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EVALUATION METHODS FOR FISCAL DECENTRALIZATION

MALİ YERELLEŞME DEĞERLENDİRME YÖNTEMLERİ

Neringa SLAVINSKAITE[1], Teodora G. DİNOVA[2], Hakan KIRBAŞ[3]

Abstract

Fiscal decentralisation has attracted attention from government, academic studies, and international institutions with the aims of enhancing economic growth in recent years. One of the difficult issues is to measure satisfactorily the degree of fiscal decentralisation across countries. Fiscal decentralization is a complex phenomenon, demonstrating its various aspects in reality. Therefore, multicriteria methods may be used for its evaluation. The fiscal decentralization is described by a number of criteria, therefore, an hierarchical set of criteria should be developed to assess it more accurately. Multicriteria evaluation may be aimed at determining the preference order of the considered phenomena or at quantitative evaluation of the state of a particular phenomenon (or object). It is the latter that allows us to determine level of fiscal decentralization of country. All currently used multicriteria evaluation methods have some advantages and disadvantages, therefore, the evaluation should be based on the use of several methods, and the mean value of the data obtained should be considered.

This paper provides a general, brief but comprehensive overview of the main evaluation methods from the literature of fiscal decentralization. In doing so, literature on evaluation methods of fiscal decentralization is grouped into two main parts: "used methods' and "new methods".

Keywords: Fiscal decentralization, Evaluation methods, Multicriteria methods,

Öz

Son yıllarda mali yerelleşme, ekonomik büyümenin artırılması amacıyla hükümetlerin, akademik çalışmaların ve uluslararası kuruluşların dikkatini çekmiştir. Zor konulardan bir tanesi ülkeler arasındaki mali yerelleşme derecesinin tatmin edici bir şekilde ölçülmesidir. Mali yerelleşme aslında çeşitli açıları gösteren karmaşık bir olgudur. Bu nedenlede değerlendirilmesinde çok kriterli yöntemler kullanılabilmektedir. Mali yerelleşme bir dizi kritere göre tarif edilmete bundan dolayıda daha doğru değerlendirme yapmak için hiyerarşik kriter dizisi geliştirilmesi grekmektedir. Çok kriterli değerlendirme, gözönünde bulundurulan olguların tercih sırasının belirlenmesi veya belirli bir olayın (ya da nesnenin) devlet tarafından niceliksel değerlendirmesi amacına

[1] PhD student of Economic, Vilnius Technical University, neringa.slavinskaite@gmail.com
[2] Visiting Lecturer, PhD Student, South-West University, t.dinova@swu.bg
[3] Lecturer at Mehmet Akif Ersoy University, hakankirbas@mehmetakif.edu.tr

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yönelik olabilir. ikinci olarak da ülkenin mali yerelleşme düzeyini belirlemek için izin vermektedir. Halihazırda kullanılan tüm çok kiterli değerleme yöntemlerinin bazı avantajları ve dezavantajları vardır, bundan dolayı değerleme çeşitli yentemlerin kullanımına dayanmalı ve elde edilen verilerin otalama değerleri değerlendirilmelidir.

Bu makale mali yerelleşme literatüründeki ana değerlendirme yöntemlerine, genel, kısa öz ama kapsamlı bir bakış sağlamaktadır. Bunu yaparkende ,Mali yerelleşme değerlendirme yöntemleri ile ilgili literatür iki ana bölümde gruplanmaktadır: "kullanılan yöntemler 've' yeni yöntemler".

Anahtar Kelimeler: Mali yerelleşme, Değerleme Yöntemleri, Çok kriterli yöntemler

1. INTRODUCTION

Fiscal decentralisation has recently emerged as a fundamental issue in the literature on economic growth in developing countries. The issue has attracted the attention of both academics and international institutions such as the World Bank. Most of research works evaluated only some parts of fiscal decentralization (revenue or/and expenditure) and showed impact on economic growth. The research problem is find suitable methods which will help to evaluate all fundamental principles of fiscal decentralisation.

In recent years, multicriteria evaluation methods have been widely used in solving both theoretical and practical problems. Actually, these methods are universal because they allow us to quantitatively evaluate any complicated object described by a set of criteria. Another advantage of these methods is their ability to combine both maximizing and minimizing criteria expressed in various dimensions into one integrated criterion. The maximizing criteria imply that, if their values are growing, the situation is getting better, while for minimizing criteria this means a worsening situation. The integration is achieved by normalization which helps to convert all the criteria values into non-dimensional, i.e. comparable quantities (Ginevičius, Podvezko, 2007). Many similar assignments, involving various technical, social and other problems have been solved. The major part is devoted to deal with the construction issues, such as investment efficiency in individual housing construction business (Ustinovičius *et al*., 2005, (a)), evaluation of construction contracts (Podvezko *et al*., 2010), selection of rank mode (Ustinovičius *et al*., 2005 (b)), evaluating construction company‘s financial standing (Ginevičius, Podvezko, 2006), the comparison of several real construction variants, office repair and realization options (Ustinovičius *et al*., 2006), setting the construction place for commercial facilities (Zavadskas *et al*., 2009), management of vocational training quality (Andriušaitienė *et al*., 2008), the comparison of Baltic States level of development (Tvaronavičienė *et al*., 2008), evaluation of tax system (Bivainis, Skačkauskienė, 2009), evaluation of financial system (Žvirblis, Buračas, 2010), evaluation of product quality (Pabedinskaitė, Vitkauskas, 2009), evaluation of company‘s potential competitiors (Žvirblis *et al*., 2008), evaluation of company‘s environmental components (Žvirblis, Zinkevičiūtė, 2008), evaluation of the strategic potential of an enterprise (Ginevičius et al. 2012) ,evaluation of Lithuanian banks‘s financial stability and soundness (Ginevičius, Podviezko, 2013), evaluation of the effect of state subsidies on business (Ginevičius, Bruzgė, 2013); strategic assessment of networking of a higher education institution (Ginevičius, Nugaras, 2015) and other evaluations. Evaluation of fiscal decentralization is new object for using multicriteria evaluation methods.

