Complex Evaluation of Economic Development of the Baltic States and Poland

Romualdas GINEVIČIUS – Algirdas BUTKEVIČIUS** – Valentinas PODVEZKO****

Abstract

Economic development of the states may be described by various criteria or indicators. The values of some criteria may be higher for some particular countries, while the values of others may be better for other states. Some of the criteria values are maximized, others are minimized. In this complicated and often conflicting situation it is hardly possible to determine which countries have a higher level of economic development and are considers as leaders and which are lagging behind. Even some integrated criteria used for evaluation, e. g. annual gross domestic product per capita cannot reflect all aspects of state development. The application of multiple criteria evaluation methods may give an unbiased view of the economic state of particular countries. The data obtained in multi-criteria analysis of economic development of the states show the effectiveness of this approach to studying complex processes mainly because it can provide an unbiased view of the actual economic situation.

Keywords: *economic development, multicriteria evaluation, expert judgement*

JEL Classification: C16, O10, P51

1. Introduction

In recent years, much effort has been made to compare the achievements of four countries – Estonia, Latvia, Poland and Lithuania from various perspectives. It fell to their lot to go along the same road seeking to join the ranks of highly

* Romualdas GINEVIČIUS, Vilnius Gediminas Technical University, Department of Economics and Management of Enterprises, Saulėtekio al. 11, LT-10223 Vilnius-40, Lithuania; e-mail: romualdas.ginevicius@adm.vtu.lt

** Algirdas BUTKEVIČIUS, Ministry of Finance of the Republic of Lithuania, J. Tumo-Vaizganto 8a/2,01512 Vilnius, Lithuania; e-mail: a.butkevicius@finmin.lt

*** Valentinas PODVEZKO, Vilnius Gediminas Technical University, Department of Mathematical Statistics, Saulėtekio al. 11, LT-10223 Vilnius-40, Lithuania; e-mail: lsaulis@fm.vtu.lt

developed Western countries. Together they were preparing to become member states of the European Community and were invited to join it and became the EU members simultaneously.

Now, these countries are going to introduce euro, the EU monetary unit. Despite these facts, the above states are competing with each other in many areas trying to prove that they achieved more than their rivals. The statistical data on social and economic development of these countries provided by various EU reference books (e. g. Eurostat, etc.) also give rise to discussion about the actual situation. It may be stated that the ranking of the countries according to their achievements is often made based on one particular indicator taken out of the context. In other cases, some local indicators which vary in importance for particular countries are considered. Therefore, the conclusions made on this basis can hardly be sufficiently reliable. Even some general indicators, e.g. gross domestic product, GDP, per capita, often relied upon in analysis can hardly reflect all aspects of the state development. In fact, we are faced with a situation when the values of some particular indicators are higher for certain countries, while the values of other indicators are higher for other states. In addition, the indicators may have various dimensions, and the higher values may be 'better' in some cases, while in others the lower values are preferable. In fact, the situation is even more complicated because the weights of economic development indicators of the state also differ.

The question arises how to rate the countries according to the level of their economic development under such complicated and even conflicting conditions? A compromise solution may be found if multiple criteria evaluation methods taking into account the above diverse parameters are used (Hwang and Yoon, 1981; Ginevičius and Podvezko, 2000; 2001; 2004; Vilutienė and Zavadskas, 2003; Zavadskas et al., 2001; 2004; Brans et al., 1986; Roy, 1996; Ustinovičius, 2001; Larichev et al., 2003). The present paper describes an attempt to evaluate the economic development of Estonia, Latvia, Poland and Lithuania and its rate from various perspectives, applying multicriteria evaluation techniques.

Various data on economic development of the countries are provided by their statistical departments and bureaus. The present analysis of economic development relies on the information provided by Turku School of Economics and Business Administration which is based on the official data obtained from the statistical departments of the respective countries (Baltic Rim Economics, 2004).

