PANOECONOMICUS, 2010, 3, pp. 283-302
Received: 5 October 2009; Accepted: 2 April 2010.

UDC 330.342:336.748
DOI: 10.2298/PAN1003283T
Original scientific paper

Neli Tomić-Plazibat

Faculty of Economics,
University of Split,
Croatia

lil@efst.hr; neli@efst.hr

Zdravka Aljinović

Faculty of Economics,
University of Split,
Croatia

zdravka.aljinovic@efst.hr

Snježana Pivac

Faculty of Economics,
University of Split,
Croatia

spivac@efst.hr

The research presented in the paper is supported by Ministry of Science, Education and Sports of the Republic of Croatia, scientific project: *Mathematical models in analysis of the Croatian financial market.*

Risk Assessment of Transitional Economies by Multivariate and Multicriteria Approaches

Summary: This article assesses country-risk of sixteen Central, Baltic and South-East European transition countries, for 2005 and 2007, using multivariate cluster analysis. It was aided by the appropriate ANOVA (analysis of variance) testing and the multicriteria PROMETHEE method. The combination of methods makes for more accurate and efficient country-risk assessment. Country risk classifications and ratings involve evaluating the performance of countries while considering their economic and socio-political characteristics. The purpose of the article is to classify, and then find the comparative position of each individual country in the group of analyzed countries, in order to find out to which extent development of market economy and democratic society has been achieved.

Key words: Country-risk, Transition countries, Multivariate cluster analysis, PROMETHEE method.

JEL: O57, P52, C10, C60.

The decision making process in economic, political and social context requires the evaluation of a large set of diverse factors. Policy makers, managers of international lending institutions, multinational firms, and investors have access to substantial amounts of information from specialized sources. The problem is that of how to use such vast and diverse information systematically in the managerial decision-making process. For such multidimensional analysis, the natural choice is to use multivariate and multicriteria methods.

Today, the globalization of economic and industrial activities is evident; production is spreading throughout the world in pursuit of economic and labour advantages. Globalization offers greater flexibility in maintaining quality, lowering costs, and improving competitiveness. In addition, the governmental type, and the political outlook of a country, both affect the internal administration, and the international image of the country which could encourage, or deter, companies from seeking business there. The international situation must be considered as a macroenvironment, in which economic, financial, and political factors create new conditions. These conditions, directly and indirectly, could represent threats or opportunities to businesses. The problem described by country-risk assessment is of special interest to transition countries. In a broad sense, country-risk assessment involves analyzing the performance of countries while considering their economic and socio-political characteristics (Michael Doumpos and Constantin Zopounidis 2002).

There are two major approaches to country-risk assessment. The first one ranks countries from best to worst, according to an appropriate definition of country risk adopted by Institutional Investor and Euromoney. Several studies replicate these ratings using statistical methods, (Jean-Claude Cosset and Jean Roy 1991; Sun H. Lee 1993; Nadeem Ul. Haque et al. 1996) as well as multicriteria decision analysis (MCDA) techniques (Jean-Claude Cosset, Yannis Siskos, and Zopounidis 1992; Zoran Babić and Neli Tomić-Plazibat 1998, 2001). The second one is based on the classification approach, which classifies countries according to their performance and level of risk. This approach is adopted by Moody and Standard and Poor, well-known international country rating agencies. Several studies use this approach (Richard J. Taffler and Boulem Abassi 1984; Doumpos and Zopounidis 2000, 2002).

This study is the continuation of previous research (Tomić-Plazibat, Snježana Pivac, and Zdravka Aljinović 2006, 2007), and it represents time continuation and methodological improvement. For the first time both methods of country-risk assessment, multivariate and multicriteria, are employed. First, multivariate analysis is used to classify the relevant economy into each associated class. Other statistical tests are done to confirm any significant differences among formed classes. After that, the PROMETHEE method, one of the most popular and widely used multicriteria decision-making methods, is employed in the country risk ranking of 15 Central, Baltic and South-East European transition countries (EU countries and other countries) for 2005, and 16 countries for 2007. The observed EU countries for 2005 are: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia. Bulgaria and Romania became EU countries in 2007. The other observed countries are: Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, (for 2007) and Serbia. Comparative analysis of results is done for both years. The period from 2005 to 2007 is relatively short period for such analysis. It must be emphasized that because of the rapid transition of most countries included in the analysis it is likely that the risk assessment will change over a two-year period.

Fifteen country-risk indicators are selected according to: (1) their relevance to country-risk analysis on the basis of the existing literature on the subject (Thomas L. Saaty and Luis G. Vargas 1994) and (2) the availability of the data (for some other relevant indicators data was missing in the World Bank's and IMF's tables). This article presents a statistical analysis (ANOVA), to show selected indicators with regard to their statistical significance in the differentiation between two groups of countries—Central and Baltic versus Southeast-European transition countries for 2005, and EU countries and other countries for 2007. The ANOVA has shown a significant difference between two groups of countries according to all socio-political criteria—while according to most economic-financial indicators—there is no significant difference.

The rest of the article is organized into five sections. The first section presents the data, and criteria including ANOVA analysis. The second section is dedicated to the country-risk assessment carried out by multivariate analysis. Section three shows an outline of the PROMETHEE method and its application to country-risk assessment. Sections four and five conclude the analysis and discuss country classification and ratings regarding the given indicators. Finally a few possible future research directions are posited.

1. Data and Criteria

An initial preprocessing of the available data led to the selection of 15 socio-political and economic-financial country-risk indicators: electoral process (EP), civil society (CS), independent media (IM), national democratic governance (NDG), local democratic governance (LDG) (governance (G)), judicial framework & independence (JFI), corruption (C), life expectancy of birth (LE), GDP (US$) billions, exports of goods and services/GDP (EGS/GDP), current account balance/GDP (CAB/GDP), annual GDP growth (AGDP), inflation (ICP), and FDI-net flow (US$) billions, and market capitalization (MC) of listed companies (% of GDP) in 2007. Apart from ANOVA analysis, market capitalization criterion is excluded from further analyses because of the problems due to its extremely high values for observed young, emerging capital markets. Therefore, use of this criterion does not show an accurate picture or provide a valid country risk ranking. (All socio-political indicators are selected from Freedom House, Nations in Transit.)