The purpose of this article is to analyse used methods and introduce multicriteria decision making methods for evaluation of fiscal decentralization.

To achieve stated object, the following goals have been set:

- to assess critically the existing methods for quantitative evaluation of fiscal decentralization;
- to analyze new methods (multicriteria decision making) for evaluation of fiscal decentralization evaluation;

Research methods. Review of scientific literature, analysis of statistical data and the methods applied in the theory of multiple criteria have been used for the research.

2. ANALYSIS OF THE METHODS USED FOR QUANTITATIVE EVALUATION OF FISCAL DECENTRALIZATION

The theoretical framework in which authors sustain is the endogenous growth model of Barro (1990), where the production function has multiple inputs including private and public spending. This perspective is adopted by Davoodi and Zou (1998); Zhang and Zou (1998); Xie, Zou and Davoodi (1999), Zhang and Zou (2001); Akai and Sakata (2002), Akai, Nishimura and Sakata (2004); Jin and Zou (2005); Carrión-i-Silvestre, Espasa and Mora (2006); Pérez and Cantarero (2006); Esteban (2006), Baskaran and Feld (2009). Concretely, in the model of Davoodi and Zou (1998), the public spending is divided in three government levels and the spending shares are determined assigned at the different government levels with the macroeconomic objective of maximization of the growth. The model´s essential implication is that for a given share of total government spending to GDP, the growth-maximizing government budget shares are proportional to the relative productivity of federal and local level governments. Iimi (2005) indicates an interpretation of the model of Davoodi and Zou (1998) is that: when the productivity effect of sub-national level government spending is relatively large compared with the central government expenditure, fiscal decentralization has a positive effect on the growth rate. However, holding the relative productivity constant between governments, fiscal systems that are excessively decentralized are likely to lower economic growth. Therefore, it is logical to expect that allocating budgetary resources to less productive levels of government is harmful for the economic efficiency and therefore, for the economic growth of a country. This implies that if the sub-national governments are inefficient and faulty in the supply of local public goods, the fiscal decentralization is not the best option.

On the other hand, the studies of Lin and Liu (2000), Martínez and Mcnab (2006a), Thieben (2003, 2005); Feld *et al.* (2004) and Bodman and Ford (2006) use a different approach. Following Mankiw *et al.* (1992), these authors use the model of exogenous growth of Solow (1956) and they introduce the fiscal decentralization as a variable explanatory of the growth rate of output per capita. The cornerstone of these last works is to admit that the exogenous parameter not only reflects technological aspects of the economy but also a measure of the economic performance of the decentralized Public Sector. *I.e.* the level of technology reflects not just technology but also differences in resource endowment and institutions across countries/regions and over time, as well as in other non-bservable countries/region-specific characteristics. This disintegration of the term *technological progress* is consistent with the economic literature about the growth and with the hypotheses of conditional convergence (Barro, 1990; Sala, 1994).

In any case, the previous studies probably use a theoretical framework ad-hoc, since they don't allow to identify the causes of the estimated effect of decentralization in the economic growth of a country. In this sense,

the procedure used by Sollé and Esteller (2006) is quite different to that employed in previous investigations. This authors consider the assignment process among alternative investments and, then, they compare it with the effect that this assignment process causes in decentralized decision-taking scenario as in another centralized. In this point of the analysis, if the assignment process differs among the two contexts of decision-taking, they are able to identify the inefficiency taken place under the centralized government structure. Also, combining the obtained results with the estimates of the effects of the outlined alternative investments (roads and education) on the economic growth, they can determine the gain from the output due to the better assignment in the investments in the decentralized decision-taking scenario (see 1 Table).

Table 1. - Analytical Framework and Empirical Methodology used in research works of fiscal decentralization

Author	Empiric methodology	Analytical Framework
Oates (1995)	No details available	No explicit any theoretical model
Phillips, Woller (1997)	Panel data. Fixed Effects Model. OLS	Levine and Renett (1992) and Sala-i-Martin (1997)
Zhang and Zou (1998)	Panel data. Fixed Effects Model. OLS	Model of endogenous growth of Barro (1990)
Xie *et al*. (1999)	OLS	Model of endogenous growth of Barro (1990)
Yilmaz (2000)	Panel data. Fixed Effects Model. GLS	Not explicit any theoretical model
Lin, Liu (2000)	Panel data. Fixed Effect Model	Model of neoclassical growth of Maniw *et al*. (1992)
Thieben (2000)	GLS	Model of endogenous growth without providing more particulars
Zhang and Zou (2001)	Panel data. Fixed Effect Model	Model of endogenous growth of Barro (1990)
Akai and Sakata (2002)	Fixed Effects Model. OLS	Model of endogenous growth of Barro (1990)
Behnisch *et al*. (2003)	Time series analysis	They don't make reference to any theoretical pattern
Desai *et al*. (2003)	OLS and TSLS	They don't make reference to any theoretical pattern
Thieben (2003)	GLS	Model of economic growth of Solow enlarged by Mankiw *et al*. (1992)
Feld *et al*. (2004)	OLS and TSLS	Model of neoclassical growth of Maniw *et al*. (1992)

Jin *et al*. (2005)	Fixed Effect Model. GLS	Model of endogenous growth of Barro (1990)
Jin and Zou (2005)	Panel data. Fixed Effects Model	Model of endogenous growth of Barro (1990)
Martínez, McNab (2006)	Panel data. Fixed Effects Model. GLS	Model of economic growth of Solow enlarged by Mankiw et al. (1992)
Thieben (2005)	OLS	Model of economic growth of Solow enlarged by Mankiw *et al*. (1992)
Iimi (2005)	OLS and IV	Endogenous growth model provided by Davoodi and Zou
Carrion *et al*. (2006)	Panel data. Fixed Effects Model. OLS	Model of endogenous growth of Barro (1990)
Bodman and Ford (2006)	OLS	Model of economic growth of Solow (1956)
Akai *et al*. (2007)	Maximum likelihood estimation	Model of endogenous growth of Barro (1990)
Thornton (2007)	OLS	Not explicit any theoretical model
Baskaran and Feld (2009)	Panel data; OLS; Random effects; Fixed effects estimations	Endogenous growth model provided by Davoodi and Zou (1998)
Chu, Zheng (2013)	Two-stage least squares, Fixed effects model	Model of endogenous growth of Lucas (1988) and Stiglitz's theory of local public goods (1977)
Gemmel et al (2013)	Pooled Mean Group (PMG) *Estimations*	Endogenous growth model provided by Davoodi and Zou (1998)
Baskaran, Feld (2013)	Fixed effects model, two-stage least squares	Endogenous growth model provided by Davoodi and Zou (1998
Jalil et al (2014)	ARDL (Autoregressive Distributed Lag), error correction model (ECM)	Endogenous growth model provided by Davoodi and Zou (1998) and Iimi (2005).