The above information is presented, taking into account the following eight main indicators of economic development (Table 1): gross domestic product (y-o-y % – change); industrial production (y-o-y % – growth); inflation (y-o-y % – change); general gover-nment budget balance (% of GDP); annual gross wage,

EUR; unemployment, %; exports (EUR billion, current prices); imports (EUR billion, current prices).

Table 1

The Values of Economic Development Indicators

Indicator	Year						
	1997	1998	1999	2000	2001	2002	2003
1. *Annual rate of GDP, in per cent*							
Estonia	10.5	5.2	–0.1	7.8	6.4	7.2	5.1
Latvia	8.3	4.7	3.3	6.9	8.0	6.4	7.5
Lithuania	7.0	7.3	–1.7	3.9	6.4	6.8	9.7
Poland	6.8	4.8	4.1	4.0	1.0	1.4	3.8
2. *Annual growth of industrial production, in per cent*							
Estonia	14.6	4.1	–3.4	14.6	8.9	8.2	9.8
Latvia	6.1	2.0	–8.8	3.2	6.9	5.8	6.5
Lithuania	3.3	8.2	–9.9	2.2	16.0	3.1	16.1
Poland	11.5	3.5	3.6	6.7	0.6	1.1	8.4
3. *Annual rate of inflation, in per cent*							
Estonia	12.5	6.5	3.9	5.0	4.2	2.7	1.1
Latvia	7.0	2.8	3.2	1.8	3.2	1.4	3.6
Lithuania	8.4	2.4	0.3	1.4	2.0	–1.0	–1.3
Poland	13.2	8.6	9.8	8.5	3.6	0.8	1.7
4. *General government budget balance, in per cent of GDP*							
Estonia	2.1	–0.2	–4.3	–1.0	0.3	1.0	2.4
Latvia	–	0.1	–4.0	–2.6	–2.0	–2.3	–1.6
Lithuania	–	–	–	–2.5	–2.0	–1.5	–1.9
Poland	–1.2	–2.4	–2.0	–2.2	–4.4	–5.1	–4.5
5. *Annual gross wage, EUR*							
Estonia	227	262	284	314	352	393	430
Latvia	183	202	225	268	282	297	298
Lithuania	173	208	231	263	274	293	306
Poland	288	314	401	472	557	544	501
6. *Unemployment rate, in per cent*							
Estonia	9.8	10.2	12.9	13.9	11.9	11.3	9.3
Latvia	14.1	13.7	13.2	13.3	12.9	11.6	10.3
Lithuania	14.1	12.6	15.3	16.1	17.5	13.0	11.6
Poland	10.2	10.6	15.3	16.0	18.5	19.7	19.3
7. *Exports, current prices, EUR billion*							
Estonia	1 891	2 252	2 239	3 445	3 698	3 642	3 996
Latvia	–	–	1 613	2 020	2 232	2 416	2 559
Lithuania	–	–	2 583	3 841	4 778	5 526	6 135
Poland	–	25.1	25.7	34.4	40.4	43.4	47.5
8. *Imports, current prices, EUR billion*							
Estonia	3 127	3 529	3 224	4 615	4 798	5 079	5 734
Latvia	–	–	2 758	3 453	3 910	4 284	4 634
Lithuania	–	–	4 340	5 650	6 767	7 943	8 441
Poland	–	41.5	43.2	53.1	56.2	58.3	60.4

Source: Baltic Rim Economies (2004).

The comparative analysis of the main indicators of economic development of four countries has confirmed the statement made in the introduction that some indicators are better for certain countries, while others are more favourable for other states. This complicates the comparison and rating of the countries according to their achievements. To determine which countries achieved more in economic development than their rivals, a special complex evaluation is needed.

2. Complex Evaluation of Economic Development of Three Baltic States and Poland

The analysis is based on the data obtained for 2000 – 2003 because not all information is available for 1997 – 1999 and 2004.

Multicriteria evaluation technique is based on aggregation of the products of two values. The first is the weight of a considered aspect, the second is the value of an indicator relating to it.

