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THE APPLICATION OF A SYNTHETIC MEASURE IN THE ASSESSMENT OF THE FINANCIAL CONDITION OF LGUs IN POLAND USING THE TOPSIS METHOD APPROACH

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ABSTRACT. An assessment of the financial condition of local government units (LGUs) is usually carried out in a manner referring to traditional tools and methods based on financial analysis. However, it turns out that this approach is unreliable. There are known examples of LGUs, which, despite current reporting concerning their financial situation to the authorities controlling their financial economy, not only did not avoid financial problems (see Rewal, Dziwnów, Byczyna communes), but as a result of the improper management of public funds they were liquidated (e.g., Ostrowice commune). The finding presented above raises pertinent questions about the effectiveness of the current way of assessing the financial condition of local government units and on this basis arriving at conclusions and estimations relating to the possible consequences of the situation in local finance for the future of LGUs. Given the above, attempts to develop new solutions to assess the financial situation of LGUs are becoming more frequent. The aim of this article is to build a synthetic measure for the assessment of the financial condition of communes with regard to all basic statistics describing local government finances and making use of the TOPSIS methodology. The constructed measure does not focus on the estimation of individual financial measures but rather takes into account their interrelationships and interactions. It eliminates the problem of the lack of relationships between the analyzed result values, which may be responsible for the incorrect interpretation of the financial conditions of local government units. The value of the obtained measure allows for an objective assessment of the condition of LGUs finances, providing synthetic information concerning the multi-sectional assessment of the condition of local government finances.

JEL Classification: H11, H70, H71, H72, H74, G18

Keywords: local government units, local government finances, TOPSIS, condition of local finances, financial analysis.

Introduction

The financial condition of local government units (LGUs) is an extremely important issue, both from the point of view of the public finance system as a whole, as well as the individual interests of citizens who contribute to public resources. Considering the role of the decentralization of public finances in local finance management processes, the condition of local government finances is a crucial matter. LGUs are the providers of basic public goods and services, the organizers of local public life and the source of the development of local communities[1]. Considering the factors listed above, it is extremely important to provide, on the one hand, the necessary resources to meet those needs, and on the other hand, to provide the necessary tools to allow for the anticipation of future risks related to local government finances that may pose a potential threat to the implementation of public policies and disrupt the smooth functioning of LGUs.

In the literature concerning this subject, a fair share of the debate concerns public finance management tools (Poniatowicz, 2017; Szołno-Koguc, 2011; Salachna, 2007), constructing solutions enabling the effective use of public debt, appropriate selection of financial instruments (Skica & Wołowiec, 2012; Dylewski, 2014), including the introduction of financial assemblies, as well as the creation of regulations to protect against the excessive indebtedness of local governments. At the same time, the actual practice of the functioning of local governments shows that even the statutory introduction of regulations constituting the prevention of certain activities in the area of LGUs finances, which may result in negative consequences for local communities, is not always effective. Local governments have learned to create solutions to "circumvent" restrictive rules (Owsiak, 2008; Owsiak, 2009; Langer, 2014), and on the other hand, authorities with the responsibility of controlling financial management are not always effective (Dylewski, 2011) at ameliorating the risks early enough (Sołtyk, 2016). For this very reason the development of new solutions and methodological approaches becomes particularly important, thereby allowing for a different, more effective approach to assessing the financial situation of LGUs.

Recent experience has shown that the attempts to create synthetic measures of development and to build multi-component indicators, as well as objectified measures of economic phenomena (Dziekański, 2014a; Dziekański, 2013; Kik & Nalepka, 2016; Stasiak & Janiszewska, 2019) are relatively frequent. These solutions have both advantages and disadvantages. Nevertheless, the multi-criteria approach used in their assessment should be considered in terms of the strengths rather than the weaknesses of such solutions. This assertion is particularly relevant in assessing the financial situation of LGUs (Skoczylas, 2011). Several factors determine this. The first of them is the fact that the analysis of local government finances carried out with single measures can provide positive results assuming a lack of interaction between the studied parameters. Secondly, the use of a greater number of measures (in particular, the ones used to determine the same aspect of LGUs, e.g., financial independence) does not always improve the information value obtained. Often, these measures are correlated, as a result of which a greater number of measures of the same phenomenon do not translate into a greater knowledge of the financial situation in the LGUs (Kawa & Kaczmarczyk, 2012). Thirdly, the measures of the financial condition applied assume that all of the examined aspects have a significant influence over the condition of the local finances. This assumption is also not entirely correct (Stanny & Strzelczyk, 2015). It does not take into account the individual character of the surveyed units (including their division into urban communes, rural communes,

[1] Article 18, paragraph 2, point 6a of the Act of 8th March 1990 on Commune Self-government (Journal of Laws from 2019, item 506, consolidated text).

urban-rural communes, cities with poviat rights and metropolies), their diverse level of development, and thus — the starting point for the assessment (deterioration or improvement) of the local financial situation.

All of the arguments presented above prove that there is a need to look for new solutions to develop more effective methods of assessing the financial situation of LGUs (Mioduchowska-Jaroszewicz, 2013). Commonly used single measures describing the state of local finances seem to be a far from adequate way to meet the challenges posed by the market, and provide answers to the risk associated with access to new financial instruments, or launch early prevention measures to counter the escalation of negative phenomena appearing in the activities of some LGUs. The best evidence confirming the position presented above are the not so distant financial problems of the communes of Rewal, Dziwnów, Byczyna and Wałbrzych, for which regular financial statements and the standard type of supervision over financial management have proven to be ineffective in preventing incorrect decisions from being made in the sphere of public funds, which, as a consequence led to a crisis in LGUs finances. The most striking example of this is the special act liquidating the commune of Ostrowice[2].

1. Literature review

The justification presented above for the search for new solutions to assess the financial situation of LGUs draws attention to the implementation of new methods and approaches to the study of local government finances, often those which until recently were rarely used in the public sector. This is due to the fact that the terms 'efficiency', 'management' or 'optimization' have been permanently inscribed in the public finance system and are now synonymous with the regularity of public funds management.