Among the two most backed theoretical focuses, models of endogenous court *versus* models of exogenous court, it seems that there is a clear preference to contrast the influence of the processes of fiscal decentralization empirically on the economic growth from an environment of endogenous growth. Concretely, the fact stands out that most of the studies of individual countries are based theoretically on the contributions of Barro (1990),

where the government expenditure assigned at each government level is added to the production function as one more productive input.

The econometric specifications that are used, mainly refer to two particular procedures in the treatment of the data: regressions with cross-section data as opposed to those that are solved on a panel of data.

In the panels of data the variables of annual frequency are usually used. Although, it is true that, it is possible to establish panels with data averages of more than a year of frequency, with the purpose of grasping the possibility of long term effects. This is the case detected in Davoodi and Zou (1998) and Phillips and Woller (1997) who use a panel on average data covering five years or decenal frequency, in the first case; and of annual frequency, triennial and five-year, in the second case.

The pros and cons of these two types of data treatment are discussed in the investigations of Thieben (2000, 2003). This author grants, in both studies, a bigger priority to the regressions of cross-section with data annual averages. However, in spite of most authors lean for the methodology applied on panel data, Akai and Sakata (2002) use regressions with cross-section data and they introduce a variable dummy that picks up the specific characteristics of each country.

Equally, one empirical issue that should be considered before analysing the relation between decentralization fiscal and economic growth concernid the potencial endogeneity of fiscal decentralization to the growth process. A significant body of empirical literature suggest that the level of income is a determinant of decentralization fiscal (Oates, 1972; Panizza, 1999; Eller, 2004). As it is suggested in Bodman and Ford (2006)'s report, development stimulates demand for variety and quality in the range of public services being provided whilst increasing the revenue raising capacity of governments, making decentralization affordable. If federal decentralization has a high income elasticity, then higher income per capita may allow the constitution of a new level of decentralization. If fiscal decentralization affects economic growth, then the new level of decentralization will in turn have an impact on the of income. Thus suggest a potential bidirectional relationship between fiscal decentralization and economic growth (Bodmand and Ford, 2006). Moreover, Breuss and Eller (2004) and Iimi (2005) acknowledge that unobservable and omitted variables that tend to simultaneously may also exit. If is this the case, then simply including fiscal decentralization in a growth regression could lead to simultaneity bias.

The different channel of interference and potencial bi-directional causalities between fiscal decentralization and economic growth have not been sufficiently considered within theoretical models or empirical specifications, respectively. Breuss and Eller (2004) suggest that given potential bi-directional causalites it is also necessary to address the research regarding the impact of economic growth on fiscal decentralization and examine the various channels of interference. It is important to specify the determinants and dimension of both fiscal decentralization and economic growth and clarify wich exogenous variables determine simultaneously the two variables of inters *(e.g.* population growth)" (Breuss and Eller, 2004). If fiscal decentralization and economic growth are endog-enously related then failure to control for this econometric issue would result in inconsistent parametres estimate. And additional problem in testing and controlling for endogeneity is the lack of control variables that are correlated with decentralization, uncorrelated with growth, and available across countries and time. The literature of data has focused primarily on the contemporaneous relationship between decentralization and growth; ignoring for the most part the potential for time-wise causality (Martínez and Mcnab, 2003).

From this point of view, the results of some researches assume that there is one way causality between fiscal decentralization and economic growth; whereas others authors consider that there are some problems in Ordinary Least Square (OLS) estimations, and provide corrected estimations of results. In order to provide correct estimates, most of the studies value the effect of fiscal decentralization by considering endogeneity. They correct these potential problems, using Three Stage Least Squares (TSLS) and adding the Instrumental Variables (IV) to the exogenous ones already included in the basic regression model.

Regarding the estimator used by different authors, the estimador of OLS is the one that prevails in most of studies. Nevertheless, Zhang and Zou (1998), Yilmaz (2000) and Thieben (2000) use the estimator of General Least Square (GLS); Akai et al. (2007) opt for Maximum Likelihood (ML) estimation; Desai *et al.* (2003) use the Three Stage Least Squares (3SLS) estimate to minimize the simultaneity and endogenousity of some explanatory variables that can be the case of the transfers received by the subcentral governments.

More specifically, and among the most recent investigations, Bodman and Ford (2006) go even further in Thieben's (2000, 2001) analysis of the relationship between fiscal decentralization and the components of the growth equation. His study uses pooled cross-section regression. On the other hand, in Thieben (2005) the simple OLS method is used with the assumption that the independent variables are exogenous. The estimate is a pure cross-section analysis; that is, short-term time effects were eliminated by forming averages to enable only the long-term effects to be measured. Equally, in Thornton (2007), given the relatively small sample size, the estimation technique was OLS with average data for the period. Whereas the use of ols in this context implies that the explanatory variable is exogenous, which may be problematic, the relatively small sample prevents the use of an alternative Instrumental Variable (IV) method. In the same way, in Iimi (2005) and Esteban (2006) the estimation results are based on the ols and IV technique using data averages for the period of reference.

Jin and Zou (2005) use a panel data set for 30 provinces in China. The regression analysis in this study uses the panel data sets combining time series and cross section. All coefficients are estimated with fixed-effects with corrections for panel heteroskedasticity and and panel serial correlation. Of particular note, comparing the ols and IV results, the IV models tend to estimate systematically smaller effects of fiscal decentralization than the ols regressions, implying that the OLS results are biased.

