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COMPARISON OF SELECTED METHODS FOR PERFORMANCE EVALUATION OF CZECH AND SLOVAK COMMERCIAL BANKS

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Abstract. The successful development of economy is based on the efficient and stable performance of commercial banks. A broad range of methods is used to evaluate them. Each method has its own specific features and logic, which results in the existence of discrepancies in the results of their evaluation. For this reason, as well as due to the elimination of model risk, numerous methods are recommended in practice to detect multidimensional disproportions in bank performance and to create a comparator base. This led to the realization of the research aimed at assessing the performance of selected Czech and Slovak banks by applying several methods and evaluating the process and outcome differences of these methods. The data were obtained from the non-consolidated financial statements published in the annual reports of the evaluated banks. The analysis showed that all methods have roughly the same results. Almost perfect correlation had been found not only among the methods of multi-criteria evaluation, but also among the other investigators.

Keywords: banking sector performance, multi-criteria methods, banking sector stability, rating criteria, bank ranking, bank performance index, MCDA methods.

JEL Classification: C44, G21, L25.

Introduction

In recent years, the issue of rating banks has gained significantly in terms of performance. The changes in the economic systems that caused globalization processes as well as the effects of the global economic crisis represent the main reason (Simionescu *et al.* 2017). Despite the decades-long development of various methods and methodologies, the process of evaluating the banking sector is still problematic (see Svitálková 2014). The primary reason is the heterogeneity of banking systems, the dynamics of the

environment, the incompatible data base, legislative and other constraints in the country (Burianová, Paulík 2014; Olszak *et al.* 2016). Strong pressures led to an increase of performance, efficiency and quality in companies, and to revelation of the dimensions that affect performance and efficiency. Significant heterogeneity of processes in institutions determined by the nature of the institution, its mission, focus, and others complicates the setting up of a unified platform of measurement systems, allowing comparisons of institutions in terms of their performance across different sectors (Konovalova *et al.* 2016). In case of banking institutions, the issue is similar. Performance of individual banks depends on several parameters, their integrity (Kubiszewska 2017; Paulík *et al.* 2015). In many cases, it is not possible to compare all criteria on a comparable basis, at the same value range. Integrating financial and non-financial indicators with the aim of creating a unified, comparable benchmarking system for banks makes it difficult to evaluate the performance evaluation process. Most of the authors use traditional ratios to assess the performance of banks (e.g. Kumbirai, Webb 2010; Said, Tumin 2011; Bičo, Ganić 2012). The most commonly used indicators include return on assets and return on equity, liquidity, loan portfolio quality, cost, balance sheet structure, capital adequacy, etc. Their disadvantage is the complicated comparability of bank entities due to their different characteristics (size, specialization, etc.) as well as significant differentiation of results, making it difficult to create reference comparable groups (Sinicakova *et al.* 2017).

Therefore, the main focus of the research was put on a deeper exploration of the performance assessment of commercial banks in order to explore the current approaches and their limitations and, in the application level, to evaluate the suitability of the available methodologies and their development potential. The aim of the research was to evaluate the performance of the Czech and Slovak commercial banks in 2015 by applying selected methods and to evaluate the process and result differences of these methods. The research sample was made up of 22 Czech and Slovak universal banks with the exact specifications specified in the methodological section. The results of analyzes provide a valuable platform for follow-up research and for economic policy makers.

1. Banking performance assessment in the cross-cutting research framework

When examining a wide range of studies in order to capture significant methodological lines in individual concepts, as well as the related analytical trajectories, there may be observed dominance in multi-criteria evaluation methods that allow the integration of multidimensional evaluation criteria into a single generic value and determine their significance for a research object (Ginevičius, Podvezko 2008). Of particular interest in these methods is the *PROMETHEE* (*Preferential Ranking Organization Method for Enrichment Evaluations*) method, which many authors describe as more advanced, more sophisticated and logical than other multichronic methods (Brans, Mareschal 2005; Behzadian *et al.* 2010; Kosmidou, Zopounidis 2008). As reported by Ginevičius *et al.* (2010), the results of the evaluation depend on the preferential criteria and its parameters, as well as the decision-maker experience. The spectrum of their research

interest was *SR* (*Sum of Rank*), *SAW* (*Simple Additive Weighing*), *TOPSIS* (*Technique for Order Preference by Similarity to Ideal Solution*), *COPRAS* (*COmplex PRoportional ASsessment*) mentioned e.g. in Podvezko (2011). While TOPSIS evaluates the overall distance of each alternative from the best and the worst variant (Opricovic, Tzeng 2004), the normalized values and weights of the evaluated alternatives into one value are mathematically integrated in the COPRAS method (Hwang, Yoon 1981; Ginevičius, Podvezko 2008, 2013; Zavadskas *et al.* 2008). Applying these methods by authors to Lithuanian banks (Ginevičius *et al.* 2010) concluded that different *Multi-Criteria Decision Aid* (*MCDA*) provide different results (differentiated bank rankings depending on the evaluation technique). To eliminate the separate negatives of multi-criteria methods, the authors applied a new, sophisticated PROMETHEE method, which demonstrated a greater differentiation of complex evaluation results and thus accuracy.

A new study mapping the performance of 8 Lithuanian banks for the period 2007–2009 by Ginevičius and Podviezko (2013) is based on a similar comparator platform. Criteria for rating banks were selected on the basis of the CAMEL approach. The authors emphasize the fact that the application of multiple MCDA methods may simultaneously increase the reliability of the results. Therefore, they use selected MCDA methods: SAW, TOPSIS as well as COPRAS (created in Lithuania) and a more sophisticated PROMETHEE II with a deeper internal logic. Its advantage is that it does not require the transformation of data with negative values, which is a significant positive. As may be seen from the conclusions of the study, the observed deviations in the results obtained by the application of various MCDA methods are negligible, because the correlations of the values between the cumulative criteria of each method were in the range of 0.8 to 0.98. The accuracy of the result was increased taking into account the average of the cumulative criteria. The authors conclude that the best MCDA method cannot be identified. Reliability of results can increase the use of various MCDA methods, such as *UTA* (*UTilités Additives*), *DEA* (*Data Envelopment Analysis*), *ELECTRE* (*ELimination Et Choix Traduisant la REalite´*), *MUSA* (*MUlticriteria Satisfaction Analysis*) and others.