The financial condition of LGUs is an extremely important issue. It determines the stability of local government, ensures the implementation of the tasks assigned to it and serves continuity in securing the collective needs of the local community (Sekuła, 2017; Sekuła & Śmiechowicz 2016). But what is the actual financial condition of LGUs? The answer to this question is provided by R. Berne's statement, according to which the financial condition of the local government unit is the probability that LGUs authorities will incur current and future financial obligations to lenders, consumers, employees, taxpayers, suppliers, voters and other institutions and units (Berne, 1996). The financial condition of the local government is described in a slightly different way by S.M. Groves, W.M. Godsey & M.A. Shulman (1981), and S.M. Groves, K. Nollenberger and M.G. Valente (2003), who indicate that their financial condition should be considered from the perspective of several components which describe the solvency of LGUs. These include cash solvency (the ability to generate the cash needed to maintain financial liquidity), budgetary solvency (the ability to generate the income needed to cover LGUs budget expenditure while minimizing the deficit), long-term solvency (the ability to pay long-term liabilities), and finally solvency regarding the scope of services provided by LGUs.

According to the Canadian Institute of Chartered Accountants, the financial condition of local government units should be assessed in three complementary dimensions. The first is sustainability, which means maintaining the prevailing LGUs activity without the need to increase current debt. The second dimension is vulnerability, which refers to the degree to which local government units can increase their financial resources through debt and income to

[2] Act of 5th July 2018 on special solutions regarding the Ostrowice commune in the West Pomeranian Voivodeship (Journal of Laws from 2018, item 1432).

meet the growing needs of the local community. Finally, the third dimension is created by flexibility which is defined as the degree of LGUs dependence on financial resources beyond its control[3].

The ambiguity of the presented term is reflected in the current terminological dissonance. R. Cabaleiro Casal, E.J. Buch Gómez & A. Vaamonde Liste (2014), similarly to W.C. Rivenbark & D.J. Roenigk (2011) use the term 'financial condition'. X. Wang, L. Dennis & Y.S. Tu (2007) operate with the term 'financial health', while F. Bastida, B. Benito & M.D. Guillamón (2009) use the term 'financial situation' to refer to research concerning the finances of local government units. Despite the indicated diversification of definitions, the idea of assessing the financial condition, financial health or financial situation of LGUs leads to an examination of the ability of LGUs to continuously (uninterruptedly) meet the collective needs of communities in a given area by providing services of a generally available nature. In this way we will define the financial situation of local government units in Poland[4] for the purposes of this article.

The assessment of the condition of local government finances requires a constant search for solutions to improve the scope and quality of information obtained while using them. In the literature, apart from the classic index assessment based on the standards of the Ministry of Finance (see: Hybel, 2010; Adamczyk & Dawidowicz, 2016), as well as the use of horizontal and vertical analyses of local government revenues and expenses (see: Mioduchowska-Jaroszewicz, 2013), experiments are being undertaken to implement new, more effective solutions in its assumption. In the study of local government finances, these attempts include the adaptation of the methodology used in the financial assessment of private sector enterprises (see: Maciejczyk, 2006; Staszel, 2016), using ratings as a tool of financial credibility (see: Czempas & Kobiński, 2014), applying taxonomic methods (see: Dziekanski, 2014b) and creating aggregate measures which describe the financial situation of local government units (see: Bień, 2017; Kata, 2012), as well as assessing the financial situation of LGUs using the scale of fiscal stress (see: Wójtowicz, 2014; Kloha, Weissert & Kleine, 2005).

Considering that the assessment of the financial condition of LGUs using a single indicator based on financial statements or other documents reporting the state of local finances is not only inadvisable, but even incorrect (this view is expressed by R. Cabaleiro-Casal, EJ Buch-Gómez, A. Vaamonde Liste (2012a, 2012b) and R. Hendrick (2004) among others - the state of the financial condition is multidimensional, the creation and testing of solutions assessing the finances of LGUs, which incorporate a number of measures regarding the financial situation of LGUs, becomes particularly important. The presented arguments justify the attention placed on the idea of synthetic measures for assessing local government finances. These measures allow for the inclusion in their structure of a whole set of variables describing the financial condition of LGUs, and also include a time series, instead of a single year which is commonly adopted in indicator analyses. Particular attention is paid to the TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution) method. TOPSIS is a multi-criteria decision-making method that was proposed in 1981 by C.L. Hwang & K. Yoon (1981). The method makes it possible to organize the examined entities according to an aggregated meter created on the basis of a prepared matrix. Its main idea is to evaluate the entity (e.g. local government unit) by measuring its Euclidean distance from an ideal and anti-ideal solution at

[3] Canadian Institute of Chartered Accountants (2009). Public Sector Statements of Recommended Practice (SORP) 4. Indicators of Financial Condition. CICA, Toronto, Canada. (https://www.cpastore.ca/Catalogue/ShowSampleToc.aspx?productID=1&spID=4&expID=191201915~1 Access 2019 12 28).

[4] Act of 20th December 1996 on Municipal Engineering (Journal of Laws from 2019, item 712, consolidated text).

the same time. The highest place in the ranking is occupied by this entity, which has the shortest distance from the ideal solution, and at the same time the largest distance from the anti-ideal solution.

The proposed tool would seem to be extremely intriguing, in particular with the assumption of a disjunctive approach to the study of all generic categories of LGUs at the local level, and thus taking into account and highlighting the differences between them (both in terms of financial potential and the specifics of external generic LGUs available to individual generic categories), and finally also in terms of the disparities in the ranges of values describing them for the financial results. It is important to point out that the TOPSIS method has, as yet, not been widely implemented in the assessment of LGUs finances. A review of the literature indicates that relatively few attempts have been made to undertake research dedicated to assessing LGUs finances using the TOPSIS method in Poland and at the same time their territorial scope is rather limited.

A. Majchrzak and J. Stanisławska (2009) have used this method in the assessment of the financial situation of poviats in the Lesser Poland Voivodeship, A. Standar (2017) used TOPSIS to study the financial state of all commune categories in the Greater Poland Voivodeship, while A. Bieniasz & Z. Gołoś (2015) used the TOPSIS methodology to study the financial condition of rural communes in the Greater Poland Voivodeship. A. Kozera, R. Głowicka-Wołoszyn & F. Wysocki (2016) and A. Kozera (2017) similarly to A. Bieniasz & Z. Gołoś, using the described method, have evaluated the financial situation of rural communes in the Greater Poland Voivodeship, and R. Głowicka-Wołoszyn (2016) applied it to identify spatial effects in assessing the financial condition of communes in the Greater Poland Voivodeship. Two other authors, P. Dziekański & A. Lipa (2019), using the TOPSIS method, examined the financial situation of rural communes and the level of their income in the Holy Cross voivodeship. In another work by P. Dziekański & P. Wiraszek (2018), the income situation of cities with poviat rights located in regions of Eastern Poland was analyzed with the use of the TOPSIS methodology.