The analyse of literature sources show that there is not one method which is the best for fiscal decentralization evaluation. So, in another part of article will be present multicriteria decision making methods which could help to evaluate fiscal decentralization.

3. NEW METHODS (MULTICRITERIA DECISION MAKING) FOR EVALUATION OF FISCAL DECENTRALIZATION

The analysis of literature sources show that various evaluation techniques beginning with simple (sum of places, geometric average), more accurate ones (SAW COPRAS) and finishing by the most complicated ones – TOPSIS, VIKOR, MOORA, MULTIMOORA, ELECTRE, PROMETEY, PROMETEI II and others) are used (Jakimavicius & Burinskiene, 2009; Antucheviciene & Zavadskas, 2008; Brauers & Ginevicius, 2010; Radziszewska-Zielina, 2010; Tomic-Plazibat et al., 2010; Li-Chang Hsu, 2013; Fereiro, 2013; Ginevicius et al., 2013; Aghdaie et al., 2013).

The fact that such wide spectrum of methods is applied shows that all of them are not perfect. Another circumstance is that today it is not clear what evaluation method to choose depending on the specific features of the examined phenomenon. One of suggestions how to increase the accuracy of multicriteria evaluation is to apply some methods and use the average of the received results (Ginevicius, Podvezko, 2012).

The researches show that the intensity of multicriteria evaluation methods is diverse. The analysis of applying such methods in social sciences dissertations defended in the latter 10 years was carried out. Its results are given in Table 2 (Zinkeviciute, 2006; Butkevicius, 2008; Hausmann, 2009; Jurkenaite, 2009; Sligeriene, 2009; Morkvenas, 2010; Kanapeckiene, 2010; Krivka, 2010; Zubrecovas, 2010; Kelpšienė, 2011; Plakys, 2011; Venckauskaite, 2011; Ginevicius, 2011; Griskeviciute - Geciene, 2012; Zilinskij, 2012; Podviezko, 2013; Gedminaitė - Raudonė, 2013; Činčikaitė, 2013; Sviderskė, 2014; Bartkienė, 2014; Stasiukynas, 2014; Šimelytė, 2014; Bruzgė, 2014; Nugaras, 2014).

Table 2. Multicriteria evaluation methods applied in social sciences dissertations defended in 2005-2014

Multicriteria evaluation method	Sum of places	Geometric average	MOORA (MULTI-MOORA)	SAW	COPRAS	VIKOR	TOPSIS	PROMETHEE
Time of application	3	1	4	17	7	3	5	1

Source: compiled by the authors

From Table 2 it is seen that the multicriteria evaluation methods SAW and CORPAS were applied most frequently, therefore it is meaningful to compare them. SAW (Simple Additive Weighting) multicriteria evaluation method is one of the most understandable and the simpliest ones embodying indexes values and weights connection into a single evaluating size – method criterion.

On the other hand, this method provides for usage of only maximizing indexes, therefore, before calculating the minimizing indexes should be transformed into maximizing ones. Meanwhile, COPRAS (Cooperation Platform for Research and Standards) multimedia evaluation method does not have such drawback because the authors offered to evaluate maximizing and minimizing indexes separately. The component evaluating the impact of maximizing indexes coinsides with the corresponding evaluation by SAW method.. On the other hand, the deeper analysis of CORPAS method revealed that in some definite cases it can be unstable from the point of view of data fluctuation, and the results of evaluation according to this technique can differ from other multicriteria evaluations applying other methods. To conclude, it can be stated that the general qualities of SAW and CORPAS methods make it possible to apply them for evaluation of one-levelled hierarchical level indexes. The drawbacks of these and other multicriteria evaluation methods can be diminished by carrying out multicriteria evaluation applying some techniques and using the results average.

Quantitative evaluation methods are based on the matrix of the criteria, describing the compared object, statistical data or experts' estimates $R = ||r_{ij}||$ and the criteria weights ω_i, i =1,...,m; j =1,...,n, where m is the

number of the criteria, n – the number of the objects (alternatives) compared. When using quantitative multicriteria evaluation methods, the maximizing or minimizing character of the criteria is determined. For maximizing criteria the maximum values are the best, while for minimizing criteria the best values are the minimum ones. The criteria of multicriteria evaluation methods usually embrace non-dimensional (normalized) criteria values r_{ij} and the respective criteria weights ω_i (Ginevicius 2008). Most methods use a special kind of initial data (criteria values) normalization or data transformation.

Six multicriteria methods will be analyse:

1. The most widely used method is SAW (Simple Additive Weighing) (Hwang, Yoon 1981). The criterion of the method Sj expresses the idea of various quantitative multicriteria evaluation methods – the integration of the criteria values and their weights into one quantity. The sum Sj of normalized weighted values of all criteria is calculated for every j-th object by the formula (Hwang, Yoon 1981):

$$S_j = \sum_{i=1}^{m} \omega_i \tilde{r}_{ij} \quad (1)$$

where ω_i – the i-th criterion weight; $\tilde{r}_{ij}$ - the normalized value of this criterion for the j-th object.

In this case, the normalization of the initial data can be performed by the formula (Ginevicius, Podvezko 2006):

$$\bar{r}_{ij} = \frac{r_{ij}}{\max\limits_j r_{ij}} \quad (2)$$

where r_{ij} – the i-th criterion value for the j-th object.

The best value of the criterion Sj is its largest value.

