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COUNTRY RISK ASSESSMENT BASED ON MULTIMOORA

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Abstract. Country risk analysis (CRA) attempts to identify the potential for different type of risks arising from a variety of national differences in policies, geography, economic structures, socio-political institutions and currencies. This paper proposes the analysis on country risk assessment in Baltic States during 1999–2009 periods. Investigations and calculations of rankings for country risk were made and the results optimized by implementing MOORA (Multi-Objective Optimization by Ratio analysis) and MULTIMOORA (MOORA plus Full Multiplicative Form) methods. Starting with a system of 3 alternative responses on 12 objectives (indicators), several approaches come to unambiguous results, which could be engaged in the process of creating new strategies for country risk assessment for Baltic States.

Keywords: country risk, multi-criteria valuation models, MULTIMOORA, risk assessment, Baltic States.

Jel classification: C44, C61, D81, E66

1. Introduction

Each business operation causes some kind of risk. When business operations occur in international dimension, they bring additional risks, which are not typical for domestic operations. These additional risks are called country risks and usually include risks arising from a variety of national differences in policies, geography, economic structures, socio-political institutions and currencies. Country risk analysis (CRA) tries to solve this problem by identifying the potential for these risks to decrease the expected return of cross-border investments.

Concept of "Country risk" began to be widely used in the 1970s. It was originally more professionally oriented in the sense that it aimed at addressing the concrete issue of a particular business in a particular country and was generally used by the banking industry. This stream of literature flourished in the aftermath of the international debt crisis of the 1980s.

Reviewing the sovereign rating history and its methodological evolution, Moody's (2002) states: The term "country risk" as opposed to "political risk" has been gaining ascendency because it has a broader meaning in that it can include any risk specific to a given country, whereas "political risk" restricts the risks to those that are exclusively political in nature.

Every year it becomes more and more difficult to analyse and predict changes in the financial, economic and political sectors of business. The importance of country risk analysis is now more understandable and potential for it is growing by establishing more and more country risk rating agencies, which combine a wide range of qualitative and quantitative information regarding alternative measures of economic, financial and political risk into associated composite risk ratings. However, the accuracy of any rating agency with regard to any or all of these measures is open to question. Hoti (2005a) in the study provides a qualitative comparison of country risk rating systems used by seven leading rating agencies, as well as a novel analysis of four risk ratings using univariate and multivariate volatility models for nine East European countries. These ratings are compiled by the International Country Risk Guide, which is the only risk rating agency to provide consistent monthly data for a large number of countries since 1984. The empirical results enable a comparative assessment of the conditional means and volatilities associated with county risk returns, defined as the rate of change in country risk ratings, across the nine East European countries.

The article presents a model for evaluation of country risk in Baltic States by investigating different indicators which have influence on countries' economic and socio-political environment. MOORA and MULTIMOORA methods were used for calculation and optimization of country risk in Baltic States.

2. Definitions of country risk

For some group of researchers country risk refers to the "probability of occurrence of political events that will change the prospects for profitability of a given investment" (Haendel *et al.* 1975). One of approaches adopts a practical stance and analyzes risk as a negative outcome. With this meaning, risk will exist if it implies a possible loss or at least, a potential reduction of the expected return, as stated by Meldrum (2000).

The concept of risk has different meanings and could be understood either as a performance variance or just as the likelihood of a negative outcome that reduces the initially expected return. The concept of downside risk was already mentioned in Markowitz (1959), though it is mainly because of computational difficulties in handling this type of model as well as the assumption of normally distributed returns that the variance was favoured as a measure of risk. The paper of Nawrocki (1999) reviews the literature and presents the advantages of using a downside risk approach in view of a total risk stance.

Roy (1952) and Bawa and Lindenberg (1977) had already integrated the notion of downside risk into portfolio theory, but Estrada (2000) and Reuer and Leiblein (2000) have emphasized the usefulness of the downside risk approach for studying emerging markets and international joint ventures. Quer, Claver and Rienda (2007) have introduced an integrated approach by comparing the impact of country risk and cultural distance on entry mode choice. Busse and Hefeker (2006) have also analyzed the risk and its influence of foreign direct investments.