Nations in Transit's ratings are based on a scale of one to seven, with one representing the highest level of democratic development, and seven representing the lowest. The ratings reflect the consensus of Freedom House, its academic advisors, and the authors of reports for each country. The meaning of each criterion is explained on the case of Croatia in 2005 and 2007.

As draft legislation needed to create a legal framework for funding political parties, and the revision of local electoral laws to allow direct election of mayors have yet to be adopted, Croatia's *electoral process* rating remains at 3.25, although ongoing reform efforts raise expectations for future improvement.

The rating for *civil society* improves from 3 to 2.75, although many civil society organizations continue to make efforts to influence the policy process.

Croatia's *independent media* increases from 3.75 to four, because of its failure to develop media standards, and the increased commercialization of the media.

The rating for *governance*, i.e. national democratic governance is 3.5 and local democratic governance is set at 3.75. The constitution establishes a framework for local self-government, but in practice the system is still centralized so local authorities remain dependent on financial support from central authorities.

Despite the first concrete steps toward systematic judicial reform, the court system is still faced with a sizeable backlog of cases and unreasonably long trials. The rating for *judicial framework and independence* in Croatia is 4.25, since they made little progress in 2006 and 2007.

Citizens believe that *corruption* is widespread in the health system, judiciary, and local government. Mild penalties for engaging in corrupt acts, and the prevalent custom of bribing are the most important causes of corruption. The corruption rating remains at 4.75, since only limited progress was recorded—even as public perception of the problem grew substantially.

Now, a statistical analysis (ANOVA) is conducted for the selected indicators with regard to their statistical significance in differentiation between two groups of countries over two years. The ANOVA analysis requires homogeneity of samples' variance—which is confirmed by Levene statistics in Table 1.

Table 1 Test of Homogeneity of Variances Results for the Selected Country-risk Indicators (Significance for Levene statistics)

2005	2007	Country risk indicators	2005	2007
c_1	c_1	Electoral Process (EP)	0.258*	0.969*
c_2	c_2	Civil Society (CS)	0.271*	0.633*
c_3	c_3	Independent Media (IM)	0.579*	0.164*
-	c_4	National Democratic Governance (NDG)	-	0.628*
-	c_5	Local Democratic Governance (LDG)	-	0.709*
c_4	-	Governance (G)	0.096*	-
c_5	c_6	Judicial Framework & Indep. (JFI)	0.380*	0.095*
c_6	c_7	Corruption (C)	0.651*	0.298*
c_7	c_8	Life expectancy at birth (LE)	0.164*	0.167*
c_8	c_9	GDP (US$) billions (GDP)	0.067*	0.047**
c_9	c_{10}	Exports of goods and services/GDP (EGS/GDP)	0.737*	0.151*
c_{10}	c_{11}	Current account balance/GDP (CAB/GDP); Balance of Trade/GDP (BT/GDP)	0.629*	0.721*
c_{11}	c_{12}	Annual GDP growth (AGDP)	0.041**	0.853*
c_{12}	c_{13}	Inflation (CP) (ICP)	0.033**	0.022**
c_{13}	c_{14}	FDI-net flow (US$) bill. (FDI)	0.173*	0.062*
-	c_{15}	Market capitalization of listed companies % of GDP (MC)	-	0.021**

* Denotes rejection of the null hypothesis of non homogeneity of the samples variances at the 0.05 significance level.
** Denotes rejection of the null hypothesis of non homogeneity of the samples variances at the 0.01 significance level.

Source: Estimated according to the World Bank (2009)[1], International Monetary Fund (2009)[2] and Freedom House data (2009)[3].

The ANOVA results in Table 2 show that all socio-political indicators statistically differentiate the two groups for each year at the .01 significance level. According to economic and financial indicators (except EGS/GDP; BT/GDP; and MC in 2007), there is no significant difference between the two groups of transition countries.

Table 2 ANOVA Results for the Selected Country Risk Indicators (F statistics)

2005	2007	Country risk indicators	2005	2007
c_1	c_1	Electoral Process (EP)	32.608*	68.179*
c_2	c_2	Civil Society (CS)	54.256*	53.004*
c_3	c_3	Independent Media (IM)	108.333*	20.901*
-	c_4	National Democratic Governance (NDG)	-	29.939*
-	c_5	Local democratic governance (LDG)	-	21.777*
c_4	-	Governance (G)	79.769*	-
c_5	c_6	Judicial Framework & Indep. (JFI)	123.104*	44.846*
c_6	c_7	Corruption (C)	38.099*	31.365*
c_7	c_8	Life expectancy at birth (LE)	0.000	1.030

[1] **Word Bank data.** 2009. Life expectancy at birth, GDP, Exports of goods and services/GDP, Balance of Trade/GDP, Annual GDP growth, Inflation, FDI-net flow (US$) bill. http://devdata.worldbank.org (accessed March 31, 2009).
[2] **International Monetary Fund**. 2009. Data and Statistics. http://www.imf.org (accessed March 31, 2009).
[3] **Freedom House data, Nations in Transit**. 2009. Electoral Process, Civil Society, Independent Media, National Democratic Governance, Local Democratic Governance, Judicial Framework & Indep, Corruption. www.freedomhouse.org (accessed March 31, 2009).

c_8	c_9	GDP (US$) billions (GDP)	1.885	3.349
c_9	c_{10}	Exports of goods and services/GDP (EGS/GDP)	10.852*	5.838**
c_{10}	c_{11}	Current account balance/GDP (CAB/GDP); Balance of Trade/GDP (BT/GDP)	1.001	11.570*
c_{11}	c_{12}	Annual GDP growth (AGDP)	1.732	0.045
c_{12}	c_{13}	Inflation (CP) (ICP)	0.907	0.858
c_{13}	c_{14}	FDI-net flow (US$) bill. (FDI)	0.734	2.757
-	c_{15}	Market capitalization of listed companies % of GDP (MC)	-	13.671*

* Denotes rejection of the null hypothesis that the variance of varying factor (the two groups of countries) is zero at the 0.01 level.
** Denotes rejection of the null hypothesis that the variance of varying factor (the two groups of countries) is zero at the 0.05 level.