As indicated above, the use of the TOPSIS methodology in the national assessment of the finances of LGUs is relatively rare. On a national scale, this method was used in the assessment of LGUs finances in only three cases. In the first of them, A. Kozera (2018) assessed the financial independence of Polish metropolies. Subsequently, R. Głowicka-Wołoszyn & Ł. Satoła (2018) examined the financial independence of all rural communes in Poland using the TOPSIS approach. Finally, in just one work, the method described above was used to assess the financial situation of all types of commune categories in the country. The authors of this study were A. Bieniasz, Z. Gołaś & A. Łuczak (2013).

An analysis of the literature on the subject shows significant, undeveloped potential in assessing LGUs finances using the TOPSIS method. This view has been confirmed by e.g. J. Olejniczak (2019). The research attempts undertaken thus far have had a spatially and temporally limited range, and only refer to selected types of LGUs, also, they are often limited to the borders of only one voivodeship. Due to the fact that only one nationwide study to assess the financial situation of LGUs has been identified that makes use of the TOPSIS methodology, it should be thoroughly justifiable to conduct an empirical analysis referring to the population of local government units at the municipal level in the country, taking into account the LGUs typology corresponding to the nomenclature of the Central Statistical Office (GUS). In the proposed study (in contrast to previous approaches), metropolises will be separated so that the obtained result is reliable and not prejudiced by the results of a small group of the largest cities in Poland. The results received will allow for a multidimensional analysis of the financial situation of individual categories of local government units throughout the country, and due to

the planned time horizon to be covered by the study over several years, will fully objectify the assessment of the financial situation of LGUs in each category of generic communes separately.

2. Data and method

In order to assess the financial condition of local government units (LGU), a set of indicators provided by the Ministry of Finance in Poland was used[5]. As was mentioned by E. Malinowska-Misiąg (2018) most analyses of the financial situation of LGUs in Poland are based on these indicators. Data were obtained from reports concerning the implementation of LGUs budgets, which were prepared on the basis of ordinances of the Minister of Finance[6]. The financial condition of LGUs was analyzed for the following groups: rural municipalities, urban municipalities, rural-urban municipalities, cities with poviat rights (excluding metropolises). The research sample consisted of 2,478 local government units, including 236 urban municipalities, 1,555 rural municipalities, 621 rural-urban municipalities and 54 cities with poviat rights.

Table 1. Ratios included in the study of the financial condition of LGUs developed by the Ministry of Finance

	Name of the indicator
	Budget indicators (in %)
R_{B1}	Percentage of current income in total income
R_{B2}	Percentage of own revenues in total income
R_{B3}	Percentage of operating surplus in total income
R_{B4}	Percentage of property expenditures in total expenditures
R_{B5}	Percentage of remuneration and other expenses in current expenses
R_{B6}	Percentage of operating surplus and income from the sale of assets in total income
R_{B7}	Self-financing ratio calculated as a percentage of property income and operating surplus in property expenditures
	Per capita indicators (in PLN)
R_{P1}	Current transfers (general subsidy and current subsidies) per capita in PLN
R_{P2}	Operating surplus per capita in PLN
R_{P3}	Total liabilities per capita in PLN
	Liabilities by debt title indicators (in %)
R_{L1}	Percentage of total liabilities in total income
R_{L2}	Percentage of debt service (repayment of principal and interest instalments on loans and borrowings) in total income
R_{L3}	Percentage of debt service (repayment of principal and interest instalments on loans and borrowings) in own income
R_{L4}	Percentage of liabilities due in total liabilities

Source: own elaboration based on Ministry of Finance data (https://www.gov.pl/web/finanse/wskazniki-do-oceny-sytuacji-finansowej-jednostek-samorzadu-terytorialnego-w-latach-2015---2017 Access 2019.09.12).

[5] Ministry of Finance (2018). Wskaźniki do oceny sytuacji finansowej jednostek samorządu terytorialnego w latach 2015-2017. https://finanse-arch.mf.gov.pl (Access 2019.09.12).

[6] Regulation of the Ministry of Development and Finance of 9th January 2018 on budget reporting (Journal of Laws from 2019, item 1393, consolidated text, as amended) and Regulation of 4th March 2010 on reports of public finance sector entities in the field of financial operations (Journal of Laws from 2014, item 1773, consolidated text).

After selecting the indicators that describe the financial condition of LGUs, the TOPSIS method was used to develop an aggregated synthetic metric. The calculation procedure consists of four main steps (Perło & Roszkowska, 2017):

1. The creation of a normalized data matrix according to the following formulas, which consider the nature of the indicator:
   - for stimulants (the higher the value of the indicator the better):

$$z_{ij} = \frac{x_{ij} - \{x_{ij}\}}{\{x_{ij}\} - \{x_{ij}\}} \quad (1)$$

   - for destimulants (the lower the value of the indicator the better):

$$z_{ij} = \frac{\{x_{ij}\} - x_{ij}}{\{x_{ij}\} - \{x_{ij}\}} \quad (2)$$

   - for nominants (the value is a stimulant to a certain point, known as the nominal value, and later it becomes a destimulant):

$$z_{ij} = \frac{x_{ij} - \{x_{ij}\}}{nom\{x_{ij}\} - \{x_{ij}\}}, x_{ij} \leq nom\{x_{ij}\} \quad (3)$$

$$z_{ij} = \frac{\{x_{ij}\} - x_{ij}}{\{x_{ij}\} - nom\{x_{ij}\}}, x_{ij} > nom\{x_{ij}\} \quad (4)$$

Where:
z_{ij} – normalized value of the indicator,
$\{x_{ij}\}$ - the maximum value of the *J* - indicator,
$\{x_{ij}\}$ - the minimum value of the *J* – indicator,
$nom\{x_{ij}\}$ - the nominal value of the *J* - indicator.