Expert systems are usually applied to determine weights. Various methods including direct and indirect approaches are available (Saaty, 1994; 1980; Ginevičius and Podvezko, 2004). The present analysis relies on the direct evaluation method, when the weights of indicators are expressed in parts of unity. In this case, the following condition is valid:

$$\sum_{i=1}^{m} \omega_i = 1,0 \qquad (1)$$

where ω_i is the weight of the i-th indicator; m is the number of indicators ($i = 1, \ldots, m$).

Multicriteria evaluation of economic development of the state is based on seven key indicators (Table 2).

Table 2

The Main Indicators of the Economic Development of the States

№	Indicator	Weights
1	Annual GDP	0.15
2	Industrial production	0.10
3	Inflation rate	0.20
4	General government budget balance	0.15
5	Annual gross wage	0.10
6	Unemployment rate	0.15
7	Exports/imports relationship ratio	0.15
	Total	**1.0**

Source: Baltic Rim Economies (2004) and the data obtainet in the investigation of the authors.

Using the absolute values of exports and imports irrespective of the size and GDP of the country can distort the picture. Therefore, in further calculation a new criterion – exports/imports ratio is introduced. This is a non-dimensional relative value not dependent on the state's GDP and showing a qualitative rather than a quantitative aspect of a considered phenomenon.

The values of the indicator weights given in Table 1 were obtained in two steps. First, the experts from the Ministry of Finance of Lithuania assigned the weight to each indicator in parts of unity according to the condition of formula (1). Then, the concordance degree of experts judgements was determined based on the concordance coefficient W and the value χ^2 of the distribution corresponding to it.

The concordance coefficient W was calculated according to the formulas (see Ginevičius and Podvezko, 2004; Kendall, 1970; Zavadskas and Kaplinski, 1997; Ustinovičius and Jakučionis, 2000):

$$W = \frac{12S}{r^2\left(m^3 - m\right)} \tag{2}$$

where S the total square deviation of indicator values from the average value of expert rankings; r is the number of expert's; m is the number of indicators.

The values of distribution χ^2 are calculated by the formula (Kendall, 1970):

$$\chi^2 = Wr\left(m-1\right) \tag{3}$$

where m is the number of indicators, r is the number of experts.

The initial estimates were not in agreement, therefore, at the second stage, the experts revised them and determined compromise weight values (Table 2).

Complex multicriteria evaluation of state development was performed by using seven methods: sum of rankings (Ginevičius and Podvezko, 2001; 2004), simple additive weighting, SAW, based on the sum of weighted normalized values (Hwang and Yoon, 1981; Ginevičius and Podvezko, 2001); geometrical mean (Ginevičius and Podvezko, 2001; 2000); TOPSIS (Hwang and Yoon, 1981; Opricovič and Tzeng, 2004) and VIKOR (Opricovič and Tzeng, 2004) methods as well as the method of proportional evaluation (Zavadskas et al., 2004) and its simplified version (Ginevičius et al., 2004).

The evaluation by all these methods was based on the data given in Table 1 which present the values of indicators (per year) relating to economic development of the countries $r_{ij}\left(i = 1, \ldots, m; j = 1, \ldots, n\right)$. Here, m is the number of indicators, n is the number of countries. In this case, $m = 7$, $n = 4$.

The methods of the sum of rankings and geometrical mean require the indicator values r_{ij} to be positive, therefore, all numbers in Table 1 having the sign „–" were transformed according to the formula:

$$\overline{r}_{ij} = r_{ij} + \min_j \left| r_{ij} \right| + 1 \qquad (4).$$

In this way, the least negative value of all indicators obtains the value 1.0. Multicriteria evaluation approaches based on the sum of rankings V_j and geometrical mean Π_j do not depend on the weight of indicators ω_i, therefore they may be applied at the initial stage of analysis.

Multicriteria evaluation techniques require that each indicator be changed only in one direction, i. e. can be maximized or minimized. For maximizing indicators the 'best' values are the largest, while for minimizing ones the smallest values are preferable. In our case, maximized indicators (criteria) are: gross domestic product, annual growth of industrial production, general government budget balance, gross annual wage and exports/imports ratio, while minimized indicators are inflation rate and unemployment.