An extensive study mapping the applicability of the PROMETHEE method was developed by Behzadian *et al.* (2010), consisting of 217 articles published since 1985. The application spectra of the method are obvious in various fields: environmental management, hydrology and water management, business and financial management, chemistry, logistics and transportation, production and assembly, energy management, social and other areas. Also interesting are the PROMETHEE links presented with other methods, such as *GAIA* (*Geometrical Analysis for Interactive Aid*).

The performance of banks in Greece has been the subject of a study by Doumpos and Zopounidis (2010) who applied the PROMETHEE II method implemented in an integrated decision support system. The evaluation criteria were selected in accordance with CAMEL. Criteria for rating banks were selected in cooperation with Bank of Greece experts. Particular emphasis was placed on the sensitivity of the results in the context of the relative importance of the evaluation criteria, the evaluation process parameters and the input data. The authors recommend connecting analytical methods of sensitivity analysis with Monte Carlo simulation. They also emphasize the importance of imple-

menting macroeconomic factors to improve the analysis and implementation of stress testing scenarios to quantify the impact of external factors on banks' performance. In conclusion, they recommend linking analytical results with macroeconomic indicators from the banking sector from emerging and emerging economies and revealing the potential and risks in this segment of the country's economy.

Similar recommendations are also presented by Sahajwala and Van den Bergh (2000), which provide an overview of the banking rating systems currently in use. They apply the most widely used approach based on the *CAMELS* concept, covering the six main categories: *Capital, Assets, Management, Earnings, Liquidity,* and *Sensitivity to Market Risk*. Specific criteria within these categories are typically aggregated in a simple weighted average model. The methodology of credit rating agencies as one of the main categories of the assessment methodologies for the financial condition of commercial banks is also mentioned in Ginevičius and Podviezko (2013), complementary to the use of MCDA methods and econometric statistics. Brauers *et al.* (2014) reflected on the results of studies highlighting the comparison of several MCDA methods and focused on the comparison of the *MULTIMOORA* (*Full MULTIplicative form of Multi-Objective Optimization by Ratio Analysis*) method with the methods applied in the Ginevičius and Podviezko (2013) study (SAW, TOPSIS, COPRAS, and PROMETHEE II). Brauers *et al.* (2014) analyzed Lithuanian banks in 2008 and 2009 and also used the CAMEL evaluation criteria. The results of the MULTIMOORA commercial banks' financial stability assessment were comparable to those obtained through the MCDA methods. The robustness of the method is recommended by experts to increase the use of the levels of importance of the assessment criteria (Brauers, Zavadskas 2011; Brauers *et al.* 2014).

The PROMETHEE method and its application capabilities are also appreciated by Greek experts Kosmidou and Zopounidis (2008). Their preferential goal was to assess the position of two groups of banks: commercial (14) and cooperative (16) operating in Greece for the analyzed period 2003–2004. Their conclusions show a more favorable position for commercial banks, which become more competitive and maximize their profits. The financial indices of the cooperative banks are getting worse. The results of the comparative study of Greek and European commercial and cooperative banks require further research. Similarly, Romanian researchers Diaconu and Oanea (2014) used a similar selection to assess banks' stability to identify the main determinants of bank stability and disproportion between commercial and co-operative banks. Commercial and cooperative banks as credit institutions apply different approaches to their operational processes. Four banks (one co-operative bank – CreditCoop Bank and 13 commercial banks) were surveyed for the period 2008–2012. The authors examined the existence of differences between the main determinants of their financial stability. They have used the Z-score model with 4 proxies for the macroeconomic general situation, the proxy for the macroeconomic general situation, the financial market situation (BET rate) and the interbank offer rate for 3 months situation. As may be seen from their conclusions, the financial stability of cooperative banks was mainly influenced by two factors: GDP growth and three-month interbank offer rates. No significant factors were found for commercial banks. The recent study by these authors (Diaconu, Oanea

2015) was specific in that it was unique in focusing on assessing the financial stability of banks, taking into account each subsidiary of all regions. This process has enabled the author to ascertain whether the economic characteristics of the county affect the stability of CreditCoop subsidiaries (Banca Centrala Cooperatista). The study analyzed the data for the period 2008–2013 and the determinants examined were differentiated into two groups: internal determinants (resulting from bank management policy and decisions, like capital ratio and efficiency ratio) and external determinants (macroeconomic variables, e.g. GDP). They compared results of *ROA* (*Return on Assets*) vs. Z-score for each region. As the authors conclude in their conclusions, an increase in the bank's credit activity brings greater risk and endangers the stability of the bank. The growth of GDP has a significant impact on the profitability of subsidiaries, as an increase in the equity of the subsidiary will make it possible to increase the profitability and stability of the bank. In the latest studies, the Z-Score model was used to assess banks' stability. Altman (2000), in addition to the importance of Z-Score, highlights in its work also the significant potential of the ZETA Model to analyze the financial stability of both financial and non-financial institutions. This easier approach in the process of measuring financial stability through the Z-Score is also preferred by Groeneveld and De Vries (2009), whose analytical results clearly state the stability of cooperative banks as compared to commercial banks. An extensive comparative study based on the Z-Score application is also presented by Andries and Capraru (2011) who analyzed the banking sector in 17 countries in Central and Eastern Europe for the period 2004–2008, clearly pointing to improving the stability of the banking sector. This improvement is justified by the process of harmonization of the national regulatory framework of the European Union. Despite the wide applicability of the Z-Score method, its main drawback is the impossibility of capturing the correlation between financial institutions (Čihák 2007). For this reason, in recent years, there is obvious boom, especially in the group of multicriteria methods and their modifications.

