,0	$\delta_{21}=1$	0	(0;0)
22	1,000	1,000	1,000	0,0	$\delta_{22}=1$	0	(0;0)
23	1,000	1,000	1,000	0,0	$\delta_{23}=1$	0	(0;0)
24	1,000	1,000	1,677	0,0	$\delta_{24}=1$	0	(0;0)
25	2,000	1,000	1,000	0,0	$\delta_{25}=1$	0	(0;0)
26	1,000	1,000	1,000	0,0	$\delta_{26}=1$	0	(0;0)
27	1,000	1,000	1,000	0,0	$\delta_{27}=1$	0	(0;0)
28	1,000	1,000	4,000	0,0	$\delta_{28}=1$	0	(0;0)
29	3,000	1,000	1,000	0,0	$\delta_{29}=1$	0	(0;0)
30	2,000	1,200	1,000	0,0	$\delta_{30}=1$	0	(0;0)
31	4,000	1,000	1,000	0,0	$\delta_{31}=1$	0	(0;0)
32	3,000	1,000	1,000	0,0	$\delta_{32}=1$	0	(0;0)
33	1,000	1,000	1,000	0,0	$\delta_{33}=1$	0	(0;4)
34	1,000	1,000	1,000	0,0	$\delta_{34}=1$	0	(0;0)
35	**1,436**	**1,000**	**1,000**	**4,63**	$\delta_{20}=0{,}436$	0	**(2,34;2,85)**
36	**1,235**	**1,000**	**1,000**	**3,23**	$\delta_{20}=0{,}387$	0	**(3,18;2,78)**
37	1,000	1,000	1,000	0,0	$\delta_{37}=1$	0	(0;0)
38	1,000	1,000	1,000	0,0	$\delta_{38}=1$	0	(0;0)
39	1,000	1,000	4,000	0,0	$\delta_{39}=1$	0	(0;0)
40	3,000	1,000	1,000	0,0	$\delta_{40}=1$	0	(0;0)
41	**1,125**	**1,000**	**1,000**	**3,13**	$\delta_{20}=0{,}312$	0	**(2,05;2,42)**
42	**1,324**	**1,000**	**1,000**	**3,19**	$\delta_{20}=0{,}297$	0	**(2,49;2,67)**
43	3,000	1,000	1,000	0,0	$\delta_{43}=1$	0	(0;0)
44	1,000	1,000	1,000	0,0	$\delta_{44}=1$	0	(0;0)
45	1,000	1,000	1,000	0,0	$\delta_{45}=1$	0	(0;0)

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46	1,000	1,000	1,677	0,0	$\delta_{46}=1$		(0;0)
47	2,000	1,000	1,000	0,0	$\delta_{47}=1$	0	(0;0)
48	1,000	1,000	1,000	0,0	$\delta_{48}=1$	0	(0;0)
49	1,000	1,000	1,000	0,0	$\delta_{49}=1$	0	(0;0)

Source : *Author's work*

Analyzing, in Table 1, the solution corresponding to the decision unit $k=35$, we notice that it is not efficient. It is dominated by the decision unit 20, the corresponding λ variable is positive, $\delta_{20}=0{,}436$.

Since the deviation variable of the output is $\alpha=0$, the unit is not inefficient in the output. However, it is inefficient in terms of input consumption, we have deviations in the inputs from the hyperplane $\beta_1=2{,}34$ and $\beta_2=2{,}85$.

To become effective, the unit should reduce its inputs by 2.34 and 2.85 units, respectively. It is located at a distance of 4.63 units of the hyperplane support that has the equation: $1{,}436y_1-x_1-x_2=0$, a hyperplane that passes through the origin.

6. Conclusions

Analyzing the educational efficiency of the 49 higher education institutions in Romania, "Babeş-Bolyai" University of Cluj-Napoca (1), University of Bucharest (2), "Alexandru Ioan Cuza" University of Iaşi (3), Politehnica University of Bucharest (4), Carol Davila University of Medicine and Pharmacy in Bucharest (5),West University of Timisoara(6), University of Medicine and Pharmacy Iuliu Haţieganu from Cluj-Napoca (7), University of Medicine and Pharmacy Grigore T. Popa from Iaşi (7), Gheorghe Asachi Technical University of Iaşi (8), University Polytechnics in Timişoara (9), Bucharest Academy of Economic Studies (10) are the top 10 in terms of efficiency, with a DEA> 0.8.