The simplest multicriteria method used at the initial stage of evaluation is based on the sum of ranks calculated for the alternative, taking into account the values of the indicators describing it (Ginevičius and Podvezko, 2001; 2004). This method does not need any transformation of data or positive values and the uniformity of units of measu-rement, being also independent of the particular values of the indicators weights ω_i. The sum of ranks for the j-th country is calculated in the following way:

$$V_j = \sum_{i=1}^{m} m_{ij} \qquad (5)$$

where m_{ij} is a rank (position) of the j-th alternative for the i-th indicator, with $m_{ij} = 1$, if the value of the indicator is the best (the largest or the smallest, depending on the indicator type), $m_{ij} = 2$ for the second most important country, etc., and $m_{ij} = n$ for the last country. If two or more countries are assessed as equal, they are assigned the same rank (probably, a fractional number) which is an arithmetical mean of their respective positions. For example, if two equally assessed countries are placed in positions 3 and 4, then, each of them is assigned the rank $(3 + 4)/ 2 = 3.5$.

The most effective alternative correlates with the smallest value of the criterion V_j. A wide application of this technique for practical purposes has demonstrated its high efficiency and the agreement of the obtained ranked lists of alternatives with the results obtained by more sophisticated multicriteria evaluation methods. It is particularly valid for the leading alternatives and the least effective options

with low ranks. The simplicity of the above method is its main advantage because the values of the criterion V_j may be determined for all n alternatives in few minutes, not even using a computer. However, the criterion V_j has low sensitivity to slight variation of indicator values. Thus, the adjacent values of the indicator for two or more alternatives may be nearly the same or completely different, while the ranks of the alternatives may differ by one in both cases. The criterion V_j should be cautiously applied in actual situations, if the i-th indicator is of maximizing and minimizing types and if some of the values are negative. In such cases, to simplify formal evaluation of the alternatives, the indicators may be transformed into maximizing ones with positive values.

One of the simplest and effective methods of multicriteria evaluation is based on the calculation of a geometric mean for normalized (dimensionless) values of $\tilde{r}_{ij}$, the criterion Π_j of which is easily determined from the formula given below by using a calculator:

$$\Pi_j = \sqrt[m]{\prod_{i=1}^{m} \tilde{r}_{ij}} \tag{6}$$

The initial indicator values of r_{ij} may be normalized, for example, by dividing the value of every indicators by the sum of its values for every j-th country. This simple 'classical' normalization is performed by the formula:

$$\tilde{r}_{ij} = \frac{r_{ij}}{\sum_{j=1}^{n} r_{ij}} \quad (i = 1, \ldots, m; j = 1, \ldots, n) \tag{7}$$

In this case, the sum of normalized values of $\tilde{r}_{ij}$ for every indicator with respect to all alternatives is equal to one: $\sum_{j=1}^{n} \tilde{r}_{ij} = 1$.

The largest value of the index Π_j corresponds to the 'best' (leading) alternative. All other alternatives are ranked in the descending order of the value of Π_j.

The method SAW (Simple Additive Weighting) is based only on maximizing indicators, therefore the values of minimizing indicators should be transformed into the maximizing ones by the formula:

$$\hat{r}_{ij} = \frac{\min_j r_{ij}}{r_{ij}} \tag{8}$$

As shown by formula (8), the smallest minimized indicator value acquires the largest value equal to one.

The initial data r_{ij} are normalized for calculations by SAW according to the formula (7).

Multicriteria evaluation of economic development of a particular country by the SAW method is performed by the formula:

$$S_j = \sum_{i=1}^{m} \omega_i \tilde{r}_{ij} \ , (j = 1, ..., n) \tag{9}$$

where S_j is the value obtained by evaluating j-th country by SAW method.