Table 1. Various approaches of the literature on country risk (Source: made by authors)

Terminologies	Definition of risk	Sources of risk	Nature of the investment	Methodology
Political risk	Performance variance	Sovereign interference	Foreign direct investment	Qualitative
Country risk	Negative outcome	Environmental instability	Banking commercial loans	Quantitative
Sovereign risk			Portfolio investment	
Cross-border risk				

Analyzing the literature over the last 40 years, situation with country risk changes, as more and more companies are making their businesses abroad, as a result, the specific risks it engenders occurs, whatever the source of risk and the nature of the industry. Without doubt, specific features of each investment or transaction type must obviously be taken into account. Country risk analysis (CRA) tries to define the potential for these risks in order to decrease the expected return of a cross-border investment. Such definition rejoins the very early articles of Gabriel (1966) or Stobaugh (1969) where the investigation was made on difference in investment climate at home and abroad – in a foreign country. It highlights the specific risks when doing business abroad, outside the national borders of the company's country of origin. Sometimes economic level of country's development is not so important, as even economically developed countries can face with a degree of country risk. Finnerty (2001) noted that "many project finance professionals would argue that natural resource projects in the United States are exposed to political risk because of the proclivity within the United States to change the environmental laws and apply the new laws retroactively".

A comprehensive formulation of country risk theory is yet in progress. Till now, the literature is usually indicating the implicit assumption that, for a given country, imbalances in the economic, social and political fields are likely to increase the risk of investing there. Because of the multiplicity of the sources of risk, the complexity of their interactions and the variety of social sciences involved, an underlying theory of country risk is still missing. Such a conceptualization would greatly help to identify the variables at stake. It would make it possible to test the respective relevance of the various approaches on offer. So far, most of the research merely consists of a classification and a description of the various potential sources of risk, and the assessment methods turn these elements into numerical variables without any scientific justification. Fitzpatrick (1983) writes on the subject that "the literature is found to define political event risk rather than political risk". Citron and Nickelsburg (1987) have proposed a model of country risk for foreign borrowing as well as estimated which incorporates a political instability variable. The proposed model predicts high probabilities of default for most of the actual default dates for six countries looking on historical perspective. This is suggestive of how to understand the phenomenon of foreign debt default. There are a lot of studies related to country risk, its financial integration in a country, the impact on economic

and other aspects of country's welfare (Cathy, Goldberg 2009; Kesternich, Schnitzer 2010; Benítez *et al.* 2007; Bordo 2009; D'Argensio, Laurin 2009).

3. Classification of country risk

Miller (1992), Meldrum (2000), Hoti (2005b), Bali and Cakici (2010) list each type of country risk and describe its characteristics after having classified the main origins.

Indeed, in the absence of any comprehensive theory, an accurate and exhaustive classification is necessary in order to make an extensive review of the different specific sources of risk, without missing in the future any possible new factor of instability. This is also necessary to be able to undertake an operational monitoring at the company's level. Table 2 recaps these various groupings.

Globalization and internationalization led to a variety of country risks, which occur due to increase in business relationships internationally. So, importance of county risk evaluation and assessment is obvious.

Table 2. Sources of risk classification (Source: made by authors)

Socio-political risk	Political	Democratic or non-democratic change in the government
	Government policy	Change in the policy of the local authorities
	Social	Social movement intending to influence foreign business or host country policy
Economic risk	Macroeconomic	Any macroeconomic risk specific to the host country
	Microeconomic	Any microeconomic risk specific to the host country
Natural risk		Earthquake and other natural disaster

4. Evaluation of country risk

The country risk of one country could be expressed by a single index, which shows the degree of the overall risk to invest in or loan to this country. Two types of indices, which represent the degree of country risk, discrete and continuous, exist. Discrete type includes several risk levels, which are predefined and every country is in one level. The number of risk levels may vary from 1 to 20. The single index representing the degree of country risk is a set of different factors about the country. The main interested factors are political and economic-financial ones, and the total number of factors used may vary from less than ten to more than twenty.