Source: Estimated according to the World Bank (2009), International Monetary Fund (2009), and Freedom House data (2009).

This statistical analysis contributes to multivariate analysis results. Within the context of multicriteria decision analysis, such a statistical analysis for the selection of the decision criteria (country risk indicators), is not necessary, given that a decision maker can specify the criteria which are considered to be relevant to the analysis.

On the basis of ANOVA results, it was decided to proceed with three different groupings of criteria in multivariate and multicriteria analyses. In one case, all socio-political criteria are included; in another case, all of them are included as a democracy score indicator—which is an average of ratings for all six socio-political indicators—and finally, only the economic-financial indicators are included.

2. Country-risk Assessment by Multivariate Analysis

2.1 The Elements of Multivariate Analysis

Multivariate analysis (MVA) is based on the statistical principle of multivariate statistics, which involves observation and analysis of more than one statistical variable at a time. In any design and analysis, the technique is used to perform trade studies across multiple dimensions while taking into account the effects of all variables on the responses of interest.

Multivariate analysis examines interdependencies and group variables, according to their similarity (factor analysis) and/or grouping of cases, according to their similarity, e.g., connections (cluster analysis).

Multivariate analysis can be exploratory and confirmatory. *Exploratory analysis* is used to uncover the underlying structure of a relatively large set of variables. The researcher's à priori assumption is that any indicator may be associated with any factor. *Confirmatory analysis* seeks to determine if the number of factors and the loadings of measured (indicator) variables on them conform to what is expected on the basis of pre-established theory. The researcher's à priori assumption is that each factor (the number and labels of which may be specified in advance) is associated with a specified subset of indicator variables.

Clustering is a type of multivariate statistical analysis also known as cluster analysis, unsupervised classification analysis, or numerical taxonomy. It is based on

a mathematical formulation of a measure of similarity. There are a number of characteristics that distinguish different approaches to cluster analysis.

The term *cluster analysis* (Michael R. Anderberg 1973) encompasses a number of different algorithms and methods for grouping objects of similar kind into respective categories. A general question facing researchers in many areas of inquiry is how to *organize* observed data into meaningful structures, that is, to develop taxonomies. In other words, cluster analysis is an exploratory data analysis tool that aims at sorting different objects into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise.

Agglomerative hierarchical clustering is a bottom-up clustering method where clusters have sub-clusters, which in turn have sub-clusters, and so on. Agglomerative hierarchical clustering starts with every single object in a single cluster. Then, in each successive iteration, it agglomerates (merges) the closest pair of clusters by satisfying some similarity criteria, until all of the data is in one cluster.

A matrix tree plot, or dendrogram, visually demonstrates the hierarchy within the final cluster, where each merger is represented by a binary tree. Connected vertical lines designate joined cases. The dendrogram rescales the actual distances to numbers between zero and 25, preserving the ratio of the distances between steps. The cluster procedure can be described as follows:

- Assign each object to a separate cluster;
- Evaluate all pair-wise distances between clusters;
- Construct a distance matrix using the distance values;
- Look for the pair of clusters with the shortest distance;
- Remove the pair from the matrix and merge them;
- Evaluate all distances from this new cluster to all other clusters, and update the matrix;
- Repeat until the distance matrix is reduced to a single element.

Cluster multivariate analysis can produce an ordering of the objects, which may be informative for data display. Use of different distance metrics for measuring distances between clusters may generate different results. Performing multiple experiments and comparing the results is recommended to support the veracity of the original results.

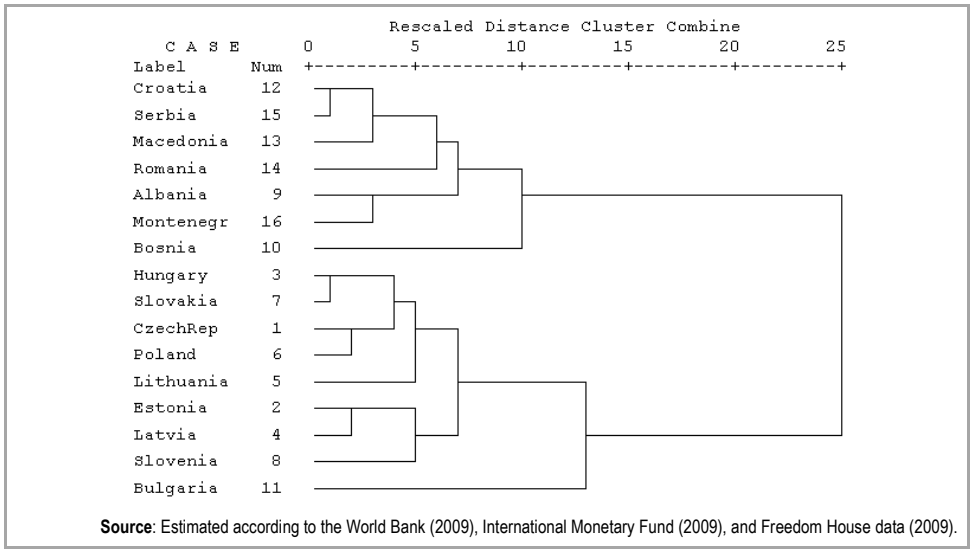
The most common distance measurements between data points are the Euclidean distance and Euclidean squared distance.

Distance measurements between clusters have several options. The mean linkage represents the distance between two clusters as the average of the distances between all points in those clusters. Single linkage shows the distance between two clusters as the distance between the nearest neighbours in those clusters, and complete linkage measures the distance between two clusters as the distance between the farthest points in those clusters. Ward's method (Joe H. Ward 1963) is distinct from all other methods because it uses an analysis of variance approach to evaluate the distances between clusters. In short, this method attempts to minimize the Sum of Squares (SS) of any two (hypothetical) clusters that can be formed at each step.