According to a complex method of proportional evaluation and its simplified version, the normalization should be mode by formula (7) (see Zavadskas et al., 2004; Ginevičius et al., 2004):

The criterion of a complex proportional evaluation method is calculated as follows:

$$Z_j = S_{+j} + \frac{S_{-\min} \sum_{j=1}^{n} S_{-j}}{S_{-j} \sum_{j=1}^{n} \frac{S_{-\min}}{S_{-j}}} \tag{10}$$

where $S_{+j} = \sum_{i=1}^{m} \omega_i \tilde{r}_{+ij}$ the sum of the weighted values $\tilde{r}_{+ij}$ of the j-th maximizing indicator (for which the largest value is the best) for all countries m; $S_{-j} = \sum_{i=1}^{m} \omega_i \tilde{r}_{-ij}$ same for j-th minimizing indicator (with the minimum value $S_{-\min} = \min_j S_{-j}$).

Basing ourselves on the proportional evaluation criterion (10), we offer its simplified version (Ginevičius et al., 2004) which could allow much faster and simpler (not computer-aided) calculation of the values of the criterion Z_j.

The simplified criterion Z_j will be of the form:

$$Z_j^* \approx S_{+j} + \frac{S_{-\max} S_{-\min}}{S_{-j}} \tag{11}$$

The calculations show that Z_j and Z_j^* do not actually differ, while the order of priority obtained in both cases is the same.

TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) relies on vector normalization:

$$\tilde{r}_{ij} = \frac{r_{ij}}{\sqrt{\sum_{j=1}^{n} r_{ij}^2}} \tag{12}$$

The best solution (alternative) V^* and the worst V^- are calculated by the formulas:

$$V* = \{V_1^*, V_2^*, ..., V_m^*\} = \{(\max_j \omega_i r_{ij} \ / \ i \in I_1), (\min_j \omega_i \tilde{r}_{ij} \ / \ i \in I_2)\} \tag{13}$$

$$V^- = \{V_1^-, V_2^-, ..., V_m^-\} = \{(\min_j \omega_i r_{ij} \ / \ i \in I_1), (\max_j \omega_i \tilde{r}_{ij} \ / \ i \in I_2)\} \tag{14}$$

where I_1 a set of indices of maximizing indicators; I_2 a set of indices of minimizing indicators; ω_i i-th indicator weight.

D_j^* distance of any compared alternative from the best solutions and D_j^- distance from the worst solutions are calculated by the formulas:

$$D_j^* = \sqrt{\sum_{i=1}^{m} (\omega_i \tilde{r}_{ij} - V_i^*)^2} \tag{15}$$

$$D_j^- = \sqrt{\sum_{i=1}^{m} (\omega_i \tilde{r}_{ij} - V_i^-)^2} \tag{16}$$

The main TOPSIS criterion C_j^* is calculated from the formula:

$$C_j^* = \frac{D^-}{D_j^* + D_j^-} \quad (j = 1, ..., n), \ (0 \le C_j^* \le 1) \tag{17}$$

The best alternative correlates with the largest criterion value C_j^*. The compared alternatives (countries) should be ranked in the descending order.

The compromise classification method VIKOR assumes the following normalization to be made:

$$\tilde{r}_{ij} = \frac{\max_j r_{ij} - r_{ij}}{\max_j r_{ij} - \min_j r_{ij}} \tag{18}$$

VIKOR is based on three criteria S_j, R_j and Q_j ($j = 1, ..., n$) [19].

The criteria S_j and R_j are calculated by the formulas:

$$S_j = \sum_{i=1}^{m} \omega_i \tilde{r}_{ij} \tag{19}$$

$$R_j = \max_i \ (\omega_i \tilde{r}_{ij}) \tag{20}$$

The main integrated criterion Q_j is calculated from the formula:

$$Q_j = v\,(S_j - S^*)/(S^- - S^*) + (1-v)\,(R_j - R^*)/(R^- - R^*) \qquad (22)$$

where $S^* = \min_j S_j$, $S^- = \max_j S_j$, $R^* = \min_j R_j$, $R^- = \max_j R_j$, v is the majority criterion, the strategic weight (in this case, $v = 0.5$)