2. The simplest of the applied methods is **the sum of ranks of all the criteria** (VS). The method's criterion Vj for every j-th object is determined by the formula (Ginevicius et al. 2006):

$$V_j = \sum_{i=1}^{m} m_{ij} \quad (3)$$

where m_{ij} – the i-th criterion rank for the j-th object ($1 \le m_{ij} \le m$). The best value of the criterion Vj is its smallest value. The criterion Vj values depend neither on the normalization method's initial data and their scale transformation, nor on the criteria weights ω_i (i = 1,...,m) . However, the application of this method requires prior determination of the type of the criteria used which may be maximizing or minimizing. There is also a possibility to convert minimizing criteria to maximizing ones by the formula (Ginevicius, Podvezko 2007):

$$\bar{r}_{ij} = \frac{\min\limits_j r_{ij}}{r_{ij}} \quad (4)$$

where r_{ij} – the i-th criterion value for the j-th object.Then, the smallest criterion value will become the largest value equal to one.The calculations have shown that this criterion may be used only for

preliminary evaluation. However, in many cases, the results yielded by the method VS, i.e. by ranking objects, do not differ considerably from those obtained by complex mathematical methods.

3. Another simple method is the geometric normalized values of all the criteria (method GV). It is calculated from the formula (Ginevicius, Podvezko 2007):

$$\Pi_j = \sqrt[m]{\prod_{i=1}^{m} r_{ij}} \tag{5}$$

The priority order based on formula (5) does not depend on the value of the criteria weights ω_i; therefore, it is not necessary to include it into the above formula. The best value of the criterion R_j is its highest value.

4. TOPSIS is based on vector normalization (Hwang, Yoon 1981):

$$\tilde{r}_{ij} = \frac{r_{ij}}{\sqrt{\sum_{j=1}^{n} r_{ij}^2}} \quad (i = 1, ..., m;\ j = 1, ...n), \tag{6}$$

where $\tilde{r}_{ij}$ – a normalized value of the i-th criterion of the j-th object.

The best alternative V* and the worst alternative V^- are calculated by the formula:

$$V^* = \{V_1^*, V_2^*, ..., V_m^*\} = \{(\max_j \omega_i r_{ij} / i \in I_1), (\min_j \omega_i r_{ij} / i \in I_2)\}, \tag{7}$$

$$V^- = \{V_1^-, V_2^-, ..., V_m^-\} = \{(\min_j \omega_i r_{ij} / i \in I_1), (\max_j \omega_i r_{ij} / i \in I_2)\}, \tag{8}$$

where I_1 is a set of maximized criteria, I_2 – a set of minimized criteria, ω_i – the weight of the i –th criterion $(\sum_{i=1}^{m} \omega_i = 1)$.

The total distance D_j^* to the best alternatives and D_j^- to the worst ones is calculated by the formulas:

$$D_j^* = \sqrt{\sum_{i=1}^{m} (\omega_i \tilde{r}_{ij} - V_i^*)^2} \tag{9}$$

$$D_j^- = \sqrt{\sum_{i=1}^{m} (\omega_i \tilde{r}_{ij} - V_i^-)^2} \tag{10}$$

The main criterion C_j^* of the method TOPSIS is calculated by the formula:

$$C_j^* = \frac{D_j^-}{D_j^* + D_j^-} \quad (j = 1, 2, ..., n) \tag{11}$$

$$(0 \le C_j^* \le 1)$$

The best alternative is associated with the highest value of the criterion C_j^*. The compared alternatives should be ranked in the descending order.

5. A compromise approach VIKOR (Opricovic, Tzeng 2004) also allows the stability intervals of the criteria weights to be established. Like TOPSIS, this method assesses the distance to the ideal solution but it is not so sensitive to instability of the initial data, offering compromise options in the case of conflicting criteria. VIKOR is based on the type of normalization:

$$\widetilde{r}_{ij} = (\max_j r_{ij} - r_{ij}) / (\max_j r_{ij} - \min_j r_{ij}) \tag{12}$$

$$(0 \le \widetilde{r}_{ij} \le 1)$$

The method uses 3 evaluation criteria: S j Rj Qj , , .(j =1, ..., n). The criteria S j and Rj are calculated by the formulas:

$$S_j = \sum_{i=1}^{m} \omega_i \widetilde{r}_{ij} \tag{13}$$

$$R_j = \max_i (\omega_i \widetilde{r}_{ij}) \tag{14}$$

The main integrated criterion Qj is calculated by the formula:

$$Q_j = \nu (S_j - S^*) / (S^- - S^*) + (1-\nu)(R_j - R^*) / (R^- - R^*) \tag{15}$$

Where $S^* = \min_j \mathrm{S_j}$, $S^- = \max_j S_j$, $R^* = \min_j R_j$, $R^- = \max_j R_j$, ν make the majority criterion or the strategic weight. The best alternatives (enterprises) have the lowest values of the criteria Sj, Rj and Qj , implying that the considered alternatives should be ranked in an ascending order.

6. The value of the criterion of complex proportional evaluation method (COPRAS) (Zavadskas et al. 2009; Zavadskas et al. 2010; Zavadskas, Turskis 2011) is defined by the formula:

$$Z_j = S_{+j} + \frac{S_{-\min} \sum_{j=1}^{n} S_{-j}}{S_{-j} \sum_{j=1}^{n} \frac{S_{-\min}}{S_{-j}}} \tag{16}$$

Where $S_{+j} = \sum_{i=1}^{m} \omega_{+i} \widetilde{r}_{+ij}$ 1 is the sum of the weighted values $\widetilde{r}_{+ij}$ of j-th maximizing criteria (whose maximum values are the best) for all m objects. $S_{-j} = \sum_{i=1}^{m} \omega_{-i} \widetilde{r}_{-ij}$ is the same for j-th minimizing criteria (their minimum value $S_{\text{-min}} = \min_j S_{-j}$. COPRAS is based on the initial data normalization method.

4. CONCLUSION

1. The analyse of literature sources show that there is not one method which is the best for fiscal decentralization evaluation. The degree of fiscal decentralization should not be measured by the share of expenditure/revenue of lower level governments as of that of total government expenditure/revenue. In turn, it seems necessary to evaluate all fundamental principles of fiscal decentralisation..
2. Multicriteria evaluation methods have been used in Lithuania for more than 30 years. At first they were used for solving technological problems in construction. Their universal nature allowed to start applying them later in analysing socioeconomic systems, especially in quantative evaluating of the processes which have such nature and for evaluation of expressions position.
1. The analysis of literature sources (of the defended social sciences dissertations) showed that in the latter 10 years the two multicriteria evaluation methods SAW and CORPAS were used most frequently. Both of them are quite simple and understandable for applying. In comparison with SAW, the method CORPAS has the advantage that it evaluates both maximizing and minimizing indexes without any transformations, while SAW evaluates only maximizing ones. On the other side, CORPAS method in certain cases can be unstable from the point of view of data fluctuation.