Cluster analysis does not presuppose any statistical significance, and it is therefore recommended to use appropriate statistical tests in practical analyses.

2.2 Country-risk Classification

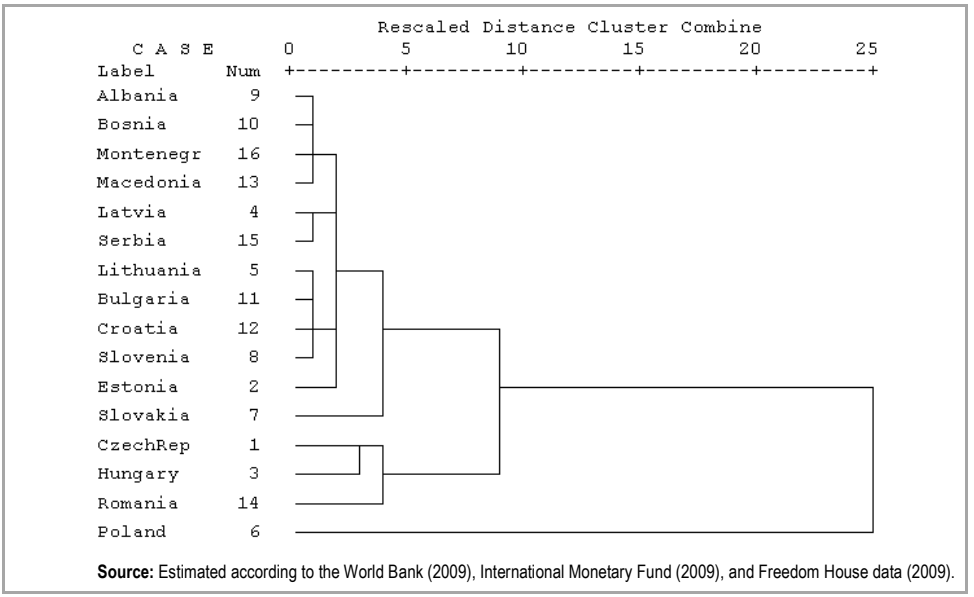
In this article, the multivariate cluster analysis by Euclidean distance using the Average Linkage method is applied to classify countries into each associated class for 2007. Firstly, the analysis is done for the socio-political criteria only. Appropriate dendrogram is shown in Figure 1.



Source: Estimated according to the World Bank (2009), International Monetary Fund (2009), and Freedom House data (2009).

Figure 1 Dendrogram Using Average Linkage (between groups) According to Socio-political Criteria

The analysis confirms that there are two main classes of countries: EU countries, and others (except Romania, which is classified with non-EU countries). In these two main groups, the pairs of most similar countries (in terms of their socio-political conditions) are: Czech Republic and Poland, Hungary and Slovakia, Estonia and Latvia, Croatia and Serbia, and Albania and Montenegro. The most distanced countries, i.e. countries with specific, socio-political conditions, are Bulgaria and Bosnia. Figure 2 illustrates classes of countries according to all socio-political and financial-economic criteria. Here the situation is quite different. According to all indicators, Poland takes a special position. It isn't grouped with any other country, and obviously, it can be referred to as the leader in the group of observed transition countries. Romania is transferred from the group of other non-EU countries to a very well positioned group with Czech Republic and Hungary.



Source: Estimated according to the World Bank (2009), International Monetary Fund (2009), and Freedom House data (2009).

Figure 2 Dendrogram Using Average Linkage (between groups), According to all Socio-political and Financial-economic Criteria

Croatia is in a similar situation, although at a lower level, in other words, Croatia is promoted from the non-EU countries to the group of three EU countries: Lithuania, Bulgaria, and Slovenia. Accordingly, it can be said that these two countries (Croatia and Romania) are characterised by much better financial-economic conditions, and that the main failures occur in the socio-political sphere. So, the significant strategic reversals in terms of democratization and full affirmation of human rights and freedom have to be done. The same thing applies to other Southeast European countries, along with the need for ensuring stable economic conditions, and faster economic growth in terms of economic policy. Latvia is closely positioned with Serbia, while Estonia and Slovakia take rather specific positions.

3. Country-risk Assessment by Multicriteria Analysis

3.1 The PROMETHEE Method

The PROMETHEE method is appropriate to treat the multicriteria problem of the following type:

$$Max\{f_1(a),...,f_n(a)|a \in K\}, \tag{1}$$

where K is a finite set of possible actions (here countries), and f_j are n criteria to be maximized. For each action $f_j(a)$ is an evaluation of this action. When we com-

pare two actions, $a, b \in K$, we must be able to express the result of this comparison in terms of preference. We, therefore, consider a preference function *P*:

$$P : K \times K \to [0,1], \tag{2}$$

representing the intensity of action *a* with regard to action *b*. In practice, this preference function will be a function of the difference between the two evaluations $d = f(a) - f(b)$, and it is monotonically increasing. Six possible types (usual, U-shape, V-shape, level, linear and Gaussian) of this preference function are proposed to the decision maker (Jean-Pierre Brans and Philippe Vincke 1985; Brans and Bertrand Mareschal 1989). The effective choice is made interactively by the decision maker and the analyst according to their feeling of the intensities of preference. In each case, zero, one, or two parameters have to be fixed:

- *q* is a threshold defining an indifference area;
- p is a threshold defining a strict preference area;
- s is a parameter the value of which lies between p and q.

Now, we can define a preference index:

$$\Pi(a,b) = \frac{\sum_{j=1}^{n} w_j P_j(a,b)}{\sum_{j=1}^{n} w_j}, \tag{3}$$

where w_j are weights associated with each criteria.