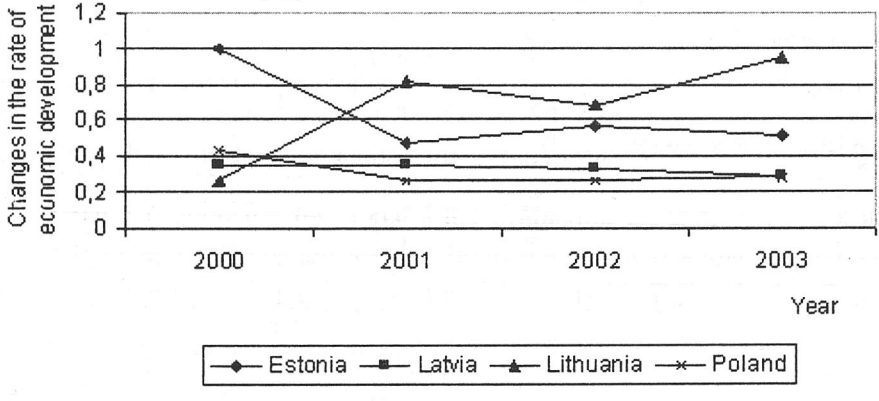
The best alternatives have the smallest values of the criteria S_j, R_j *and* Q_j implying that the compared alternatives should be ranked in the ascending order.

3. The Results of Multicriteria Analysis of Economic Development of the Baltic States and Poland

The results obtained in the complex evaluation of economic development of the Baltic states and Poland over the period from 2000 to 2003 are presented in Table 3. As shown in the table, the results also depend on the evaluation technique used. Therefore, a more general view may be obtained by considering the average value (Table 3). Graphical representation of the data obtained demonstrates the rate of economic development of the countries in question (Figure 1).

Figure 1

The rate of Economic Development of the Baltic States and Poland



According to the data of economic development of the Baltic states and Poland in 2000 – 2003, these countries may be divided into two groups. The first group includes Estonia and Lithuania, the second – Latvia and Poland. In terms of economic development the countries of the first group are in a leading position, leaving the states of the second group far behind. A comparison of the countries of each group against each other yielded the following results.

Table 3

The Results of Multicriteria Evaluation of Economic Development of the Baltic States and Poland

Method	Estonia		Latvia		Lithuania		Poland	
	value	rank	value	rank	value	rank	value	rank
	2000							
Geometrical mean	0.29	1	0.22	2	0.20	4	0.21	3
SAW	0.30	1	0.25	2	0.24	3	0.21	4
Sum of rankings	11	1	19	3	22	4	18	2
Proportional evaluation	0.34	1	0.20	3	0.18	4	0.29	2
Simplified proportional evaluation	0.33	1	0.19	3	0.17	4	0.28	2
TOPSIS	0.84	1	0.26	3	0.1	4	0.61	2
S_j	0.22	1	0.82	4	0.75	3	0.42	2
VIKOR R_j	0.11	1	0.15	3	0.20	4	0.14	2
Q_j	0	1	0.73	3	0.94	4	0.36	2
Total	–	9	–	26	–	34	–	21
Average	–	1	–	2.89	–	3.78	–	2.33
	2001							
Geometrical mean	0.27	2	0.24	3	0.28	1	0.12	4
SAW	0.28	2	0.25	3	0.30	1	0.17	4
Sum of rankings	13.5	1	17.5	3	17	2	22	4
Proportional evaluation	0.28	2	0.26	3	0.29	1	0.17	4
Simplified proportional evaluation	0.28	2	0.26	3	0.29	1	0.17	4
TOPSIS	0.60	2	0.58	3	0.68	1	0.22	4
S_j	0.35	1	0.50	3	0.37	2	0.74	4
VIKOR R_j	0.20	4	0.15	2-3	0.13	1	0.15	2-3
Q_j	0.50	3	0.35	2	0.03	1	0.66	4
Total	–	19	–	25.5	–	11	–	34.5
Average	–	2.11	–	2.83	–	1.22	–	3.83
	2002							
Geometrical mean	0.28	1	0.24	3	0.27	2	0.13	4
SAW	0.29	2	0.24	3	0.31	1	0.17	4
Sum of rankings	12	1	20	3 – 4	18	2	20	3 – 4
Proportional evaluation	0.29	2	0.24	3	0.30	1	0.14	4
Simplified proportional evaluation	0.28	1	0.23	3	0.27	2	0.16	4
TOPSIS	0.56	2	0.51	3	0.68	1	0.31	4
S_j	0.28	1	0.52	3	0.31	2	0.65	4
VIKOR R_j	0.20	4	0.15	2–3	0.10	1	0.15	2-3
Q_j	0.50	2	0.57	3	0.04	1	0.75	4
Total	–	16	–	27	–	13	–	34
Average	–	1.78	–	3	–	1.44	–	3.78
	2003							
Geometrical mean	0.26	2	0.20	3	0.31	1	0.17	4
SAW	0.27	2	0.21	3	0.34	1	0.18	4
Sum of rankings	14	1 – 2	22	4	14	1 – 2	20	3
Proportional evaluation	0.28	2	0.20	3	0.33	1	0.19	4
Simplified proportional evaluation	0.26	2	0.19	3	0.30	1	0.18	4
TOPSIS	0.62	2	0.34	3	0.68	1	0.27	4
S_j	0.37	2	0.71	4	0.26	1	0.65	3
VIKOR R_j	0.12	2	0.20	4	0.10	1	0.15	3
Q_j	0.23	2	1	4	0	1	0.70	3
Total	–	17.5	–	31	–	9.5	–	32
Average	–	1.94	–	3.44	–	1.06	–	3.56