Regarding the sustainable development, Romanian state universities are stable and MI values are about 1.0. Values of MI far from 1 would indicate that their educational inputs-outputs are unstable. The study has confirmed that state universities in Romania with high educational efficiency and stable development are mainly those with an efficient management.

The universities were also set in order using the Pareto efficiency model. The results showed that analyzing the educational effectiveness of the 49 higher education institutions in Romania, "Babeş-Bolyai" University of Cluj-Napoca (1), the University of Bucharest (2), "Alexandru Ioan Cuza" University of Iasi (3) The Polytechnic University of Bucharest (4), the University of Medicine and Pharmacy Carol Davila in Bucharest (5) are the best state universities in Romania, while "Constantin Brancusi" University of Targu Jiu, "Valachia" University of

Targoviste, University of Petrosani, University of Pitesti, North University of Baia Mare, "Aurel Vlaicu" University of Arad and University of Bacau are the worst performing state universities in Romania.

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Annex 1. Data on the activity of the 49 state universities

Table A1. Data on the activity of the 49 state universities (values are scaled in the 10-20 range)

Current no. of the decision unit	DECISION UNIT	INPUT 1	INPUT 2	OUTPUT 1
1	Politehnica University of Bucharest	16	14	19

2	Technical University of Civil Engineering of Bucharest	14	15	16
3	"Ion Mincu" University of Architecture and Urbanism of Bucharest	17	18	16
4	University of Agricultural Sciences and Veterinary Medicine of Bucharest	13	15	14
5	University of Bucharest	17	18	20
6	University of Medicine and Pharmacy "Carol Davila" of Bucharest	15	16	19
7	The Bucharest University of Economic Studies	15	16	17
8	National Music University of Bucharest	13	14	14
9	Bucharest University of Arts	18	15	16
10	The National University of Theater and Cinematography "I.L. Caragiale" in Bucharest	12	11	11
11	ANEFS Bucharest	11	12	11
12	National School of Political and Administrative Studies in Bucharest	11	10	11
13	"December 1, 1918" University of Alba-Iulia	10	11	10
14	"Aurel Vlaicu" University of Arad	13	11	10

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15	University of Bacau	14	15	11
16	North University of Baia Mare	14	14	11
17	"Transilvania" University of Brasov	15	16	16
18	Technical University of Cluj Napoca	16	17	17
19	University of Agricultural Sciences and Veterinary Medicine of Cluj Napoca	17	18	16
20	"Babes - Bolyai" University of Cluj Napoca	19	18	20
21	"Iuliu Hatieganu" University of Medicine and Pharmacy of Cluj Napoca	17	18	19
22	Academy of Music "Gh.Dima" from Cluj Napoca	15	14	15
23	University of Art and Design from Cluj Napoca	16	15	15
24	"Ovidius" University of Constanta	12	13	13
25	Maritime University of Constanta	11	10	11
26	University of Craiova	11	13	14
27	University of Medicine and Pharmacy of Craiova	14	15	15
28	"Dunarea de Jos" University of Galati	12	11	12
29	"Gheorghe Asachi" Technical University of Iasi	15	14	18

30	"Ion Ionescu de la Brad" University of Agricultural Sciences and Veterinary Medicine of Iasi	11	10	11
31	"Al. I. Cuza" University of Iasi	18	17	19
32	"Gr. T. Popa" University of Medicine and Pharmacy of Iasi	13	12	16
33	"George Enescu" University of Arts of Iasi	17	16	13
34	University of Oradea	12	11	12
35	University of Petrosani	15	16	11
36	University of Pitesti	10	11	11
37	Oil & Gas University of Ploiesti	11	10	11
38	"Eftimie Murgu" University of Resita	10	10	10
39	"Lucian Blaga" University of Sibiu	13	12	12
40	"Stefan cel Mare" University of Suceava	12	13	12
41	"Valachia" University of Targoviste	15	13	10
42	"Constantin Brancusi" University of Targu Jiu	14	13	10
43	"Petru Maior" University of Targu Mures	11	12	12
44	University of Medicine and Pharmacy of Targu Mures	16	14	15

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45	University of Theatrical Art of Targu Mures	13	12	13
46	"Politehnica" University of Timisoara	15	16	15
47	University of Agricultural Sciences and Veterinary Medicine of Banat Timisoara	12	11	11
48	West University of Timişoara	16	17	19
49	"Victor Babes"University of Medicine and Pharmacy of Timisoara	17	14	15