2. Calculation of the weighted normalized values. This step was omitted because each indicator was considered to have an identical weight.
3. The calculation of the Euclidean distance of each LGU from the ideal solution a^+ and negative-ideal solution a^-:

$$d_i^+ = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - a_j^+\right)^2} \qquad where\ i = 1,2,\dots,m\ and\ j = 1,2,\dots,30. \quad (5)$$

$$d_i^- = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - a_j^-\right)^2} \qquad where\ i = 1,2,\dots,m\ and\ j = 1,2,\dots,30. \quad (6)$$

4. The calculation of the value of the synthetic measure indicating the similarity of entities to the ideal solution:

$$r_i = \frac{d_i^-}{d_i^+ + d_i^-} \qquad where\ i = 1,2,\dots,m\ and\ j = 1,2,\dots,30. \quad (7)$$

It is noteworthy that $0 \leq SM \leq 1$. According to the concept of the TOPSIS methodology, the highest value of a synthetic measure indicates the best financial condition of the entity in a given research period (Balcerzak, 2020; Korzeb & Niedziółka, 2020; Azizi, 2017). The stages

of the aggregate metric construction are presented in Table 2. The matrix which was finally developed contained the average values of ten indicators estimated on the basis of data for the period 2015-2017 for individual local government units. All ratios included in the matrix were considered to be equally important.

Table 2. Stages of the construction of a synthetic measure of the financial condition of local government units

	Stage	Description
I	Creating a matrix: a selection of the features describing the financial condition of LGU's	After the elimination of closely correlated indicators, 10 were included in the matrix: six from the budget group (R_{B1}, R_{B2}, R_{B3}, R_{B4}, R_{B5}, R_{B7}) and three debt ratios (R_{L1}, R_{L2}, R_{L3}, R_{L4}). Indicator R_{P1} was excluded due to its close correlation with R_{B2}, R_{P2} with R_{B6} and R_{B3}, R_{P3} with R_{L2}, R_{B6} with R_{B3} and R_{L3}, R_{L3} with R_{L5}.
II	Standardization of features	The zero-unitarization method was used, which made it possible to transform the destimulant (R_{B5}, R_{L1}, R_{L2}, R_{L3} R_{L4} indicators) and nominant (R_{B7}) to the form of stimulant, and make their values comparable.
III	Synthetic indicator estimation	The calculation of the Euclidean distance of each assessed entity from the ideal (d +) and anti-ideal (d-) solutions. In the case of the zero-unitarization method - from 1 and 0. Estimate the value of the synthetic metric by comparing the distance from the anti-ideal solution to the sum of both distances.

Source: own elaboration based on Hwang, C.-L., Yoon, K. (1981). Multiple Attribute Decision Making. Lecture Notes in Economics and Mathematical Systems 186, Springer-Verlag, New York. DOI: 10.1007/978-3-642-48318-9; Shih, H.-S., Shyur, H.-J., Lee, E.S., (2007). An extension of TOPSIS for group decision making, Mathematical and Computer Modelling, 45 (7-8), 801-813. DOI: 10.1016/j.mcm.2006.03.023.

The aggregated synthetic metric allowed for the segregation of local government units into those with a very good financial condition and those threatened with bankruptcy. According to Polish legislation, no entity is permitted to declare bankruptcy against a local government unit[7]. The indebted entity may, however, be liquidated physically by connecting its areas to neighbouring units, which indicates the importance of the ongoing monitoring of its financial condition. Due to the value of the aggregate measure, the analysed local government units were included in one of four groups defining the level of their financial condition as: very good, good, medium and low. The criterion for classifying the unit into a given category was the value of the synthetic measure and its standard deviation. LGUs were divided into 4 groups in accordance with the formula:

- Group I (very high): $r_i \geq \underline{r} + s$
- Group II (high): $\underline{r} + s > r_i \geq \underline{r}$
- Group III (medium): $\underline{r} > r_i \geq \underline{r} - s$
- Group IV (low): $r_i < \underline{r} - s$

The linear ordering of LGUs, due to the value of the synthetic measure of the financial condition and the division of LGUs into four groups have enabled the authors to derive valuable conclusions that were presented in the last section of the paper.

[7] The Bankruptcy Law of 28th February 2003, article 6. (Journal of Laws from 2003, No. 60, item 535).

3. Research results

Table 3 presents the values of selected statistics describing the indicators for assessing the financial situation of local government units, which were adopted to calculate the indicator of their financial condition. The values presented in the table were calculated on the basis of the arithmetic mean of these indicators for three years (2015, 2016 and 2017) and for individual municipalities.

The following were used to present the shaping of indicators: arithmetic mean, median, minimum value, maximum value, value of the first and third quartiles, standard deviation, coefficient of variation, and the minimum and maximum limit of a typical variation range. Six of the budget indicators and all liabilities by debt title indicators suggested by the Ministry of Finance were selected for the research. The budget indicators may be used to assess the budgetary performance of the examined local government unit and its flexibility in terms of income and expenditure as well as debt capacity (Kopyściański & Rólczyński, 2014).

R_{B1} indicator - reflects the share, and thus the importance of the current income in total income. The higher the level of this indicator, the greater the potential for the implementation of tasks by the communes (Bieniasz, Gołaś & Łuczak, 2013). The analysis of the value of this indicator among the examined communes in the chosen period showed that its average value was over 94%, with a minimum of about 60%, and the maximum value almost close to one. The typical range of variation, i.e. the area in which about 2/3 of all values of the examined feature for the units of the studied population are located, was within eight percentage points for this indicator. This may prove that local government units use property income to a relatively small extent.

The R_{B2} indicator - share of own income in total income, presents a picture of the independence of a given commune from external financing. It assesses the financial independence of the unit. Own income is characterized by the following features: it comes from sources located in the area of a given local government, it is made available to it in full and indefinitely by virtue of the law (Denek, Sobiech & Wolniak, 2001). Obtaining own income, however, depends on many factors, the most important of which are the level of economic development of the commune and the economic activity of the population. A high level of this indicator shows great potential as a method for managing own revenues, while lower levels of the indicator prove that the entity is more dependent on transfers from the state budget. An analysis of the value of this indicator among the examined communes and within the analyzed period showed that communes are significantly dependent for their activities on external financing. The average value of the indicator in the analyzed period reached almost 40%, with a minimum of around 15% and a maximum close to 95%. The typical range of variability of the value of this indicator was between 26% and 53%. It should be noted that the low share of own income in total income indicates the low development potential of a given local government unit. On the one hand, there is the inability to finance investment tasks from own resources, and on the other, there is no possibility of debt financing, due to the limited debt capacity and debt service capacity.