Thus, at the beginning of the considered period, i. e. in 2000, Estonia was in a much better position than Lithuania. However, in the middle of the period, i.e. in 2001 – 2002, these countries changed places, while at the end of the period, i. e. in 2003, Lithuania took the leadership and still maintains this position with respect to all countries considered. The positions of Latvia and Poland making the second group are similar at the beginning, in the middle and at the end of the examined period. The data obtained in the study show that multicriteria analysis allows for complex evaluation of such a complicated process as economic development of the states providing the unbiased view of the actual situation.

Conclusions

1. Economic development of the Baltic states and Poland is described by many indicators (or criteria). For certain countries some indicators are 'better', while others are more favourable for other states. Some of the indicator values are maximized, others are minimized. In this complicated and often conflicting situation it is hardly possible to determine which countries have a higher level of economic development and are the leaders and which are lagging behind. The application of multiple criteria evaluation methods may give an answer to this question and provide a true picture of the economic state of the countries considered.

2. To analyze complicated processes, such as economic development of the states, some simple and rather complicated criteria evaluation methods may be used. The former include the geometrical mean approach and SAW (based on the addition of products of the criteria weights and values), while the latter embrace more complicated approaches, such as complex proportional and simplified pro-portional evaluation as well as TOPSIS and VIKOR.

3. Multicriteria analysis of economic development of three Baltic states and Poland allows us to determine the actual state of their economics and rank the countries according to their achievements. The analysis made also allows us to subdivide the countries into two groups. The first group includes more economically advanced countries – Estonia and Lithuania, the second – Latvia and Poland as less developed economies. A position of Estonia was better at the beginning of the examined period (2000), but in the middle of the period (2001 – 2002) it changed places with Lithuania, and at the end of the period (2003) Lithuania took the leadership. The positions of Latvia and Poland were similar throughout the whole period.

4. The data obtained in multicriteria analysis of economic development of the states show the effectiveness of this approach in studying complex processes because it can provide an unbiased view of the actual situation.

References

[1] HWANG, C.-L. – YOON, K. (1981): Multiple Attribute Decision Making-Methods and Applications. A State of the Art Survey. Berlin/Heidelberg/New York: Springer-Verlag.

[2] GINEVIČIUS, R. – PODVEZKO, V. (2001): Complex Evaluation of Economical-social Development of Lithuanian Regions. Journal of Civil Engineering and Management [Statyba], Vol. VII, No. 4, pp. 304 – 309.