2. Aim, data and methodology

Commercial banks creating banking sector play an important economic role in providing financial intermediation and economic acceleration by converting deposits into productive investments. Therefore, it is very important to study their performance and stability and try to find out how the banks could reduce their inefficiency in the process of transformation of funds from those which have a surplus of funds to those which have their shortage. Low performance and instability of banks together with poor financial infrastructure, which is not enhanced by strong legislation, could slow economic growth of the country. Nowadays, when many banks operated on the international basis, instability and low performance of banks in the banking sector in one country may be transmitted as financial contagion to other countries.

The Slovak and Czech banking sectors are representatives of the bank-oriented financial system, where the financial intermediaries play a crucial role. In analyzed countries, the term "bank" encompasses several types of banks aside from a central bank. According to the Act on Banks in the Czech Republic and in the Slovakia, a domestic bank

can be defined as a joint-stock company based in the country, accepting deposits from the public and granting loans, licensed by the central bank of the country (the Czech national bank, or the National bank of Slovakia). The second type of banks is foreign banks. Foreign banks may operate as a branch upon authorization (license) given by the central bank. Banks coming from the European Union (EU) may operate as a branch without receiving a license from the National bank of Slovakia or Czech national bank. Since May 1, 2004, when Slovakia and the Czech Republic joined the EU, the simplified procedure ("the single banking license") enabled foreign banks licensed within the EU Member States to exercise the freedom to provide services within the territory of the Slovak or the Czech Republic on a cross-border basis.

From the historical point of view, the Czech Republic and Slovakia formed one state for a long period of time. Therefore, these two states may be considered as very similar with the comparable banking systems. The banking systems in both countries could be considered as small, where the number of commercial banks is around the 30, of which domestic banks are less than half. As the foreign branches are not required to publish non-consolidated financial statements for a branch in the territory of the mentioned countries, it was not possible to include them in the analysis. It caused that the samples size in individual countries were very low, which could lead to the low reporting ability of the analysis. Therefore, an evaluation of the domestic commercial banks' performance from both states together was performed.

The aim of the article was to evaluate the performance of the Czech and Slovak commercial banks in 2015 through selected methods and to point out the procedural and outcome differences of these methods. The target segment of the survey was the Czech and Slovak banks based in the Czech and Slovak Republic. Branches of foreign banks were not included in the analysis. In qualitative terms, banks with a dominant position in the Czech and Slovak banking markets were occupied, with their share in total assets in individual banking sectors in excess of 75% in 2015. Only universal banks were the subject of the analysis. Specialized banks (such as mortgage banks, savings banks, central banks) were not included in the surveyed file. The examined set was made up of 22 banks, 13 of which were based in the Czech Republic and 9 in the territory of Slovakia. Data were obtained from unconsolidated financial statements as published in the annual reports of the rated banks.

The baseline step for applying the methods to assess overall performance was to establish key indicators (criteria). For all applied methods, the same data set of 22 banks, with 10 key indicators being tracked for each bank in 2015 was used. These indicators were divided into 5 groups according to the CAMEL methodology. The CAMEL method is based on determining the overall ranking, taking into account the indicators in the five main areas: capital adequacy (C), asset quality (A), management soundness (M), earnings and profitability (E) and liquidity (L). In the first group focusing on the assessment of capital quality, we focused on indicators: *share of equity and total assets (ETA), share of equity and total volume of loans (ETL).* In the second group focusing on the rating of the quality of assets portfolio, the indicators analyzed were: *share of earnings assets and total assets (EATA), share of non-performing loans and the total*

volume of loans (NPL). The third area was the management where the indicators were examined: *operational efficiency, expressed as the share of operating costs and operating revenues (CI), and the share of operating revenues and the number of employees (IEMP).* The fourth area was aimed at assessing profitability through indicators of *ROA and net interest margin*, expressed as a *share of net interest income and total assets (NIM).* The last evaluated area was the liquidity of the bank, monitored by the *proportion of liquid assets with a maturity of up to one year and total assets (LATA),* and the *share of total loans and total deposits (LD).* The reason of using indicators based on the CAMEL methodology was, that CAMEL is world-wide accepted method to determine a bank´s overall condition and to identify its strengths and weaknesses from the financial, operational and managerial point of view. Each bank in the evaluation set is assigned a uniform composite rating based on the five elements. It is standardized method which allows the assessment of the quality of banks according to the standard criteria providing a meaningful rating that allows to compare banks from different countries (with comparable banking systems).

The second important step in the application of the overall performance rating methods (except for the ranking method) is the weighting. In theory, the following values were weighed e.g. equal weights method, expert examination, score method, ordinal method, Saaty and Fuller method, scaling, factor analysis, regression analysis, and etc. In the present work, the weights of the individual indicators were determined by means of scoring method based on scaling (Hunjak, Jakovcevic 2001). For each indicator, a scoring scale ranging from 1 to 5 points was determined. The boundaries of the scale were bounded by the minimum and maximum values of the indicator. Depending on the value of the pointer and the positions at defined intervals, the banks are assigned the following points: <min.; 15. Percentile> = 1; <15. Percentile; 35. Percentile> = 2, <35. Percentile; 65. Percentile> = 3; <65. Percentile; 85. Percentile> = 4; <85. Percentile; max.> = 5. Subsequently, points for individual criteria were assigned to banks (Table 1). The value of the weight for the individual indicators (criteria) was determined as the ratio of the sum of the points in the given criterion and the total number of points that banks could obtain under all criteria. By comparing with the total number of points the sum of the weights of all the evaluated criteria is equal to 1.

Defined indicators and weightings have been used in the complex assessment of individual banks in the analyzed file based on the overall ranking method, the performance index and the multi-criteria evaluation methods.