R_{B3} indicator - the share of the operating surplus in total income presents an overview of the ratio of difference between current income and current expenditure in relation to the total income of local government units. It reflects the potential capacity and possibilities of local government units to repay liabilities and to finance investment expenditure. It also describes the degree to which the entity could incur new liabilities in relation to earnings. The higher the value of this ratio, the greater the investment possibilities or the greater the possibility of increasing current expenses (Skoczylas, 2016). A negative value of the indicator means that a local government unit does not generate an operating surplus. The average value of the analyzed

indicator for all analyzed communes was close to the median, both values oscillated at around 9%. The minimum level below zero proves that some communes achieved a lower current income in relation to current expenses, which indicates that these units did not generate an operating surplus, and therefore did not have the capacity to implement investments.

R_{B4} indicator - as a typical structure indicator - reflects the share of capital expenditure in total expenditure. It presents an overview of how a given unit develops and reflects its investment activity (Skoczylas, 2016). The average value and median of this indicator amounted to approximately 13%. However, there are communes that perform very weakly in terms of the share of property expenditure in total expenditure. In the case of some of them, this share was below 1%, but at the same time, in the case of some of the surveyed LGUs, the analyzed ratio exceeded 40%. Properly targeted investments can generate an additional current income in the future, and hence, they can act as a driving force for the local economy. A higher level of commune development is a factor attracting external investors, which in turn generates additional jobs and increases the tax base. The higher the levels of this indicator, the better the situation of the commune.

R_{B5} indicator - reflects the amount of current expenses of local government units with employment-related expenses. The analysis showed that for the surveyed LGUs, the values of this ratio were 38.93% and 44.55%. Expenses connected to salaries should be treated as so-called "fixed expenses". LGUs have rather weak abilities to limit them, which suggests that the level of this indicator will provide information about the “budget stiffness”. In the local government units surveyed, a large part of the expenditure is fixed.

R_{B7} ratio - reflects the degree of financing the investment with the entity's own funds. It is the ratio of the sum of the operating surplus and property income to property expenditure. The value of this indicator shows the ability of local government units to self-finance investments. The higher this ratio, the lower the risk of losing financial liquidity due to excessive debt servicing costs. On the other hand, however, the high value of the index may indicate a low level of investment in relation to one's own abilities. The specificity of the indicator means that it is not possible to clearly indicate for all units one universal and optimal range within which its value should be shaped. This indicator is therefore highly individualized. RB7, in the case of the analyzed communes, was characterized by the greatest degree of variability. The first differences occurred in comparing the arithmetic mean and the median, the values of which were significantly different. The second characteristic feature is the huge range of the data, i.e. the difference between the minimum and maximum value of the indicator. It should be mentioned that the maximum value indicated in Table 3 was not adopted for the calculation of the financial stability index, as the value for the Rewal commune significantly exceeded the index values for other communes and this distorted the results.

The second group of indicators adopted for the analysis of the financial condition of local government units are liabilities by debt title indicators. Four of the indicators analyzed provide an overview of the general profile of local government units in terms of the demand for debt financing. as well as the scale of debt of subsidiaries (Kopyściański & Rólczyński. 2014).

The R_{L1} ratio determines the share of total liabilities in the total revenue of local government units. The level of this indicator ranged from zero to slightly over 400%. with the arithmetic mean at a level of about 20% and a median value of about 22%. The level of this indicator shows very different municipal strategies in the field of debt management. Some of them have no liabilities. for 75% of the communes this indicator is lower than 33%. but there are those where the liabilities are four times higher than the total income. Of course. communes that do not incur liabilities do not have to bear the costs related to their service. but the legitimacy of such a procedure should be related to the development needs of a given local government unit and the manner of performing the assigned local government services should

be assessed. For if the inhabitants of the commune experience shortcomings in terms of the necessary infrastructure or broadly understood public services. the application of the policy of not incurring obligations should be considered a mistake. It is impossible to positively assess the situation in which the lack of commitments is accompanied by problems with the level of implementation of the tasks for their benefit that is satisfactory for the residents. Despite the lack of own funds. the commune can afford to obtain these funds from outside sources. the regulations allow it. and thus increase its possibilities.

Table 3. Value of indicators for the assessment of the financial situation of local government units adopted for the calculation of the synthetic indicator (%)

No	RB1	RB2	RB3	RB4	RB5	RB7	RL1	RL2	RL3	RL4
Mean	94.34	39.94	9.23	13.18	41.54	242.03	24.03	4.80	13.23	0.49
Median	95.17	38.04	8.81	12.58	41.79	126.87	22.05	4.48	11.34	0.00
Minimum	59.95	14.62	-34.08	0.30	13.70	-122.93	0.00	0.00	0.00	0.00
Maximum	99.88	94.85	38.15	39.87	55.66	223263.89[a]	401.24	78.85	97.06	66.67
First quartile	92.70	29.16	6.53	9.29	38.93	106.41	12.65	3.07	7.41	0.00
Third quartile	96.86	49.49	11.49	16.32	44.55	159.37	32.95	6.03	17.36	0.00
Standard deviation	3.71	13.39	4.32	5.50	4.37	4485.95	17.26	3.11	9.05	3.32
Variation coefficient	3.93	33.53	46.81	41.69	10.52	1853.43	71.84	64.70	68.39	680.22
Typical range of variation min	90.63	26.55	4.91	7.69	37.17	-4243.92	6.77	1.69	4.18	-2.83
Typical range of variation max	98.04	53.33	13.55	18.68	45.91	4727.99	41.29	7.91	22.28	3.81

[a] Maximum applies to the Rewal commune. Due to the fact that this value differed significantly from the others. it was excluded from the calculation of the synthetic indicator.

Source: own elaboration.