[3] VILUTIENĖ, T. – ZAVADSKAS, E. K. (2003): The Application of Multi-criteria Analysis to Decision Support for the Facility Management of a Residential District. Journal of Civil Engineering and Management, Vol. IX, No. 4, pp. 253 – 259.

[4] ZAVADSKAS, E. K. – KAKLAUSKAS, A. – RASLANAS, S. – MALIENĖ, V. (2001): Die Anwendung der mehrikriteriellen methode bei der Bewertung von Erholingsgrundstucken. Journal of Civil Engineering and Management [Statyba], Vol. VII, No. 4, pp. 327 – 333.

[5] GINEVIČIUS, R. – PODVEZKO, V. (2000): Complex Evaluation of Efficiency of Economic Activities at Construction Enterprises. Journal of Civil Engineering and Management [Statyba], Vol. VI, No. 4, pp. 278 – 288.

[6] GINEVIČIUS, R. – PODVEZKO, V. (2004): Determination of Weightiness of the Hierarchically-structured Organization According to its Commercial Activity. Poznan: Foundations of Civil and Environmental Engineering/Publishing House of Poznan University of Technology, No. 5, pp. 21 – 33.

[7] BRANS, J. P. – VINCKE, Ph. – MARESCHAL, B. (1986): How to Select and How to Rank Projects: The PROMETHEE Method. European Journal of Operational Research, Vol. 24, pp. 228 – 238.

[8] ROY, B. (1996): Multicriteria Methodology for Decision Aiding. Dordrecht: Kluwer Academic Publishers.

[9] USTINOVIČIUS, L. (2001): Determining Integrated Weights of Attributes. Journal of Civil Engineering and Management [Statyba], Vol. VII, No. 4, pp. 321 – 326.

[10] ZAVADSKAS, E. K. – KAKLAUSKAS, A. – BANAITIS, A. – KVEDERYTĖ, N. (2004): Housing Credit Access Model: The Case for Lithuania. European Journal of Operational Research, Vol. 155, pp. 335 – 352.

[11] LARICHEV, O. I. – KOCHIN, D. – USTINOVIČIUS, L. (2003): Multicriteria Method of Choosing the best Alternative for Investments. International Journal of Strategic Property Managemen, Vol. 7, No. 1, pp. 33 – 43.

[12] Estonia – Latvia – Lithuania – Poland (2004): Baltic Rim Economics, No. 5, pp. 1 – 4.

[13] SAATY, T. L. (1994): Fundamentals of Decision Making and Priority Theory with the AHP. Pittsburgh, PA: RWS Publication.

[14] SAATY, T. L. (1980): The Analytic Hierarchy Process. New York: M.Graw-Hill.

[15] GINEVIČIUS, R. – PODVEZKO, V. (2004): Assessing the Accuracy of Expert Methods. Kaunas University of Technology, Engineering Economics, Vol. 40, No. 5, pp. 7 – 12.

[16] KENDALL, M. (1970): Rank Correlation Methods. London: Griffin.

[17] ZAVADSKAS, E. K. – KAPLINSKI, O. (1997): Expert Systems for Construction Processes. Journal of Civil Engineering and Management [Statyba], Vol. 12, No. 4, pp. 49 – 61.

[18] USTINOVIČIUS, L. – JAKUČIONIS, S. (2000): Application of Multicriteria Decision Methods in Restoration of Buildings in the Old Town. Journal of Civil Engineering and Management [Statyba], Vol. VI, No. 4, pp. 227 – 236.

[19] OPRICOVIČ, S. – TZENG, G.-H. (2004): Compromise Solution by MCDM Methods: A Comparative Analysis of VIKOR and TOPSIS. European Journal of Operational Research, Vol. 156, pp. 445 – 455.

[20] GINEVIČIUS, R. – PODVEZKO, V. – MIKELIS, D. (2004): Quantitative Evaluation of Economic and Social Development of Lithuanian Regions. [Economics: Research Papers.] Vilnius: Vilnius University, Vol. 65, pp. 67 – 81.