Analyzing the available studies on the issues of measuring and evaluating the performance of banks, we see a frequent classification of indicators into five main groups based on the CAMEL rating system. Therefore, this methodology was used as the base for definition of key indicators for our analysis.

The first applied method was the ranking method based on the values of key indicators. The aim of the ranking method is to assess the overall health of the bank and identify strengths and weaknesses in the financial, operational and management spheres (Kaya 2001; Trautmann 2011; Altan *et al.* 2014). Ranking method has its concept based on the creation of the ranking of individual banks in individual indicators (banks with the

Table 1. Determination of weights by scoring method based on scaling

Bank	Capital		Asset quality		Management		Earnings		Liquidity	
	ETA	ETL	EATA	NPL	CI	IEMP	ROA	NIM	LATA	LD
Československá obchodná banka, a.s. (SK)	3	3	5	5	2	3	3	3	3	5
OTP Banka Slovensko, a.s. (SK)	2	1	4	3	2	2	2	3	3	3
Poštová banka, a.s. (SK)	5	5	3	2	5	5	4	5	4	2
Prima banka Slovensko, a.s. (SK)	1	1	4	2	2	2	2	4	3	4
Privatbanka, a.s. (SK)	3	5	4	1	3	3	3	3	5	1
Sberbank Slovensko, a.s. (SK)	3	3	3	3	2	1	1	2	4	4
Slovenská sporiteľňa, a.s. (SK)	4	3	5	5	3	3	4	5	2	5
Tatra banka, a.s. (SK)	2	2	3	5	3	2	3	4	4	4
Všeobecná úverová banka, a.s. (SK)	4	3	4	4	3	3	3	5	4	4
Air Bank, a.s. (CR)	1	4	1	1	2	4	2	5	3	1
Česká spořitelna, a.s. (CR)	5	4	2	3	4	3	5	4	2	3
Československá obchodní banka, a.s. (CR)	3	3	3	5	5	4	5	3	2	4
Equa bank, a.s. (CR)	2	1	5	4	1	1	3	4	1	5
Expobank CZ, a.s. (CR)	5	2	5	4	1	1	2	2	1	3
Fio banka, a.s. (CR)	1	1	3	1	1	5	1	1	5	1
J&T Banka, a.s. (CR)	4	5	2	2	3	5	4	2	5	2
Komerční banka, a.s. (CR)	5	4	2	4	5	3	5	3	1	4
Moneta Money Bank, a.s. (CR)	5	5	4	2	4	4	5	5	1	4
PPF banka, a.s. (CR)	1	5	1	1	5	5	4	1	5	1
Raiffeisenbank, a.s. (CR)	3	2	1	3	2	3	3	3	3	4
Sberbank CZ, a.s. (CR)	3	3	1	3	1	1	1	1	3	5
UniCredit Bank Czech Republic and Slovakia, a.s. (CR)	3	3	5	3	4	5	4	1	3	5
Total	68	68	70	66	63	68	69	69	67	74
Weight	0.0997	0.0997	0.1026	0.0968	0.0924	0.0997	0.1012	0.1012	0.0982	0.1085

Source: prepared by authors.

best results is ranked as first in order, the bank with the worst results is ranked as last in order). This order is then aggregated and transformed into the resulting ranking for each bank. Individual orders across variables (key indicators) are aggregated for each bank according to the established methodology (described in detail e.g. in Altan *et al.* 2014). The bank with the lowest sum is rated as the best and is assigned a total rank of 1. The disadvantage of this simple method is that the minimum and maximum differences between the values have the same weight.

Recently, in the work of many experts, it is more likely to encounter an effort to construct aggregate performance indices (e.g. Gersl, Hermanek 2008; Maudos 2012; Laznia 2013; Mishra *et al.* 2013; Petrovska, Mihajlovska 2013; Roman, Sargu 2013; and others). When constructing simple aggregated indices, the index value can be calculated as the weighted average of the partial performance indicators. Since variability of variables within individual indicators may be relatively high, it is essential before the final aggregation to adjust and normalize the variables used. In the first step, the variables need to be adjusted to have a positive impact on the overall performance of the bank (their rising value also leads to a rise in overall performance). For this reason, variables whose decreasing value leads to the performance growth must be transformed in such a way that their inverted value is used in calculating the overall index. An example of such variables is the NPL (the ratio of non-performing loans in the total loans), where the growth of the share indicates that the quality of the loan portfolio is decreasing. The second important step is the standardization of data, which aims to ensure that all the parameters considered are within the same range. Theoretical sources operate with two basic ways of normalization: empirical and statistical (Cheang, Choy 2009; Petrovska, Mihajlovska 2013). Empirical normalization compares the values of the indicators with the limit values (minimum and maximum) for the given indicator, therefore the normalized values express their deviation from these limit values. Empirical normalization allows for the placement of variables within the bounded interval <0; 1>. This will ensure that the variables with different variability ultimately will move at a specified interval. Statistical standardization compares the values of the indicators with the mean value and the standard deviation of the values. The disadvantage of this normalization method is that the extreme value indicators also have higher normalized values, and ultimately a higher impact on the composite index. Therefore, this method is more often used if we want to highlight the exceptional results of one of the analyzed entities. The third important step is the assignment of weights to individual variables. The scales of the variables express their distinction in terms of their significance. They are most often expressed in normalized values to ensure that standardized weights will represent non-negative numbers, the sum of which is equal to 1.