The R_{L2} ratio is calculated according to the following formula - the sum of interest on credits and loans and the repayment of principal installments on credits and loans in relation to total income. The vast majority of communes set the value of this indicator at a level of a few percent. Despite this. there are also local government units in which the interest on credits and loans taken as well as the repayment of principal installments on credits and loans taken account for almost 80% of the total income. When planning debt policy. each commune should consider whether it will be able to pay off its liabilities in the future. The value of the R_{L2} ratio in the surveyed communes shows that for most of them. the payment of interest on loans and borrowings and the repayment of capital installments on loans and borrowings is not a great burden for them. but there is also a large group that must donate a large part of their total income to financial institutions.

The R_{L1} and R_{L2} ratios indicate the degree of debt burden on the units. Until 2014. there were strict debt limits in Poland. which could not exceed 60% of budget revenues. Currently

municipalities have to follow the individual debt ratio. The standard regulating the limitation of local government debt is based on an individualized approach to calculating the permissible level of debt of local governments. The permissible level of indebtedness of local government units is determined by the relationship between the amount of debt being serviced and funds that. in the opinion of the legislator. can be used for its repayment. i.e. this refers primarily to the operating surplus from the past three years[8].

The R_{L3} ratio describes the debt service burden on own income. For most of the surveyed communes. the value of this indicator did not exceed 12%. but there were also units where debt service was almost equal to own income. The higher the value of this indicator. the greater the risk of local government unit insolvency[9].

The R_{L4} ratio is calculated as the ratio of liabilities due to total liabilities. If the RL4 ratio is higher than zero. it means that the payments are delayed. The greater the value. the greater the scale of this phenomenon. The vast majority of Polish municipalities did not experience any liquidity problems in the analyzed period and did not have any outstanding liabilities. but it should be acknowledged that a consequence of the unfavourable financial situation of local government units may be the lack of financial liquidity. which will result in the delayed payment of liabilities.

The abovementioned coefficients were used to calculate the aggregated metric of the synthetic financial stability of the commune. Polish communes were divided into four groups depending on the value of the synthetic indicator. these groups may be described as follows:

- 1st group - very high. the range of the commune's financial stability index varies between 0.673 and 0.911.
- 2nd group – high. the value of the synthetic measure varies between 0.638 and 0.672.
- 3rd group – medium. the value of the synthetic measure varies between 0.603 and 0.638.
- 4th group – low. the value of the synthetic measure varies between 0.472 and 0.603.

The calculated values of the synthetic metric ranged from 0.472 to 0.911. The lowest level of the measure was calculated for the rural commune of Rewal. Located near the Baltic Sea. Rewal is a very good example of the failure of Polish regulations concerning local government finances. For many years. the commune was considered to be a role model. it won many national rankings. which focused on such aspects as investment activity. A small commune with a population of about a thousand inhabitants. it spent EU funds and incurred debts on subsequent investments and. as a result of several years of such a financial policy. the debts of the unit reached a value three times greater than the total amount of its budget. This situation overlapped with the period covered by the analysis. which explains the fact that this LGU occupied the last place in Poland in terms of financial stability.

At the other extreme. there is the Kleszczów commune located in the Łódź Province. This commune ranks first in the ranking of the richest communes in Poland. and the total sum of incomes per capita is the highest in the country as it is about ten times higher than the national average. The reason for this is the high revenues from the real estate tax and operating fees resulting from the location of the Bełchatów Brown Coal Mine in the commune and the largest lignite-fired power station in Poland and Europe - Bełchatów Power Station.

Table 4 presents the results of analyses concerning the financial stability of local government units depending on the type of commune. In the first group. i.e. the most financially stable one accounted for almost 14% of Polish municipalities. slightly less than 31% were

[8] Act of 30 June 2005 on public finances (Journal of Laws No. 249, item 2104, as amended), Art. 169-170, the Act of 27 August 2009 on Public Finance (Journal of Laws of 2013, item 885, as amended), Art. 242 and 243.

[9] Ministry of Finance (2018). Indicators for assessing the financial situation of local government units in 2015-2017. https://finanse-arch.mf.gov.pl (Access 2019.08.10), p. 9.

qualified to join the second group. i.e. local government units with favourable financial stability. the third group (with average financial stability) comprised slightly more than 43% of units. while poor financial stability characterized slightly more than 12% of the surveyed local governments.

Table 4. Financial stability of communes depending on the type of commune

Group	Type of commune				Total
	CPR	UC	RC	URC	
1st group – very high	6 (11.1%)	60 (25.4%)	173 (11.1%)	99 (15.9%)	338 (13.7%)
2nd group - high	26 (48.1%)	127 (53.8%)	367 (23.6%)	239 (38.5%)	759 (30.8%)
3rd group - medium	20 (37.0%)	45 (19.1%)	761 (48.9%)	241 (38.8%)	1067 (43.3%)
4th group - low	2 (3.7%)	4 (1.7%)	254 (16.3%)	42 (6.8%)	302 (12.2%)
Total	54 (100.0%)	236 (100.0%)	1555 (100.0%)	621 (100.0%)	2466 (100.0%)

where: CPR – cities with poviat rights, UC – urban commune, RC – rural commune, URC – urban-rural commune
Source: *own elaboration.*

For the purposes of this analysis. four types of communes were taken into account: cities with poviat rights. urban communes. rural communes and urban-rural communes. Obviously. for an absolute analysis. i.e. which type of commune is the most numerous in particular groups of the synthetic indicator simply would not make sense. because over 60% of the communes in Poland are rural communes. therefore the relative values were used. As mentioned previously. almost 14% of the units were included in the 1st group of communes with very favourable financial stability. however. among urban communes and urban-rural communes. the percentage of entities belonging to this group was definitely. in the case of urban communes. and in the case of urban-rural communes slightly higher than in the case of all local government units. In the group of communes with favourable financial stability. only among rural communes was a share of the communes in this group lower than the average.

Predictably, for groups III and IV, i.e. those representing moderate and bad financial stability, the situation was diametrically different. Rural communes dominate in these groups. Indeed, only this type of commune has a greater share of units from this group than the average for the entire population.

An analysis of the data contained in the table above clearly shows that urban and urban-rural communes are characterized by the greatest financial stability. Particularly noteworthy is the fact that among urban communes, the synthetic index was calculated to be over 98% of units at a level that guarantees a place in a group with at least average financial stability.