Finally, for every $a \in K$, let us consider the two following outranking flows:

i. leaving flow:

$$\phi^+(a) = \sum_{b \in K} \Pi(a,b), \tag{4}$$

ii. entering flow:

$$\phi^-(a) = \sum_{b \in K} \Pi(b,a). \tag{5}$$

The leaving flow ϕ^+ is the measure of the outranking character of *a* (indicates how *a* dominates all other actions of *K*). Symmetrically, the entering flow ϕ^- gives the outranked character of *a* (indicates how *a* is dominated by all other actions). The action is better if the leaving flow is higher, and the entering flow lower. The PROMETHEE I gives a partial reordering of the set of actions in which some actions are comparable, while some others are not. When the decision maker requests the complete ranking, the net outranking flow may be considered:

$$\phi(a) = \phi^{+}(a) - \phi^{-}(a) \tag{6}$$

And the higher the net flow, the better the action is. All the actions of K are now completely ranked (PROMETHEE II).

3.2 Problem Presented by Multicriteria Method

For each criterion, one of the six offered preference function types and its thresholds have been chosen. In this way, the problem was completely prepared for the implementation of the PROMETHEE, as an appropriate method for such a multi-criteria, and relatively weakly structured problem. Its advantages lie in the possibility to define indifference and preference thresholds that have the real economic importance.

The choice of the function types, and its thresholds, was carried out in cooperation with the same group of experts who conducted a detailed analysis of the values of each criterion for all the observed countries. In addition to that, the final ranking is obtained by cumulating mutual comparisons of alternative pairs, according to all the criteria, into final leaving and entering flows, i.e. the final rank of alternatives.

Table 3 Decision Matrix with Socio-political Indicators in 2005 and 2007

CRITERIA '05	C1	C2	C3	-	-	C4	C5	C6	C7
Name	**EP**	**CS**	**IM**	**-**	**-**	**G**	**JFI**	**C**	**LE**
Min/Max	min	min	min	-	-	min	min	min	max
Type	5	4	5	-	-	5	5	5	4
Weight	6	6	6	-	-	6	6	6	8
ACTIONS 2005									
Czech Rep.	2	1.5	2	-	-	25	2.5	3.5	76
Estonia	1.5	2	1.5	-	-	2.25	1.5	2.5	73
Hungary	1.25	1.25	2.5	-	-	2	1.75	2.75	73
Latvia	1.75	1.75	1.5	-	-	2.25	1.75	3.5	71
Lithuania	1.75	1.5	1.75	-	-	2.5	1.75	3.75	71
Poland	1.75	1.25	1.5	-	-	2.5	2	3	75
Slovakia	1.25	1.25	2.25	-	-	2	2	3	74
Slovenia	1.5	1.75	1.5	-	-	2	1.5	2	78
Albania	3.75	3.25	4	-	-	4.25	4.5	5.25	75
Bosnia	3.25	3.75	4	-	-	4.75	4.25	4.5	74
Bulgaria	1.75	2.75	3.5	-	-	3.5	3.25	4	73
Croatia	3	3	3.75	-	-	3.5	4.5	4.75	76
Macedonia	3	3.25	4.25	-	-	4	3.75	5	74
Romania	2.75	2.25	4	-	-	3.5	4	4.25	72
Serbia and Montenegro	3.25	2.75	3.25	-	-	4	4.25	5	73
CRITERIA '07	C1	C2	C3	C4	C5	-	C6	C7	C8
Name	**EP**	**CS**	**IM**	**NDG**	**LDG**	**-**	**JFI**	**C**	**LE**
Min/Max	min	min	min	min	min	-	min	min	max
Type	5	4	5	5	5	-	5	5	4
Weight	5	5	5	5	5	-	5	5	8
ACTIONS 2007									
Czech Rep.	1.75	1.5	2.25	3	1.75	-	2	3.5	77
Estonia	1.5	1.75	1.5	2.25	2.5	-	1.5	2.5	73
Hungary	1.75	1.5	2.5	2.25	2.25	-	1.75	3	73
Latvia	2	1.75	1.5	2	2.5	-	1.75	3	71
Lithuania	1.75	1.75	1.75	2.5	2.5	-	1.75	4	71
Poland	2	1.5	2.25	3.25	2.25	-	2.25	3	75

Slovakia	1.5	1.5	2.25	2.25	2	-	2.25	3.25	74
Slovenia	1.5	2	2	2	1.5	-	1.5	2.25	78
Albania	4	3	3.75	4.25	2.75	-	4	5	76
Bosnia	3	3.5	4	4.75	4.75	-	4	4.25	75
Bulgaria	1.75	2.5	3.5	3	3	-	2.75	3.75	73
Croatia	3.25	2.75	4	3.5	3.75	-	4.25	4.75	76
Macedonia	3.25	3.25	4.25	3.75	3.75	-	3.75	4.75	74
Romania	2.75	2.25	3.75	3.5	3	-	3.75	4	73
Serbia	3.25	2.75	3.5	3.75	3.75	-	4.25	4.5	73
Montenegro	3.5	3	3.5	4.5	3.25	-	4.25	5.5	75

Source: Freedom House (2009) and according to authors' analysis.

The group of alternatives consists of 16 countries which are compared according to the 14 previously observed criteria. The types and weight values of all criteria for 2005 and 2007 are shown in Tables 3 and 4. It can be seen that weight values are different for 2007, primarily because of the new added criteria.