Another, frequently used approach to comprehensive bank assessment is the application of multi-criteria evaluation methods. They integrate the values of all criteria into one final pointer. Based on the value of the resulting variables, banks can rank in the ranking from the most, to the least efficient. Multi-decision decisional problems are described by a set of alternatives, a set of evaluation criteria that indirectly formulate the goal of the decision analysis with the links between the criteria and the alternatives. This is a complex process of assessing banks on the basis of a number of criteria that are assigned

a different weight in the evaluation. The advantage of multi-criteria assessment methods is that the defined criteria can be both maximizing and minimizing, both quantitative and qualitative, and can be expressed in different units. In the professional sources, there are various methods of multi-criteria evaluation, with the most commonly applied methods being *SAW (Simple Additive Weighting), ORESTE (Organization, Rangement Et Synthese De Donnes Relationnelles), PROMETHEE (Preference Ranking Organisation Method for Enrichment Evaluations), MAPPAC (Multicriterion Analysis of Preferences by means of Pairwise Actions and Criterion comparisons), AHP (Analytic Hierarchy Process), ELECTRE (ELimination Et Choix Traduisant la REalit'e), PRAGMA (Preference RAnking Global frequencies in Multicriterion Analysis), and TOPSIS (Technique for Ordering Preference by Similarity to Ideal Solution)* (methodologically defined, e.g. in Fiala *et al.* 1994, 2008; Ginevičius *et al.* 2010; Ginevičius, Podvezko 2008; Brans, Mareschal 2005; Kosmidou, Zopounidis 2008; Behzadian *et al.* 2010; Matarazzo 1986, 1988). We were inspired by this segment of methods and we decided to use the method: SAW, ORESTE, PROMETHEE, MAPPAC to achieve the goal of our contribution. The SAW method is based on the linear function of the utility, which offers a choice of a certain alternative on a scale from 0 to 1. The alternative is more suitable according to the given criterion, the higher the value of the benefit. The worst alternative to a given criterion will have zero benefit, the best benefit will be equal to one, and the other alternatives will benefit from these extremes. When applying this method, it is necessary to replace the elements of the input criterion matrix with the elements of the normalized matrix, which represent the benefit of the individual alternatives according to the selected criterion. The aggregate benefit of an alternative by all criteria is obtained by aggregating the partial utility benefits. The ORESTE method only requires regular information on criteria and alternatives. In the first part of the method, we determine the distance of each alternative according to each criterion from the fictional start. Then the alternatives were organized according to certain rules. The second part of the method is preferential analysis, where a test to find preferences, indifference or disagreements for each pair of alternatives was done. The PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation) method uses pairing alternatives sequentially in the light of all criteria. The result of the comparison is the expression of the preference intensity between pairs of alternatives. In the first step, the coefficients expressing the intensity of the preferences of one alternative in relation to the second alternative are determined. The intensity depends on the value of the difference in the criteria. For the maximization criterion it is obvious that the greater the difference, the greater the preference intensity. The PROMETHEE method lists 6 basic types of preferential features. The basic parameters of the functions are the preference threshold, the indifference threshold and the standard deviation of normal distribution. If a preference rate has been set for each pair of alternatives, the global preference index is then calculated. Furthermore, for each alternative, positive and negative flows are determined. The indices are arranged in a matrix; the positive flow for each alternative will be given as the average of the values in the corresponding matrix row, the negative flow will be given as the average of the values in the corresponding matrix column. The final disclosure of the PROMETHEE method is the arrangement of alternatives according to the decreasing net

flow, which is calculated as the difference between the positive and the negative flow of the alternative. The MAPPAC method is based on pairing alternatives according to each pair of partial criteria. This calculation method is based on a normalized matrix of values from which the basic preference index for the individual pairs of alternatives is first calculated. The preferential indices are further arranged into a preference index matrix for each pair of criteria. The diagonal elements of the matrix are equal to zero. They are then aggregated into one preference matrix. The resulting layout can be obtained from the top and bottom. If the top layout is chosen, individual alternatives will be ranked by σ. The alternative with the highest value of σ will be ranked first in the ranking of alternatives. Each of mentioned methods (ranking method, composite index and multi-criteria methods have some advantages and on the other hand some limitations. As the advantage of the ranking method can be mentioned its simplicity, but the weakness is that the minimum and maximum differences between the values have the same weight. This limitation can be eliminated by the methodology of construction of composite index. The application of normalization in this methodology allows us to place the variables within the bounded interval. On the other hand, the limitation of this method is that the performance of banks may be assessed only in terms of overall performance. When the performance based on the other criteria is about to be assessed, the multicriteria method could be used. It allows assessing the performance from the point of view of overall utility function, net financial flow, distance from ideal alternative, and so on. Therefore, three groups of methods were used in order to compare the performance of commercial banks in the Czech Republic and Slovakia.

3. Results and discussions

The data for 10 key indicators mentioned above were obtained from the non-consolidated financial statements published in the annual reports of the evaluated banks (22) in 2015. According to the values of individual indicators the commercial banks were ranked as it was mentioned in methodology part. Table 2 and Figure 1 declare the results of the aggregate ranking method – determining the ranking for selected the Czech and Slovak banks in 2015. It is clear from Figure 1 that the lower the value achieved, the better the position of the bank in the rankings. Based on the results, we note the fact that the highest ranked bank in terms of the above criteria in a given group of banks was Poštová banka, a.s. Although in the case of the loan portfolio quality indicators and the Loan to Deposit (LD) indicator did not achieve the best results, the overall rating is in the first position. The positive impact on the overall rating was in particular the quality of capital indicators, where the bank was second in rank. The second position was also obtained in the Costs to Income (CI) indicators and in the net interest margin indicator. The first five of the rated banks are also Slovenská sporiteľňa, a.s., Moneta Money Bank, a.s., Všeobecná úverová banka, a.s., Československá obchodní banka, a.s. and Slovenská sporiteľňa, a.s. Among the former, was mainly due to good results in asset quality and profitability. Excellent results on the rank of Moneta Money Bank, a.s. had positive impact on in terms of quality of capital and profitability. On the other hand, Fio Bank, a.s., Air Bank, a.s. and Sberbank, a.s., mainly due to low liquidity, poor asset quality and low profitability compared to other banks.