REFERENCES

Akai, N., Nishimura Y., Sakata M. (2007), "Complementarity, Fiscal Decentralization And Economic Growth, *Economic Of Governance*, Vol.4, No,8(4), (339-362).

Akai, N., Sakata M. (2002), "Fiscal Decentralization Contributes To Economic Growth: Evidence From State-Level Cross-Section Data For The United States, *Journal Of Urban Economics*, No.52, (93-108).

Andriušaitienė, D.; Ginevičienė, B. V.; Šileika A. (2008), "Daugiakriterinis Profesinio Mokymo Kokybės Valdymo Vertinimo Modelis", *Verslas: Teorija Ir Praktika*, Vol.2, No.9, (88-96).

Antucheviciene, J., Zavadskas, E. K. (2008), "Modelling Multidimensional Redevelopment Of Derelict Buildings", *International Journal Of Environment And Pollution,* Vol.2-4, No.35, (331–344).

Aqhdaie, M. H., Zoltani, S. M., Zavadskas E. K. (2013), "Market Segment Evaluation And Selection Based On Application Of Fuzzy Ahp And Copras- G Methods", *Journal Of Business Economics And Management,* Vol.1, No.14, (213–233).

Bartkienė, L. (2014), Productivity Management Of Intellectual Work Using Biometric Technologies. Doctoral Dissertation, Vilnius: Technika, (156).

Baskaran, T., Feld, L. P. (2013), "Fiscal Decentralisation And Economic Growth In Oecd Countries. Is There A Relationship?", *Public Finance Review*, Vol.4, No.41, (421-445).

Baskaran, T., Feld L. (2009), Fiscal Decentralization And Economic Growth In Oecd Countries: Is There A Relationship?. Working Paper Series, 2721, <Ssrn:Http://Ssrn.Com/Abstract=1441152>.

Behnisch, A., Buettner T., Stegarescu D. (2003), Public Sector Centralization And Productivity Growth: Reviewng The German Experience. Discussion Paper, 02-03, Ludwig-Maximilians University Of Munich.

Bivainis, J.; Skačkauskienė, I. (2009), "Kompleksinio Mokesčių Sistemos Vertinimo Rodiklių Sistema", *Verslas: Teorija Ir Praktika*, Vol.4, No.10, (298-307).

Bodman, P., Ford K. (2006), Fiscal Decentralization And Economic Growth In The Oecd. Macroeconomics Research Group, Discussion Papers 7, University Of Queensland, Brisbane St. Lucia.

Brauers, W. K. M., & Ginevičius, R. (2010), "The Economy Of The Belgian Regions Tested With Multimoora", *Journal Of Business Economics And Management,* Vol.2, No.11, (173–209).

Bruzgė, Š. (2014), Valstybinio Subsidijavimo Įtakos Verslui Vertinimas: Daktaro Disertacija, Vilnius: Technika, (152).

Butkevičius, A. (2008), Increase Of Validity Of The National Budget Expenditure Planning, Doctoral Disseration, Vilnius: Technika, (141).

Carrion S., Lluis J., Espasa M., Mora T. (2006), "Fiscal Decentralization And Economic Growth In Spain", *Encuentro De Economía Pública,* Vol.36, No.11.

Chu J. Zheng X. P. (2013), "China Fiscal Decentralization And Regional Economic Growth", *The Japanese Economic Review,* Vol.4, No.64, (537 – 549).

Činčikaitė, R. (2013), Miestų Konkurencingumo Kompleksinis Vertinimas Remiantis Darnios Plėtros Principais. Daktaro Disertacija, Vilnius: Technika, (174).

Desai, R., Freinkman L., Goldberg I. (2003), *Fiscal Federalism And Regional Growth, Evidence From The Russian Federation In The 1990s*, Policy Research Working Paper 3138, World Bank, Washington.

Feld, L., Kirchgässner G., Schaltegger C. (2004), *Fiscal Federalism And Economic Performance: Evidence From Swiss Cantons*, Marburg Working Paper On Economic, 20, Philipps-Universität Marburg, Marburg.

Ferreiro Fernardo, A. F. (2013), "Measuring Trade-Ofts Among Criteria In A Balanced Score Card Frame Work: Possible Contributions From The Multiple Criteria Decision Analysis Research Field", *Journal Of Business Economics And Management*, Vol.3, No.14, (433–447).

Gedminaitė-Raudonė, Ž. (2013), *Regionų Unikalumo Ekonominis Vertinimas Europos Integracijos Procesų Kontekste*, Daktaro Disertacija, Vilnius: Technika, (192).

Gemmell, N., Kneller, R., Sanz, I. (2013), "Fiscal Decentralisation And Economic Growth: Spending Versus Revenue Decentralisation", *Economic Inquiry*, Vol.4, No.51, (1915-1931).

Ginevicius, R., Podvezko, V. (2006), Comprehensive Evaluation Of Economic And Social Development Of Lihuanian Regions Based On A Structured Set Of Criteria, *The 4th International Conference Cigsudvilnius*, P.194-199;

Ginevicius, R.; Martinkute, R.; Podvezko, V. (2006), Multicriteria Decisions In Capital Markets. *Wmsci 2006: 10th World Multi-Conference On Systemic*, Cybernetics And Informatics, Proceedings, Vol 1, (36-40).

Ginevičius, A. (2011), Increasing Economic Effectiveness Of Marketing, Doctoral Dissertation, Vilnius: Technika, (145).

Ginevičius, R., Podviezko, A. (2012), "Features Of Applying Decision-Making Methods To Evaluation Of Financial Stability Of Commercial Banks", *Business: Theory And Practice*, Vol.4, No.13, (314–328).