Table 4 Decision Matrix with Economic and Financial Indicators in 2005 and 2007

CRITERIA '05	C8	C9	C10	C11	C12	C13	-
Name	**GDP**	**EGS/GDP**	**CAB/GDP**	**AGDP**	**ICP**	**FDI**	**-**
Min/Max	max	max	min	max	min	max	-
Type	5	3	4	3	4	5	-
Weight	12	8	8	8	8	12	-
ACTIONS 2005							
Czech Rep.	124.4	72	-2	6	2	10.1	-
Estonia	13.1	84	-11	10	4	2.39	-
Hungary	109.2	66	-7	4	4	5.11	-
Latvia	15.8	48	-13	10	7	0.60	-
Lithuania	25.6	58	-7	7	3	0.69	-
Poland	303.2	37	-2	3	2	6.58	-
Slovakia	46.4	79	.	6	3	1.91	-
Slovenia	34.4	65	-2	4	2	0.09	-
Albania	8.4	22	-7	6	2	0.26	-
Bosnia	9.9	36	-22	5	2	0.52	-
Bulgaria	26.6	61	-11	6	5	2.97	-
Croatia	38.5	47	-7	4	3	1.53	-
Macedonia	5.8	45	-1	4	0	0.10	-
Romania	98.6	33	-9	4	9	6.51	-
Serbia and Montenegro	26.22	27	.	5	17	2.79	-
CRITERIA '07	C9	C10	C11	C12	C13	C14	
Name	**GDP**	**EGS/GDP**	**BT/GDP**	**AGDP**	**ICP**	**FDI**	**MC**
Min/Max	max	max	min	max	min	max	max
Type	5	3	4	3	4	5	5
Weight	10	7	7	7	7	10	9
ACTIONS 2007							
Czech Rep.	176	80	4.988	7	4	9.29	42
Estonia	20.9	74	-10.887	6	10	2.68	29
Hungary	138.4	80	1.51	1	6	37.2	34
Latvia	27.1	44	-20.258	10	13	2.24	11
Lithuania	38.3	55	-12.028	9	9	2.01	26
Poland	422	41	-2.705	7	3	22.95	49
Slovakia	74.9	86	-1.025	10	1	3.36	9
Slovenia	47.18	70	-1.304	7	4	1.48	61
Albania	10.83	28	-26.472	6	3	0.477	-
Bosnia	15.14	39	-34.574	7	6	2.111	100

Bulgaria	39.54	63	-22.093	6	8	8.974	55
Croatia	51.27	48	-8.604	6	4	4.91	129
Macedonia	7.67	55	-19.709	5	5	0.31	35
Romania	166	31	-12.37	6	11	9.49	27
Serbia	40.12	29	-22.055	8	7	3.1	60
Montenegro	3.47	51	-42.679	11	7	0.875	106

Source: World Bank (2009), International Monetary Fund (2009) and according to authors' analysis.

For both observed years the sum of all criteria values equals one hundred, as it should be. GDP and FDI are almost equally important, and together they dominate the remaining economic-financial criteria. Other criteria are at similar weights. Such criteria weights reflect the fact that transitional countries, which have reached (or surpassed) the pretransitional level of the GDP, are more attractive to foreign investors, as they are seen as countries enabling profitable investments.

Table 5 Types and Weights of Economic-financial Indicators and Democracy Score in 2005 and 2007

CRITERIA '05	C0	C7	C8	C9	C10	C11	C12	C13
CRITERIA '07	C0	C8	C9	C10	C11	C12	C13	C14
Name	DC	LE	GDP	EGS/GDP	CAB(BT)/GDP	AGDP	ICP	FDI
Min/Max	min	max	max	max	min	max	min	max
Type	5	4	5	3	4	3	4	5
Weight	25	6	21	6	8	6	6	21

Source: According to authors' analysis.

After country-risk assessment (including all socio-political indicators), multicriteria analysis is done with the democracy score indicator as an average of ratings for all socio-political indicators. Finally, only economic-financial indicators are included. Types and weights of those indicators are shown in Tables 5 and 6.

Table 6 Types and Weights of Economic and Financial Indicators in 2005 and 2007

CRITERIA '05	C7	C8	C9	C10	C11	C12	C13
CRITERIA '07	C8	C9	C10	C11	C12	C13	C14
Name	LE	GDP	EGS/GDP	CAB(BT)/GDP	AGDP	ICP	FDI
Min/Max	max	max	max	min	max	min	max
Type	4	5	3	4	3	4	5
Weight	9.5	25	9.5	12	9.5	9.5	25

Source: According to authors' analysis.

3.3 Results

After the analysis has been carried out, the final rank of alternatives according to the country-risk assessment is given in Tables 7-9.

Poland, the Czech Republic, and Hungary have the constant and convincing primacy in both years. It can be noticed that instead of the Czech Republic, Poland takes up the leadership in 2007.

Table 7 PROMETHEE II Complete Ranking according to all Socio-political and Economic-financial Indicators

2005			2007		
Rank	**Action**	**Phi**	**Rank**	**Action**	**Phi**
1.	Czech Rep.	0.31	1.	Poland	0.20
2.	Poland	0.21	2.	Czech Rep.	0.17
3.	Hungary	0.18	3.	Hungary	0.15
4.	Estonia	0.13	4.	Slovakia	0.10
5.	Slovakia	0.07	5.	Romania	0.02
6.	Romania	0.01	6.	Slovenia	0.01
7.	Lithuania	-0.01	7.	Bulgaria	-0.00
8.	Bulgaria	-0.01	8.	Lithuania	-0.03
9.	Slovenia	-0.02	9.	Estonia	-0.03
10.	Latvia	-0.07	10.	Montenegro	-0.04
11.	Croatia	-0.11	11.	Croatia	-0.06
12.	Macedonia	-0.12	12.	Latvia	-0.06
13.	Serbia and Montenegro	-0.13	13.	Serbia	-0.09
14.	Albania	-0.19	14.	Macedonia	-0.10
15.	Bosnia	-0.25	15.	Bosnia	-0.11
-	-	-	16.	Albania	-0.13

Source: Estimated according to the World Bank (2009), International Monetary Fund (2009) and Freedom House data (2009).

Table 8 PROMETHEE II Complete Ranking according to Economic-financial Indicators and Democracy Score

2005			2007		
Rank	**Action**	**Phi**	**Rank**	**Action**	**Phi**
1.	Czech Rep.	0.43	1.	Poland	0.39
2.	Poland	0.36	2.	Hungary	0.30
3.	Hungary	0.28	3.	Czech Rep.	0.25
4.	Romania	0.17	4.	Romania	0.14
5.	Estonia	0.05	5.	Slovakia	0.04
6.	Slovakia	0.02	6.	Bulgaria	0.00
7.	Bulgaria	-0.02	7.	Slovenia	-0.07
8.	Slovenia	-0.11	8.	Croatia	-0.07
9.	Croatia	-0.11	9.	Lithuania	-0.10
10.	Lithuania	-0.12	10.	Montenegro	-0.10
11.	Serbia and Montenegro	-0.12	11.	Estonia	-0.11
12.	Macedonia	-0.17	12.	Serbia	-0.12
13.	Latvia	-0.17	13.	Latvia	-0.13
14.	Albania	-0.23	14.	Bosnia	-0.13
15.	Bosnia	-0.27	15.	Macedonia	-0.14
-	-	-	16.	Albania	-0.16

Source: Estimated according to the World Bank (2009), International Monetary Fund (2009) and Freedom House data (2009).