Table 2. Ranking of banks by selected performance idicators (2015, ranking between 22 banks, minimum 1, max. 22)

Bank	Capital		Asset quality		Management		Earnings		Liquidity		Rank average	Rank final
	ETA	ETL	EATA	NPL	CI	IEMP	ROA	NIM	LATA	LD		
Československá obchodná banka, a.s. (SK)	12	14	3	1	14	14	10	11	13	1	9.3	6.5
OTP Banka Slovensko, a.s. (SK)	18	20	6	10	16	18	19	4	10	14	13.5	14
Poštová banka, a.s. (SK)	2	2	14	18	2	3	6	2	5	16	7	1
Prima banka Slovensko, a.s. (SK)	21	21	8	15	15	17	18	9	11	9	14.4	18
Privatbanka, a.s. (SK)	13	5	7	19	10	11	14	12	3	19	11.3	12
Sberbank Slovensko, a.s. (SK)	11	15	15	13	18	20	22	17	6	7	14.4	18
Slovenská sporiteľňa, a.s. (SK)	8	12	4	4	11	12	5	3	16	2	7.7	2.5
Tatra banka, a.s. (SK)	16	18	11	2	12	16	11	8	7	6	10.7	11
Všeobecná úverová banka, a.s. (SK)	6	13	10	5	9	13	9	6	8	12	9.1	4
Air Bank, a.s. (CR)	20	8	20	21	17	8	17	5	12	21	14.9	21
Česká spořitelna, a.s. (CR)	4	6	16	9	6	9	4	7	17	15	9.3	6.5
Československá obchodní banka, a.s. (CR)	15	10	13	3	4	6	2	13	18	8	9.2	5
Equa bank, a.s. (CR)	17	19	2	6	22	22	15	14	19	5	14.1	16
Expobank CZ, a.s. (CR)	3	16	5	7	21	21	16	16	22	17	14.4	18
Fio banka, a.s. (CR)	22	22	12	20	20	2	20	22	1	22	16.3	22
J&T Banka, a.s. (CR)	7	4	18	17	8	4	8	18	4	18	10.6	10
Komerční banka, a.s. (CR)	5	7	17	8	3	9	3	15	20	11	9.8	9
Moneta Money Bank, a.s. (CR)	1	3	9	16	5	7	1	1	21	13	7.7	2.5
PPF banka, a.s. (CR)	19	1	22	22	1	1	7	20	2	20	11.5	13
Raiffeisenbank, a.s. (CR)	14	17	19	12	13	15	12	10	15	10	13.7	15
Sberbank CZ, a.s. (CR)	10	11	21	14	19	19	21	19	9	3	14.6	20
UniCredit Bank Czech Republic and Slovakia, a.s. (CR)	9	9	1	11	7	5	13	21	14	4	9.4	8

Source: prepared by authors.

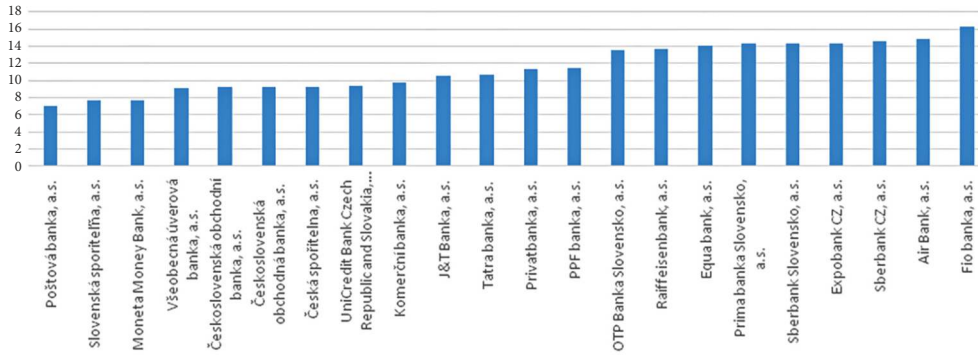

Fig. 1. Overall ranking of analyzed the Czech and Slovak banks
Source: prepared by authors.

The second method applied was the method of calculating the aggregate performance index. This overall performance index is calculated as the sum of the five sub-indices defined by the CAMEL main areas. In the calculation of sub-indices, key indicators were selected in methodology, which takes into account the financial strength of banks and the main underlying risks. Before compiling the overall index, the data must be adjusted, normalized, and the weight must be assigned to the individual criteria. In the first step, the indicators were adjusted to have a positive impact on the overall performance of the bank, so, their rising value also led to a rise in overall performance. For this reason, the variables whose declining value means the transformation of the performance are used in the way that their inverted value was used in calculating the overall index. In this case, two variables were treated, namely NPL and CI. In the second step, the data must be normalized. In our case, empirical normalization was used to ensure that all the parameters considered were within the range of <0,1>. In the third step, it was necessary to assign weight to individual indicators (see Table 1). Based on the weighing method described above, we can see that for criteria where banks were above average, this criterion gained higher weight. On the other hand, if the banks obtained values at the bottom of the scaling intervals in the given criterion, a lower weight was assigned to this criterion. In the set of rated banks, there are predominantly stable banks with a strong market position and a balanced development of performance indicators. For this reason, the values of the indicators largely ranged around the median value, resulting in approximately equal weight distribution among the criteria. The total bank performance index was calculated as the sum of the weighted adjusted and normalized values in the five main areas. Based on the total performance index values, banks were then ranked from the highest index value to the lowest. The resulting aggregate performance index values, together with the revised, standardized indicators in the five main areas, as well as the overall ranking are shown in Table 3.