Ginevičius, R., Povezko, V., Ginevičius, A. (2013), "Quantitative Evaluation Of Enterprise Marketing Activities", *Journal Of Business Economics And Management,* Vol.1, No.14, (200–212).

Ginevičius, R.; Podvezko, V. (2006), "Assessing The Financial State Of Constructiom Enerprises", *Ūkio Technologinis Ir Ekonominis Vystymas,* Vol.3, No.12, (188-194).

Ginevičius, R., Podvezko, V. (2007), "Some Problems Of Evaluating Multicriteria Decision Methods", *International Journal Of Manegementt And Decision Makin,.* Vol.5/6, No.8, (527-539).

Ginevičius, R., Podvezko, V., Novotny, M., Komka, A. (2012), "Comprehensive Quantitative Evaluation Of The Strategic Potential Of An Enterprise", *Economic Computation And Economic Cybernetics Studies And Research,* Vol.1, No.46, (65-84).

Ginevičius, R., Bruzgė, Š. (2013), "Evaluation Of The Effect Of State Subsidies On Business", *Business, Management And Education*, Vol.1, No.11, (50-76).

Ginevičius, R., Podviezko, A. (2013), "The Evaluation Of Financial Stability And Soundness Of Lithuanian Banks", *Ekonomska Istraživanja,* Vol.2, No.26, (191-208).

Griškevičiūtė - Gečienė, A. (2012), Model For The Justification Of Lithuanian Urban Transport Systems Infrastructure Development, Doctoral Dissertation. Vilnius:Technika, (153).

Hausmann, H. T. (2009), Die Entwicklung Der Tourismuswirtschaft In Den Baltichen Staaten Under Besonderer Berucksichtigung Der Kustenregion, Doktor Dissertation, Vilnius: Technika, (162).

Hwang, C. L.; Yoon, K. (1981), *Multiple Attribute Decision Making-Methods And Applications*, A State Of The Art Survey. Springer Verlag, Berlin, Heidelberg, New York.

Iimi, A. (2005), "Decentralization And Economic Growth Revisited: An Empirical Note", *Journal Of Urban Economic*, No.57, (449-461).

Yilmaz, S. (2000), "The Impact Of Fiscal Decentralization On Macroeconomic Performance", *National Tax Association*, Proceeding Of The 92º Annual Conference On Taxation, Atlanta, October, (24-26).

Jakimavicius, M., Burinskiene, M. (2009), Ranking Heating Losses In A Building By Applying The Multimoora. Available Online At: Www.Ktu.Lt/Lt/Mokslas/.../1392-2758-2010-21-4-352.Pd.

Jalin A. Feridun M. Sawhney B. L (2014), "Growth Effects Of Fiscal Decentralization: Empirical Evidence From China Provinces", *Emerging Markets Finance & Trade.* Vol.4, No.50, (176–195).

Jin, H., Quian Y., Weingast B. (2005), "Regional Decentralization And Fiscal Incentives: Federalism, Chinese Style", *Journal Of Public Economics*, Vol.9-10, No.89, (1719-1742).

Jin, J., Zou H. (2005), "Fiscal Decentralization, Revenue And Expenditure Assignments, And Growth In China", *Journal Of Asian Economic*, No.16, (1047-1064).

Jurkėnaitė, N. (2009), Modelling Of E-Government Development Under The Conditions Of Knowledge Economy, Doctoral Dissertation, Vilnius: Technika, (157).

Kanapeckienė, L. (2010), Development Of A Knowledge Management Model And A Recommender System For Construction Projects, Doctoral Disertation, Vilnius: Technika, (117).

Kelpšienė, L. (2011), Construction Modeling In Environment Of Economic Recession. Doctoral Dissertation, Vilnius: Technika, (134).

Krivka, A. (2010), Forming Enterprise In Oligopolic Market. Doctoral Disertation, Vilnius: Technika, (137).

Li-Chang, H. (2013), "Investment Decision Making Using A Combined Factor Analysis And Entropy-Based Topsis Model", *Journal Of Business Economics And Management,* Vol.3, No.14, (448–466).

Lin, J., Liu Z. (2000), "Fiscal Decentralization And Economic Growth In China", *Economic Development And Cultural Change*, Vol.1, No.49, (1-23).

Martínez-Vázquez, J., Mcnab R. (2006), "Fiscal Decentralization, Macrostability And Growth", *Hacienda Pública Española*, No.179, (25-50).

Morkvenas, R. (2010), Assessment Of Knowledge Potencial In Organization, Doctoral Disertation, Vilnius: Technika, (165).

Nugaras, J. (2014), Assessment Of Networking Of Higher Education Institution: Doctoral Dissertation, Vilnius: Technika, (126).

Nugaras, Justas, Ginevičius, Romualdas (2015), The Strategic Assessment Of Networking Of A Higher Education Institution, *Economic Research,* Vol.1, No.28, (31-44).

Oates, W. (1995), Comment On Conflicts And Dilemmas Of Decentralization By Rudolf Hommes, In M. Bruno And B, Pleskovic (Eds.), *Annual World Bank Conference On Development Economic*, The World Bank, Washington, (351-353).

Opricovic, S., Tzeng, G-H. (2004), "Compromise Solution By Mcdm Methods: A Comparative Analysis Of Vikor And Topsis", *European Joumal Of Operational Research*, No.156, (445-55).

Pabedinskaitė, A.; Vitkauskas, R. (2009), "Daugiakriterinis Produkto Kokybės Vertinimas", *Verslas: Teorija Ir Praktika,* Vol.3, No.10, (214-222).

Phillips, K., Woller G. (1997), "Fiscal Decentralization And Ldc Economic Growth: An Empirical Investigation", *Journal Of Development Studies*, Vol.4, No.34, (139-148).

Plakys, M. (2011), Efficiency Of Investment Funds Markets, Doctoral Dissertation, Vilnius: Technika, (153).

Podvezko, V.; Mitkus, S., Trinkūnienė, E. (2010), "Complex Evaluation Of Contracts For Construction", *Journal Of Civil Engineering And Management: International Research And Achievements,* Vol.2, No.16, (287-297).