All analyses show the tremendous fall of Baltic countries in 2007. The question arises whether such results could have announced the present crisis in those countries. Romania and Bulgaria are relatively highly ranked in both years of analysis, in 2005 as pre-accession countries and in 2007 as new EU members. Well positioned Slovakia and Slovenia have slightly upward rank trends according to all groupings of criteria. The rest of the South East European countries are at the bottom of the ranks. In this group of countries, Croatia and Montenegro take the best positions. In the two analyses where socio-political indicators are partially and/or completely excluded, Croatia takes the solid 8th position.

Table 9 PROMETHEE II Complete Ranking according to Economic-financial Indicators

2005			2007		
Rank	**Action**	**Phi**	**Rank**	**Action**	**Phi**
1.	Czech Rep.	0.54	1.	Poland	0.46
2.	Poland	0.42	2.	Hungary	0.35
3.	Hungary	0.32	3.	Czech Rep.	0.31
4.	Romania	0.17	4.	Romania	0.14
5.	Estonia	0.09	5.	Slovakia	0.08
6.	Slovakia	0.03	6.	Bulgaria	0.00
7.	Bulgaria	-0.02	7.	Slovenia	-0.07
8.	Lithuania	-0.12	8.	Croatia	-0.09
9.	Slovenia	-0.14	9.	Montenegro	-0.10
10.	Croatia	-0.14	10.	Lithuania	-0.11
11.	Serbia and Montenegro	-0.18	11.	Estonia	-0.12
12.	Macedonia	-0.19	12.	Serbia	-0.15
13.	Latvia	-0.20	13.	Bosnia	-0.16
14.	Albania	-0.24	14.	Latvia	-0.16
15.	Bosnia	-0.33	15.	Macedonia	-0.17
-	-	-	16.	Albania	-0.20

Source: Estimated according to data on World Bank (2009) and International Monetary Fund (2009).

Due to the high rates of economic growth Montenegro as a new economy is relatively highly positioned. Bosnia can also be considered as a country which prefers ranking without socio-political indicators. Bosnia ceded its convincingly last position in 2005 to Albania in 2007.

It also has to be emphasized that it is of special interest to consider the country risk of the group, particularly those in Southeast non EU countries. In the situation where capital attraction is needed most, it is important to have the "credit risk picture", i.e., the socio-political and economic conditions of the entire region, as well as improvements through the time. This method makes it possible. At first sight, this group of countries is consistently ranked at the bottom. But, through time, that position isn't equally bad. Fortunately, conditions are getting better. Namely, as it is known from previous section, the action (country) is better (in the sense of country risk) if the leaving flow ϕ^+ is higher, and the entering flow ϕ^- is lower. The higher the net flow $\phi(a) = \phi^+(a) - \phi^-(a)$ the better state the country is in. So, the values of the net flow ϕ are useful not only for positioning of each observed country, but also for showing differences (distances) between countries. Here it can be seen that differences between all observed countries are less from 2005 to 2007. The range of the net flow ϕ values constricts from $[-0.25, 0.31]$ for 2005 to $[-0.13, 0.20]$ for 2007 for PROMETHEE II complete rankings according to all socio-political and economic-financial indicators (Table 7). The situation is similar in the case of PROMETHEE II complete rankings according to economic-financial indicators and democracy score (Table 8): $[-0.27, 0.43]$ for 2005 and $[-0.16, 0.39]$ for 2007, and in the case of PROMETHEE II complete ranking according to only economic-financial indicators (Table 9): $[-0.33, 0.54]$ for 2005 and $[-0.20, 0.46]$ for 2007.

4. The Analysis of Classification and Ranking Methods Findings

As emphasized, this article is a continuation of previous research, and its particular contribution is methodological. In existing literature there is no agreement in the matter of country risk measuring. The suggested methodology presents dynamic (over years) and relative (in a particular year) framework of country risk measurement of observed transition countries. Beside that, both multivariate as a classification method, and multicriteria as ranking methods are used. Until now, these two major approaches have not been combined. According to the relevant indicators, which are grouped as socio-political and economic-financial (as it is recommended in economic theory), both methods give results on the basis of concrete mathematical statistical calculations. Such an approach is characterized by transparency of inputs, principles, and procedures. There are no results biases, assuming of course that all inputs are unbiased. Because of the rapid transition processes in observed countries, it is necessary to continuously examine and analyse country risk. Moreover, the analysis shows trends of the particular country positions, as well as trends of the particular criterion (the group of criteria for each country).

An introduction to the multivariate and multicriteria analysis is ANOVA testing is there statistical significance in differentiation between two groups of countries. For 2005, the difference between Central and Baltic versus Southeast European transition countries is tested. There is a statistically significant difference between these groups of countries according to all socio-political criteria—while according to most economic financial criteria there is no significant difference. Previous research from 2000 and 2004 showed the same results (Tomić-Plazibat, Pivac, and Aljinović 2006, 2007). For 2007 the same testing is done, countries are grouped as EU countries and other countries. Again there is no statistically significant difference according to most of economic-financial indicators. There is opposite situation in the context of the socio-political frame. Such results are in accordance with the theoretical insights of economic literature about transitional economics. Namely, in these countries, country risk is primarily defined by reforms that create dynamic market economies and hence socio-political criteria play a more important role in country risk ranking.

On the basis of ANOVA results, the multivariate country risk Cluster classification is first done according to only socio-political criteria for 2007. The country division on the EU countries group and others is confirmed. The exception is Romania, which is classified in the group of non-EU countries. The reasons can be seen clearly from the decision matrix (Table 3). Romania has a low socio-political criteria, and what is more important is that there is no evident improvement in that sense, even in accordance to 2000 (Tomić-Plazibat, Pivac, and Aljinović 2006, 2007).