Table 3. Ranking of banks on the basis of an aggregated performance index

	C	A	M	E	L	Performance Index	Rank
Československá obchodná banka, a.s. (SK)	0.0857	0.1946	0.0602	0.0894	0.1010	0.5308	6
OTP Banka Slovensko, a.s. (SK)	0.0459	0.1256	0.0436	0.0832	0.1371	0.4355	14
Poštová banka, a.s. (SK)	0.1663	0.0814	0.1419	0.1335	0.1046	0.6277	2
Prima banka Slovensko, a.s. (SK)	0.0348	0.1189	0.0468	0.0698	0.1188	0.3890	17
Privatbanka, a.s. (SK)	0.1219	0.1051	0.0718	0.0826	0.0961	0.4776	12
Sberbank Slovensko, a.s. (SK)	0.0860	0.0905	0.0351	0.0268	0.1385	0.3769	19
Slovenská sporiteľňa, a.s. (SK)	0.0947	0.1704	0.0716	0.1130	0.0946	0.5443	4
Tatra banka, a.s. (SK)	0.0630	0.1785	0.0647	0.0922	0.1326	0.5310	5
Všeobecná úverová banka, a.s. (SK)	0.0927	0.1499	0.0720	0.0971	0.1338	0.5455	3
Air Bank, a.s. (CR)	0.0836	0.0288	0.0556	0.0788	0.0445	0.2913	22
Česká spořitelna, a.s. (CR)	0.1358	0.1017	0.0798	0.1045	0.0658	0.4876	10
Československá obchodní banka, a.s. (CR)	0.0863	0.1462	0.0890	0.1007	0.0790	0.5012	7
Equa bank, a.s. (CR)	0.0510	0.1553	0.0000	0.0780	0.0948	0.3792	18
Expobank CZ, a.s. (CR)	0.0964	0.1363	0.0234	0.0692	0.1085	0.4338	15
Fio banka, a.s. (CR)	0.0000	0.0897	0.0855	0.0293	0.0982	0.3028	21
J&T Banka, a.s. (CR)	0.1318	0.0692	0.1014	0.0841	0.0977	0.4842	11
Komerční banka, a.s. (CR)	0.1129	0.1002	0.0848	0.0962	0.0704	0.4644	13
Moneta Money Bank, a.s. (CR)	0.1772	0.1168	0.0842	0.2023	0.0990	0.6797	1
PPF banka, a.s. (CR)	0.1316	0.0000	0.1921	0.0788	0.0918	0.4943	8
Raiffeisenbank, a.s. (CR)	0.0779	0.0799	0.0609	0.0890	0.1066	0.4142	16
Sberbank CZ, a.s. (CR)	0.0936	0.0438	0.0351	0.0503	0.1107	0.3335	20
UniCredit Bank Czech Republic and Slovakia, a.s. (CR)	0.1040	0.1318	0.0910	0.0695	0.0949	0.4913	9

Source: prepared by authors.

Figure 2 visualizes the order of the banks according to the achieved performance index values – the higher the achieved value, the better position in the rankings. Based on aggregate performance index values (Table 3, Fig. 2), it is obvious that Moneta Money Bank, a.s., was the highest ranked bank in the group's rating. The performance of this bank was positively influenced, in particular, by developments in profitability and capital quality. In the second position was Poštová banka, a.s., thanks to positive results in three areas: quality of capital, governance and profitability. Followed by the General Credit Bank, a.s., which has achieved positive results in asset quality and liquidity. The last places were Air Bank, a.s., Fio Bank, a.s. and Sberbank CZ, a.s., due to insufficient results in the following areas: asset quality, capital quality and management.

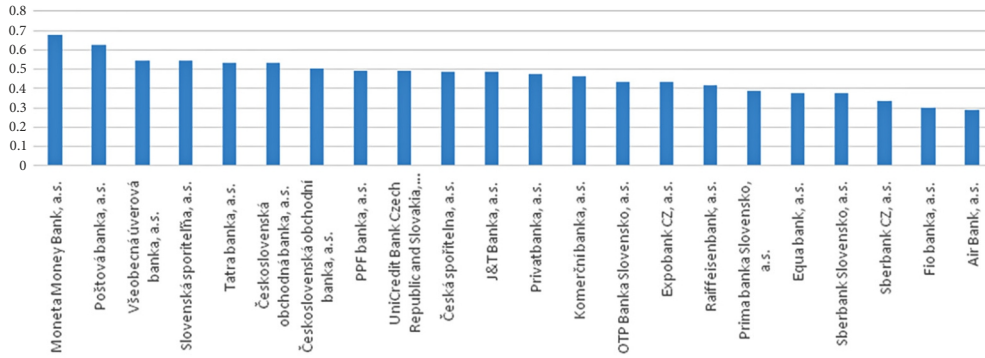

Fig. 2. Aggregated performance index of analyzed Czech and Slovak banks
Source: prepared by authors.

Another applied approach to assessing bank performance was the multi-criteria assessment method. The calculation was done via the *MCAKosa2000* (*MultiCriteria Evaluation of Alternatives*) software. This allows using the following methods: SAW, ORESTE, PROMETHEE, MAPPAC. The first step in applying these methods was to select criteria. In this case, the overall performance of banks based on 10 CAMEL benchmarks, which were benchmarks for the application of multi-criteria assessment methods was taken into consideration. The second step was to determine the type of individual criteria. In our case, all the criteria were quantitative, variables ETA, ETL, ETA, IEMP, ROA, NIM, LATA, and LD are maximization criteria, the NPL and CI are minimization criteria. The third step was to determine the weights, where we used weights determined by scoring method based on scaling, which were also used in the preparation of the overall index performance. The results of the banks' performance evaluation on the basis of selected multi-criteria evaluation methods are shown in Table 4.

Based on the results of the multi-criteria evaluation methods, we find that the individual methods produce comparable results. The reason is that all methods used the same criteria, and the same weight. Based on the resulting performance rankings, it may be visible that the best results were achieved by Moneta Money Bank, a.s., Poštová banka, a.s., General Credit Bank, a.s. and Slovenská sporiteľňa, a.s., which consistently maintained the first four bars in all applied methods. On the other hand, the worst positions were occupied by Air Bank, a.s., Fio Bank, a.s., Sberbank CZ, a.s. and Equa bank, a.s. Figures 3 to 6 visualize the presented results, while in the SAW, PROMETHEE and MAPPAC methods graphical representations show that the higher the value obtained, the better the position in the banks list. In Figure 4, the situation is the opposite, with a lower value declaring a higher position in the rankings.