Podviezko, A. (2013), Evaluation Of Financial Stability Of Commercial Banks, Doctoral Dissertation, Vilnius: Technika, (142).

Radziszewska-Zielina, E. (2010), "Methods For Selecting The Best Partner Construction Enterprise In Terms Of Partnering Relations", *Journal Of Civil Engineering And Management*, Vol.4, No.16, (510–520).

Rodríguez-Pose, A. Ezcurra, R. (2011), "Is Fiscal Decentralisation Harmful For Economic Growth? Evidence From The Oecd Countries", *Journal Of Economic Geography*, Vol.4, No.11, (619-643).

Stasiukynas, A. (2014), Rekreacinių Kompleksų Darnios Plėtros Vertinimas: Daktaro Disertacija, Vilnius: Technika, (134).

Sviderskė, T. (2014), Country Risk Assessment In Economic Security And Sustainability Context: Doctoral Disseration, Vilnius: Technika, (132).

Šimelytė, A. (2014), Tiesioginių Užsienio Investicijų Politikos Formavimas Baltijos Šalyse. Daktaro Disertacija, Vilnius: Technika, (184).

Šligerienė, J. (2009), Property Valuation In Energy Companies, Doctoral Dissertation. Vilnius: Technika, (183).

Thieben, U. (2000), *Fiscal Federalism In Western European And Selected Other Countries. Centralization Or Decentralization? What Is Better For Economic Growth?,* Discusión Paper 224, Deutsches Institut Für Wirtschaftsforschung, Berlin.

Thieben, U. (2003), Fiscal Decentralization And Economic Growth In High Income Oecd Countries, *Fiscal Studies*, Vol.3, No.24, (237-274).

Thieben, U. (2005), "Fiscal Decentralization And Economic Growth In Rich Oecd Countries: Is There An Optimum?", *Economic Bulletin*, Vol.5, No.41, (175-182).

Thornton, J. (2007), "Fiscal Decentralization And Economic Growth Reconsidered", *Journal Of Urban Economic*, No.61, (64-70).

Tomić-Plazibat, N., Aljinović, Z., Pivac, S. (2010), "Risk Assessment Of Transitional Economies By Multivariate And Multicriteria Approaches", *Panoeconomicus,* Vol.3, No.57, (283–302).

Tvaronavičienė, M.; Ginevičius, R.; Grybaitė, V. (2008), Baltijos Šalių Išsivystymo Palyginimas: Praktiniai Kompleksinio Požiūrio Taikymo Aspektai, *Verslas: Teorija Ir Praktika,* Vol.1, No.9, (51-64).

Ustinovičius, L., Andruškevičius, A., Kutut, V, Balcevič. R., Barvidas, A. (2005), Verbal Analysis Of Engineering And Construction Solutions, *Technological And Economic Development Of Economy,* Vol.3, No.11, (220-231).

Ustinovičius, L., Podvezko, V., Ginevičius R., (2006), "A Methods Of Determining Risk Zones Of Investment In Real Estate", *Control And Cybernetic,* Vol.2, No.35, (471-486).

Ustinovičius, L., Šarkienė, L., Šarka, V. (2005), "Individualių Namų Architektūrinių Sprendimų Modelis, Taikiant Daugiakriterinius Sintezės Metodus", *Ūkio Technologinis Ir Ekonominis Vystymas,* Vol.1, No.9, (18-26).

Venckauskaitė, J. (2011), Analysis Of Urban Sustainability Process And Quality Of Life Evaluation, Doctoral Disertation, Vilnius: Technika, (121).

Xie, D., Zou H., Davoodi H. (1999), "Fiscal Decentralization And Economic Growth In The United States, *Journal Of Urban Economics*, No.45, (228-239).

Zavadskas, E. K., Turskis, Z. (2011), "Multiple Criteria Decision Making (Mcdm) Methods In Economics: An Overview, *Technological And Economic Development Of Economy,* Vo.2, No.17, (397-427).

Zavadskas, E. K., Turskis, Z., Tamosaitiene, J. (2010), "Risk Assessment Of Construction Projects*", Journal Of Civil Engineering And Management*, Vol.1, No.16, (33-46).

Zavadskas, E., K., Ustinovičius, L., Stasiulionis, A. (2009), "Multicriteria Valuation Of Commercial Construction Projects For Investment Purposes", *Journal Of Civil Engineering And Management,* Vol.2, No.10, (151–166).

Zhang, T., Zou H. (1998), "Fiscal Decentralization, Public Spending And Economic Growth In China", *Journal Of Public Economic*, No.67, (221-240).

Zhang, T., Zou H. (2001), "The Growth Impact Of Intersectorial And Intergovernmental Allocation Of Public Expenditure: Whit Applications To China And India", *China Economic Review*, Vol.1, No.12, (58-81).

Zinkevičiūtė, V. (2006), Evaluation Of Business Strategic Decisions, Doctoral Dissertation, Vilnius: Technika, (228).

Zubrecovas, V. (2010), Evaluation Of The Real Estate Investment Projects, Doctoral Dissertation, Vilnius: Technika, (132, 153).

Žilinskij, G. (2012), Investment Portfolio Solutions, Doctoral Dissertation, Vilnius: Technika, (134).

Žvirblis, A., Mačerinskienė, I., Buračas, A. (2008), "Įmonių Konkurentų Potencialo Vertinimo Principai Ir Baziniai Modeliai", *Intelektinė Ekonomika*, Vol.3, No.1, (82-92).

Žvirblis, A., Zinkevičiūtė, V. (2008), "Įmonės Aplinkos Komponentų Daugiakriterio Kiekybinio Vertinimo Principai Ir Modeliai", *Verslo Ir Teisės Aktualijos*, No.1, (183-191).

Žvirblis, A; Buračas, A. (2010), "The Consolidated Measurement Of The Financial Markets Development : The Case Of Transitional Economies", *Technological And Economic Development Of Economy: Baltic Journal On Sustainability*, Vol.2, No.16, (266-279).