The findings above served as an inspiration to examine whether there is a relationship between the type of commune and the category of financial stability of the local government units. In order to test the relationship between the abovementioned variables, a chi-square test of independence was used. This test examines the independence of variables. If $p < 0.05$, then there is a relationship between the variables, the difference is statistically significant (we reject the null hypothesis). If $p > 0.05$, there is no relationship between the studied variables, the difference is not statistically significant (so there is no reason to reject the null hypothesis). The

chi-square test analysis showed that there is a relationship between the variables: commune type and financial stability group. The asymptotic significance was 0.000 for N = 2466 of valid observations. The chi-square test examines whether there is a relationship between the variables, it does not measure the strength of the relationship, therefore, in order to test the latter feature, the contingency coefficient was used, the level of which was 0.29. Such a value of the index shows that the strength of the relationship between the variables should be defined as moderate.

In the next step, it was decided to investigate the relationship between the category of financial stability to which a given commune was classified and the commune's location in a specific voivodeship. The analysis with the chi-square test showed the existence of such a relationship, and the contingency coefficient calculated for this relationship was equal to 0.345, which again proves the moderate strength of the relationship.

The findings outlined above prompted a deeper analysis of the relationship between the location and the financial stability group. First, the average financial stability index for each voivodship was calculated. It was calculated in such a way that the financial stability indicators of all communes of a given voivodship were summarized, and then divided by the number of communes in this area. The next step was to calculate the structure of the municipal financial stability groups for each province separately. The results of these analyses are presented in Figure 1.

The highest average financial independence index was achieved by communes in the Lower Silesia Voivodeship (0.6607). In this voivodship, the highest share of communes with a very favourable level of financial stability (30.4%) and a very high share of communes with favourable financial stability (40.5%) were observed among all voivodships. Communes from the Greater Poland Voivodeship (0.6493) took valuable places. Six voivodships were placed with a very similar average financial stability index: Lubusz, Pomerania, Kujavia-Pomerania, Silesia, West Pomerania and Łódź Province. For these voivodships, the indicator ranged from 0.6467 for Lubusz to 0.6401 for Łódź.

The following voivodeships were placed in the last positions: Lesser Poland, Subcarpathia and Holy Cross, where the index ranged from 0.6276 for the former to 0.6229 for the latter. The communes in the Lublin Voivodship were even worse, in this location the average indicator was calculated at a level of 0.6128. The last place of this voivodeship is not surprising. In its structure, it has the smallest share of municipalities from the two best financial stability groups and the highest share of municipalities from the fourth group with the poorest financial stability of all sixteen Polish voivodeships.

The analysis of the relationship between belonging to a specific financial stability group and the location in a specific voivodeship showed that the voivodeship in which a commune is located affects which group it belongs to. The worst situation is in south-eastern Poland, i.e. in the following voivodeships: Lublin, Holy Cross, Subcarpathia and Lesser Poland. In these voivodships, the share of communes with poor financial stability belonging to the fourth group exceeds twenty percent. Two thirds of communes from these voivodships, or even more, belong to the two worst groups in terms of financial stability. In the case of the Lublin Voivodeship, it is almost eighty percent of communes.

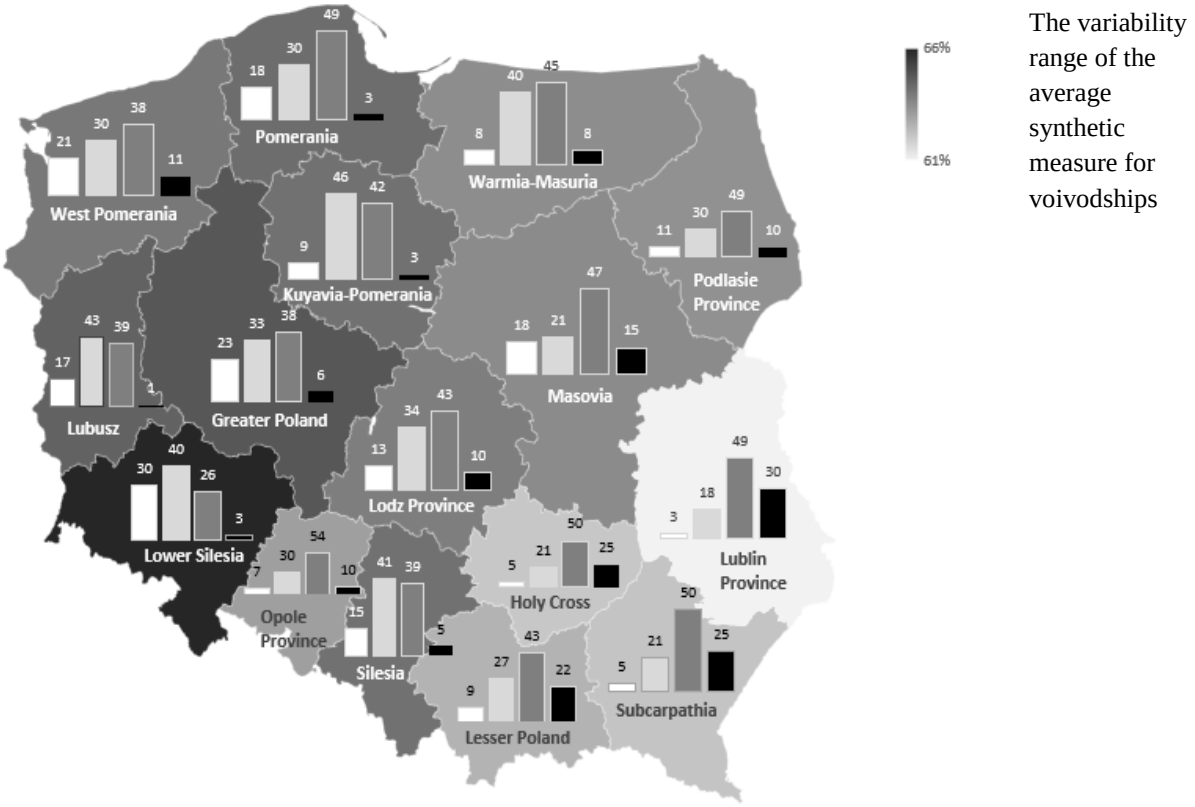

Figure 1. The level of the average financial stability index of communes in voivodships and the share of communes from individual financial stability categories by voivodship
Source: *own elaboration.*