Ratha *et al.* (2011) suggest predicting sovereign ratings for developing countries that do not have risk ratings from agencies (such as Fitch, Moody's, and Standard and Poor's). It is important to determine the volume and cost of capital flows to developing countries through international bond, loan, and equity markets. Sovereign rating also acts as a ceiling for the foreign currency rating of sub-sovereign borrowers and can be important for their access to international debt and equity capital. Shadow ratings for several developing countries, that have never been rated, could be generated and then it could be found that unrated countries are not always at the bottom of the rating spectrum. Several of them will be in a similar range to that of the emerging market economies with capital market access.

Chen, Gang and Jianping (2008) proposed a new approach for country risk evaluation, which is based on the MH DIS multicriteria decision aid method (Multi-Group Hierarchical Discrimination). They took a sample, consisting of 40 main oil-producing countries and used to estimate the performance of the method in classifying the countries into two groups. A comparison with multiple discriminant analysis, logit analysis and probit analysis were also performed The results indicate the superiority of the MH DIS method as opposed to these traditional discrimination techniques already applied in country risk assessment. Similarly, Cathy and Goldberg (2009) introduced their point of view on country risk and financial integration by presenting a case study. Marshall *et al.* (2009) have estimated and determined the country risk of emerging market as well as dynamic conditional correlation by using GARCH model, which could be one of alter-native for country risk evaluation.

Schroeder (2008) in her paper also surveys the history and current status of country risk assessment. The goal is to understand why it is that country risk assessors have such a poor track record in anticipating the onset of financial crises. The development of the field reflects changes in the composition of international capital flows. These changes have confounded a definition of country risk, especially if a definition is centered on a particular event. It is then argued that the field has reached an impasse, and this impasse is related to the methods of abstraction and the current crisis

of vision within the science of economics. This crisis of vision, as it pertains to theories of financial crises, has led to increased reliance on quantitative methods in the field of country risk. So, it is very important to find the object of country risk assessment, which is not to monitor for a particular event or symptom of financial crisis, but, rather, to monitor for a particular state of the economy. Besten (2007) has introduced an analysis on similar risk assessment approaches for European countries.

5. MULTIMOORA method

Multi-Objective Optimization by Ratio Analysis (MOORA) method was introduced by Brauers and Zavadskas (2006). This method was developed (Brauers, Zavadskas 2010) and became MULTIMOORA (MOORA plus the full multiplicative form). These methods have been applied in different studies (Brauers *et al.* 2007; Brauers, Ginevičius 2009; Brauers, Zavadskas 2009; Brauers, Ginevičius 2010; Baležentis *et al.* 2010; Brauers *et al.* 2010).

According to Brauers and Zavadskas (2006), MOORA goes for a ratio system in which each response of an alternative on an objective is compared to a denominator, which is representative for all alternatives concerning that objective.

MOORA method begins with the matrix X where its elements x_{ij} denote j-th alternative of i-th objective ($i = 1, 2, \ldots, n$ and $j = 1, 2, \ldots, m$). In our case we have m=3 alternatives (Baltic States) and $n = 12$ objectives (indicators. MOORA method consists of two parts: the ratio system and the reference point approach.

The Ratio System of MOORA. The ratio system defines data normalization by comparing alternative of an objective to all values of the objective:

$$x_{ij}^{*} = \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x_{ij}^{2}}}, \qquad (1)$$

where x_{ij} = response of alternative j on objective i; $j = 1, 2, ..., m$; m – number of alternatives; $i = 1, 2, \ldots n$; n – number of objectives; x^{*}_{ij} – a dimensionless number representing the normalized response of alternative j on objective i. These responses of the alternatives on the objectives belong to the interval [0; 1].