On the other hand for Bulgaria, which has been, like Romania, EU member since January 1, 2007, rather better values and progress of socio-political criteria is registered. This is confirmed by Nations in Transit data i.e., the decision matrix in Table 3. Progress is found by examining data associated with: electoral process, civil society, judicial framework, and corruption. Therefore, although a new EU country, Bulgaria is classified by multivariate analysis together with EU countries.

After that, classification of transition countries is done with economic financial criteria. As ANOVA testing showed there is no significant difference between

EU and non-EU countries according to economic financial criteria; that is confirmed with multivariate classification. It is shown that Poland doesn't belong to any cluster, and by comparing data from Decision matrices given in Tables 3 and 4 it can be concluded that Poland is leading country according to all indicators. In this classification, Czech Republic and Hungary are also extracted, and Romania is close to them. So, Romania is very close to developed EU transition countries when only economic indicators are considered, but still has to make significant effort and progress to be grouped with developed countries in a socio-political context. In this classification, Latvia, Lithuania, and Estonia are not clustered with leading EU countries. This could explain the current crisis in those countries. Southeast European countries like Albania, Bosnia, Montenegro, and Macedonia—all non-EU countries, comprise a separate group that all have similar, and unfortunately bad, socio-political and economic conditions.

The multicriteria method results confirm and supplement the classification method results. There is an expectation that countries which started with reforms earlier, and are now EU members are better ranked. That is, they are more interesting for potential investors. According to all socio-political and economic- financial criteria, Poland is among the leading countries and takes first in all rankings in 2007. Czech Republic and Hungary are regularly at the top of all rankings since 2000 (Tomić-Plazibat, Pivac, and Aljinović 2006, 2007). They are followed by Romania, which made huge improvement in financial economic sense as a pre-accession EU country from 2000. On the other hand, socio-political conditions in Romania drop behind a little bit. Even now, when Romania is a EU country, there needs to be effort in achieving a higher level of democracy, less corruption, and more human rights. Results for Baltic countries are confirmed: there is a significant fall in all rankings for Baltic countries in 2007. Slovakia and Slovenia, as EU members, show improvement according to all criteria.

In contrary to these countries, non-EU countries—including EU candidates—take lower positions. It is possible to follow the success of reforms of these countries by examining the rankings for each year in accordance to region, as well as all observed countries. Namely, the table results column (phi) (Tables 7, 8 and 9) serves not only for the final rankings of observed countries, but also shows distances between them. Although non-EU countries consistently take lower rankings, and also in previous studies, the differences (distances from the "developed cusp") are smaller, what is obvious if "phi intervals" are compared for 2005 and 2007. While the "phi interval" for PROMETHEE II complete ranking according to all socio-political and economic-financial indicators (Table 7) equals [-0.25, 0.31] for 2005, it is more narrow for 2007, [-0.13, 0.20]. The situation is similar in case of PROMETHEE II complete ranking, according to economic-financial indicators and democracy score (Table 8): [-0.27, 0.43] for 2005, [-0.16, 0.39] 2007, and in case of PROMETHEE II complete ranking, according to only economic-financial indicators (Table 9): [-0.33, 0.54] for 2005 and [-0.20, 0.46] for 2007.

So, it is evident that this group of non-EU countries still has lot to do if they want to climb these rankings, i.e., if they want to have the socio-political and economic conditions seen in observed EU countries. But, it is encouraging that the country-risk is decreasing for countries that are EU bound.

5. Conclusion

The recent economic crisis highlights once again the issue of country-risk assessment, both from research, and practical points of view.

This article aims at two things. The first is country-risk assessment of European transitional countries, and the second is to make a contribution to methodology. In this article, two main approaches to country-risk assessment are employed. Besides the basic statistical analysis, this study also applies the classification method, in this case, multivariate cluster analysis. It also uses a ranking method represented by multicriteria PROMETHEE method. Combining the existing classification and ranking methodologies, originating from different quantitative disciplines, presents a new method which provides an excellent basis for country-risk assessment. The suggested methodology presents dynamic (over years) and relative (in particular year) framework of country risk measurement of observed transition countries. It provides a finding position and ranking of each particular country or group of countries. It also provides a way to follow improvements or declines of countries, their mutual differences or similarities according to groups of criteria or according to particular criterion. Everything in the proposed methodology is transparent and unbiased: inputs, principles, procedures and results.

Fifteen Central, Baltic, and Southeast European transition countries, preclassified as EU countries and other countries for 2005, and 16 countries for 2007 are observed. All analyses confirm that there is a significant difference between these two groups of countries in terms of socio-political indicators, while there are no significant differences in the contexts of economic-financial environment.

Poland and the Czech Republic hold the leading positions according to all ranking analyses, with the Czech Republic ceding first place in 2007. Also, the classifying cluster analysis confirms that Poland constitutes a class for itself. Regularly, Hungary joins these countries at the top of rankings, while by classification method Hungary is in the same class as the Czech Republic.

These countries are then followed by Romania and Bulgaria. To a certain extent, Romania takes better positions, but when only socio-political conditions are considered, it is classified in the group of non-EU countries.

The Baltic countries take lower positions according to all rankings in 2007, and so they are classified closer to non-EU countries.

Slovakia takes rather good positions, always in the upper range of rankings, i.e., it is classified with the leading countries. Slovenia is positioned in the middle of rankings according to all analyses.

Other Southeast European countries are regularly at the bottom of all rankings. Croatia appears as the leader in this group of countries, especially when only economic-financial indicators are considered. It can be concluded that Croatia still has to achieve European socio-political standards, primarily in judicial framework and corruption, before it rises in the rankings.

The rest of the countries of this group show similar, or even worse trends. That is the result of strategic failures and mistakes in the design of development policy in terms of economy and politics. Therefore, hard effort in terms of democratization and full affirmation of human rights are needed, as well as progress in terms of

economic policy—which should ensure stable economic conditions and faster economic growth. This analysis shows that approaching EU family standards regularly requires positive reform from this group of countries, even in socio-political context. If they are to move up the ranks—steps must be taken much faster, and in greater strides.

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