Discussion

The task of examining the financial stability of local government units and generating a comparison with this measure using the TOPSIS methodology is relatively often undertaken by scientists. A. Bieniasz, Z. Gołaś & A. Łuczak (2013) analyzed the financial stability of rural communes. Although they indicated that financial stability did not significantly differentiate between the types of communes, it was the lowest for rural communes. The second statement agrees with the conclusions obtained in the study as described by the authors of this article, however, this study shows that there is a medium-strength relationship between the type of commune and the group which determines financial stability. On the other hand, A. Standar (2017) draws attention to the fact that the municipalities with the best financial conditions are characterized by the highest levels of indicators used to assess the financial condition of local government units. According to the author, this includes municipalities benefiting from the so-called 'agglomeration effect' (located in the vicinity of cities), or the so-called 'raw material communes', deriving tax revenues from the service fee, as well as from CIT and PIT. The author also points to the existing relationship between the group indicating financial condition and the type of commune, however, he only analyzes communes from the Greater Poland Voivodeship. In particular, the last part of A. Standar's research would seem to confirm the results of the authors' research, where the highest level of financial stability was calculated for the Kleszczów commune, a typical commune with raw materials.

R. Głowicka-Wołoszyn & Ł. Satoła (2018) also point to the location of the commune as one of the most important factors influencing its financial stability. The location near a large city or the possession of raw materials on its territory determines higher tax revenues, and thus provides greater investment opportunities. Empirical research conducted by A. Kozera (2018) shows that cities with poviat rights characterized by the highest level of income potential, and thus financial stability are distinguished by a high demographic and economic potential. This statement is somewhat contradictory to the results of the research conducted in this article, but this may be due to the fact that the author only analyzed the financial independence of Polish metropolises, and this resulted in an interpretation detached from other types of municipalities.

P. Dziekański & A. Lipa (2019) used the communes of the Holy Cross Voivodeship in their research. They drew attention to the importance of stimulus for financial stability, in particular, a location near the capital of the voivodeship, mining industry, mineral resources, developed agritourism and conversely, destimulants - a peripheral location, traditional agricultural functions of the commune. The results of the research conducted by P. Dziekański and A. Lipa are in agreement with the findings of other authors, despite the fact that they took into account one of the poorest and least developed provinces. Finally, R. Głowicka-Wołoszyn (2016), by analyzing the communes of the Greater Poland Voivodeship, proves that the best financial stability is characteristic of urban communes, including 40% of all municipal communes in this voivodeship in the best group. These results confirm what has been presented in this study.

The analysis of the available literature on the subject and the research presented in it show unequivocally that the study prepared by the authors is unique. Despite the fact that the examination of the financial stability of local government units with the research methods used are performed relatively often, to date, none of the authors has attempted such a wide scope of research covering three consecutive years and such a large research sample consisting of 54 cities with poviat rights, 236 urban communes, 1,555 rural communes and 621 urban-rural communes. The results of the research presented by the authors largely coincide with the results of other authors, but they offer the potential of a much greater degree of generalization, on the basis of which, one may with almost absolute confidence express opinions about the financial stability of individual types of communes. This was the main goal set by the authors of this study.

Conclusions

The research allows us to formulate some valuable conclusions whose importance is not only empirical but also practical. Studies have shown a relatively low use of property income by communes and confirmed the financing of their activities mainly from current revenue. This solution should be considered as a good strategy, but only in the short run. In the long run, the diversification of sources of revenue is advisable, especially in the face of insufficient amounts of transfers from the central budget required to finance commissioned tasks. The search for solutions facilitating the deepening of the diversification of sources of budget revenues is a key issue from the perspective of the activities of LGUs. This is evidenced by the fact that the share of own revenues in total revenues of communes indicates that they are significantly dependent on financing from the central budget. Considering the constant underestimation of the costs of implementing outsourced tasks as well as a lack of reforms in the local government finance system, alternative sources of budget revenues should increasingly be attracting the attention of local authorities. Moreover, the low share of own revenue in total revenue reduces the development potential of communes. The unfavourable financial situation is exacerbated by the

fact that examined local governments did not generate an operating surplus, which further reduced their potential to initiate and implement investment activity.

The findings presented above correspond to the results of the analyses of LGUs expenditure. The average share of current expenditures in total expenditures was 87%. This means that on average, about 13% of the funds spent were allocated to investments. This value is not sufficient even from the perspective of replacement investments. At the same time, the share of expenses related to employment in current expenses oscillated between 38.93% and 44.55%. Due to the relatively rare attempts to assess the effectiveness of local government structures (the regulations do not impose such requirements on LGUs), the hypothesis that the reduction of employment in local government administration could take place without adversely affecting the scope and quality of tasks performed cannot be rejected. Such a solution would open up the field for the reorganization of the expenditure structure towards increasing capital expenditure, which plays the role of a driving factor in economic development.

Research concerning local government finances also highlighted large discrepancies in debt management policies. In particular, the research did not confirm the thesis that a safe level of debt concerns communes with a stable financial situation and a high level of development. In the case of poor and underdeveloped communes, there are two possible scenarios, the verification of which requires further in-depth studies and analyses. The first one suggests that underdeveloped LGUs attempt to stimulate economic development by financing it with debt instruments. However, improperly chosen investment goals do not translate into development. Thus, a kind of "development trap" is created, which is accompanied by a significant debt burden and the accompanying expenses for its servicing. The second view suggests that financially weaker LGUs do not develop because there is no incentive in the form of investments stimulating their development. This is due to the fact that their current financial position limits and sometimes blocks their ability to opt for debt financing, they are trapped at their current level of development and deprived of the opportunity to undertake initiatives aimed at stimulating it.

The three dimensions presented above, describing the financial situation of local government units (income, expenditure and debt) combined with the research methodology used, resulted in the creation of new value in the assessment of the studied issue. The analysis of the relationship between the commune's location in the voivodship and its membership in the financial stability group is a unique, previously undiscovered relationship. It proves that communes located in different parts of the country are ‘by definition’ doomed to success or stagnation. The analysis carried out in this study proved that the traditional division of Poland into the rich west and poor east is also justified in the case of the financial condition of the communes, it may be observed that communes from the west of Poland are characterized by the higher level of their financial condition.

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