These indicators are added (if desirable value is maximal) or subtracted (if desirable value is minimal) and summary index of state is derived according by formula:

$$y^{*}_{j} = \sum_{i=1}^{i=g} x^{*}_{ij} - \sum_{i=g+1}^{i=n} x^{*}_{ij}, \qquad (2)$$

Where $i = 1, 2, \ldots, g$ as the objectives to be maximized; $i = g + 1, g + 2, \ldots, n$ as the objectives to be minimized; y^{*}_{j} – the normalized assessment of alternative j with respect to all objectives.

The Reference Point of MOORA. This reference point theory starts from the already normalized ratios as defined in the MOORA method. The j-th coordinate of the reference point can be described as $r_j = max\ x^{*}_{ij}$ in maximization case. Every coordinate of this vector represents maximum or minimum of certain objective. Then every element of normalized responses matrix is recalculated and final rank is given according to the deviation from the reference point and the Min-Max Metric of Tchebycheff:

$$\min_{i}(\max_{j} | r_j - x^{*}_{ij} |). \qquad (3)$$

The Full Multiplicative Form of Multiple Objectives and MULTIMOORA. Brauers and Zavadskas (2010) proposed updated MOORA with the Full Multiplicative Form method embodying maximization as well as minimization of purely multiplicative utility function. Overall utility of the j-th alternative can be expressed as dimensionless number:

$$U^{'}_{j} = \frac{A_j}{B_j}, \qquad (4)$$

where $A_j = \prod_{g=1}^{i} x_{gi}$, $j = 1, 2, \ldots, m$; m – number of alternatives; i – number of objectives to be maximized; $B_j = \prod_{k=i+1}^{n} x_{kj}$, $n - i$ – number of objectives to be minimized, $U^{'}_{j}$ – utility of alternative j with objectives to be maximized and objectives to be minimized.

Thus MULTIMOORA summarizes MOORA (which includes Ratio System and Reference point) and the Full Multiplicative Form.

6. Optimization of country risks in Baltic States

Empirical analysis of Baltic States' began with the definition of system of structural indicators (Table 3). The system consists of 12 indicators from the shortlist of structural indicators.

Table 3. System of structural indicators used in diachronic analysis of Baltic States' performance during 1999-2009 (Source: made by authors)

No.	Structural indicators, abbreviations	Desirable values
I. General economic background		
1	GDP per capita in PPS	Max
2	Labour productivity per person employed	Max
II. Employment		
3	Employment rate	Max
4	Employment rate of older workers	Max
III. Innovation and research		
5	Youth education attainment level	Max
6	Gross domestic expenditure on R&D	Max
IV. Economic reform		
7	Business investment	Max
8	Comparative price levels	Min
V. Social cohesion		
9	At-risk-of-poverty rate	Min
10	Long-term unemployment rate	Min
VI. Environment		
11	Greenhouse gas emissions	Min
12	Energy intensity of the economy	Min

Table 4. Indicators used in diachronic analysis of Baltic States' performance for 2000, 2005 and 2009 year (Source: made by authors)

Indicator/Year	Lithuania			Latvia			Estonia		
	2000	2005	2009	2000	2005	2009	2000	2005	2009
GDP per capita in PPS	40,0	53,0	55,0	36,0	48,0	51,0	45,0	62,0	64,0
Labour productivity per person employed	43,2	55,0	57,5	40,1	47,8	52,8	47,2	60,8	65,8
Employment rate	59,1	62,6	60,1	57,5	63,3	60,9	60,4	64,4	63,5
Employment rate of older workers	40,4	49,2	51,6	36,0	49,5	53,2	46,3	56,1	60,4
Youth education attainment level	78,9	87,8	86,9	76,5	79,8	80,5	79,0	82,6	82,3
Gross domestic expenditure on R&D	0,6	0,8	0,8	0,5	0,6	0,5	0,6	0,9	1,4
Business investment	16,3	19,2	13,2	23,1	27,7	17,2	22,0	28,1	16,5
Comparative price levels	52,7	54,9	67,4	58,8	57,0	76,0	57,3	64,7	76,5
At-risk-of-poverty rate	17,0	20,7	20,6	16,0	19,8	25,7	18,0	18,7	19,7
Long-term unemployment rate	8,0	4,3	3,2	7,9	4,1	4,6	6,3	4,2	3,8
Greenhouse gas emissions	39,0	46,0	44,0	39,0	43,0	40,0	43,0	47,0	41,0
Energy intensity of the economy	576,3	481,2	445,9	440,5	356,1	354,5	806,0	616,5	607,0

Table 5. Analysis of Baltic States' performance indicators during 1999–2009 by MULTIMOORA (Source: made by authors)

Country/Year	MOORA Ratio system			MOORA Reference Point			Multiplicative form			MULTIMOORA		
	2000	2005	2009	2000	2005	2009	2000	2005	2009	2000	2005	2009
Lithuania	2	3	2	2	2	2	2	3	2	2	3	2
Latvia	3	2	3	3	3	3	3	2	3	3	2	3
Estonia	1	1	1	1	1	1	1	1	1	1	1	1

Directions of either minimization or maximization were also attributed to each indicator. Finally, the optimization of these indicators will lead to decrease in country risk and ability to somehow measure it.

Data covering these indicators and period of 1999–2009 was obtained from EUROSTAT Structural Indicators database. Due to limited data availability three time points were chosen for the analysis, namely years 2000, 2005 and 2009. The data therefore covers 3 Baltic States, 3 years and 12 structural indicators, 108 observations in total. The indicators used for calculations are presented in Table 4.

The initial data was normalized according to formula (1) for Ratio System of MOORA, and then formula (2) was used for obtaining ranks of the Ratio System of MOORA. Formula (3) was applied for the ratios obtained according to formula (1) for Ratio System of MOORA. At the end,

initial data was computed according to formula (4), providing ranks of the Full Multiplicative Form. Final ranks for each year analyzed were obtained through the dominance theory (Brauers 2004). Such process was repeated three times for each year. All calculations are provided in the appendices. The results are presented in Table 5.

As we can see from Table 5, there was a case of absolute dominance in either year – Estonia is a leader. It received first rank in both MOORA and MULTIMOORA each year. Other results were received for Lithuania and Latvia – as there were some changes during years and evaluating by different methods. Situation with Lithuania and Latvia has changed comparing MULTIMOORA results of 2000, 2005 and 2009, as these countries scored different rankings during these periods. As an example, using MULTIMOORA method, in 2005 the first rank was received by Estonia, second one – by Lithuania and the third one – by Latvia, the same results were obtained in 2009, but 2005 had another ranking, where Lithuania and Latvia have changed their places. However, there were no significant changes in final ranking observed. It means that after optimization of country risk by using specific set of indicators, the country risk assessment in Estonia was in the highest level, while for Lithuania and Latvia the results were not so good and country risk in these countries should be managed and assessed more precisely in the future.

7. Conclusions

The system of 12 indicators, which mostly have influence on country risk, was introduced. It includes general economic background (GDP per capita in PPS and labour productivity per person employed), employment rate, innovation and research area (youth education attainment level and gross domestic expenditure on R&D), economic reform (business investment and comparative price levels), social cohesion (at-risk-of-poverty rate and long-term unemployment rate) and environment (greenhouse gas emissions and energy intensity of the economy).

Both MOORA method and its updated model MULTIMOORA could be perfectly used while evaluating country risk, as a ratio system, reference point and multiplicative form appropriately suit for case, where there are several alternatives (Baltic States) and several objectives (indicators, which directly show country risk).

After implementation of MULTIMOORA method for Baltic States, it could be concluded that taking into account the indicators, which can differ on a respect to a country risk, the best position for all periods was in Estonia, as it received first rank and it means that Estonia is optimizing its country risk in a correct way, more worse situation is in Lithuania and Latvia, as the ranks were changing depending on methods used and years. So, for Lithuania and Latvia the country risk assessment isn't made properly, and they should pay more attention on this, as country risk could lead to different undesirable consequences.

For future investigations, new methods for country risk assessment could be used (for example, S&P ratings) and results compared to those received by using MULTMOORA method. Furthermore, a new system of indicators could be created for deeper analysis of country risk assessment.

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