The resulting rankings are shown in Table 5. By comparing the resulting ranking, it was concluded that all performance evaluation methods have roughly the same results. Only some banks have more significant shifts between different methods (for example Tatra banka, a.s., Česká spořitelna, a.s., Československá obchodní banka, a.s.).

Table 4. Banking ranking based on multi-criteria assessment methods

Method Banka	SAW		ORESTE		PROMETHEE		MAPPAC	
	Utility	Rank	RI values	Rank	Net flow	Rank	Sigma	Rank
Československá obchodná banka, a.s. (SK)	0.568288	7	1001.5	8	0.011605	7	10.4826	6
OTP Banka Slovensko, a.s. (SK)	0.525850	13	1146.5	13	–0.0064	14	5.77866	13
Poštová banka, a.s. (SK)	0.682553	2	731.5	2	0.040888	2	15.1030	2
Prima banka Slovensko, a.s. (SK)	0.480118	17	1309.5	17	–0.02385	17	3.02695	17
Privatbanka, a.s. (SK)	0.554672	10	1083	12	0.001341	12	7.28123	11
Sberbank Slovensko, a.s. (SK)	0.469826	18	1373.5	18	–0.02706	18	2.43552	18
Slovenská sporiteľňa, a.s. (SK)	0.598593	4	760	4	0.028851	4	13.0170	4
Tatra banka, a.s. (SK)	0.569235	6	1044	11	0.005767	11	9.81707	7
Všeobecná úverová banka, a.s. (SK)	0.611450	3	742.5	3	0.030764	3	14.1040	3
Air Bank, a.s. (CR)	0.364872	22	1396	20	–0.03265	20	0.54241	21
Česká spořitelna, a.s. (CR)	0.563596	9	865.5	5	0.020193	5	11.0386	5
Československá obchodní banka, a.s. (CR)	0.542260	11	985.5	7	0.015333	6	8.36136	9
Equa bank, a.s. (CR)	0.413232	20	1391	19	–0.02741	19	1.13423	20
Expobank CZ, a.s. (CR)	0.519603	14	1229	15	–0.01072	15	4.35343	15
Fio banka, a.s. (CR)	0.383270	21	1631	22	–0.04606	22	0	22
J&T Banka, a.s. (CR)	0.565312	8	1017.5	10	0.007583	10	7.78199	10
Komerční banka, a.s. (CR)	0.534254	12	1012	9	0.009482	9	6.56929	12
Moneta Money Bank, a.s. (CR)	0.758237	1	647	1	0.04646	1	16.7742	1
PPF banka, a.s. (CR)	0.494284	16	1216	14	–0.00163	13	3.50098	16
Raiffeisenbank, a.s. (CR)	0.501823	15	1249	16	–0.01563	16	5.12729	14
Sberbank CZ, a.s. (CR)	0.426610	19	1499	21	–0.03797	21	1.63518	19
UniCredit Bank Czech Republic and Slovakia, a.s. (CR)	0.571233	5	979.5	6	0.011116	8	9.11934	8

Source: prepared by authors.

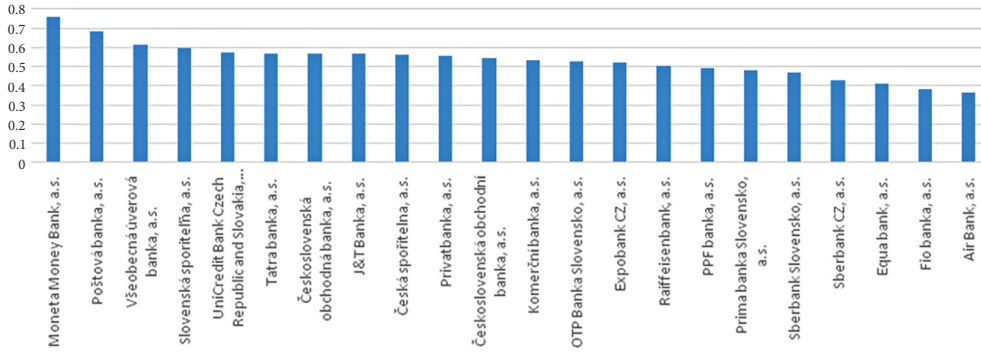

Fig. 3. Ranking of the analyzed Czech and Slovak banks according to the obtained SAW values
Source: prepared by authors.

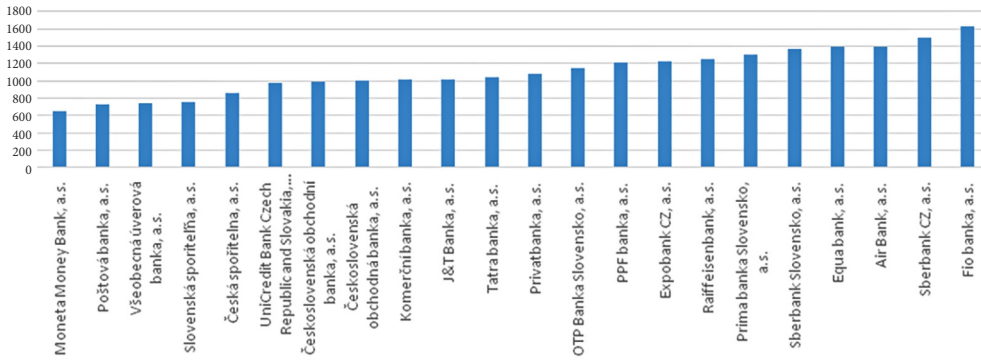

Fig. 4. Ranking of the analyzed Czech and Slovak banks according to the obtained ORESTE values
Source: prepared by authors.

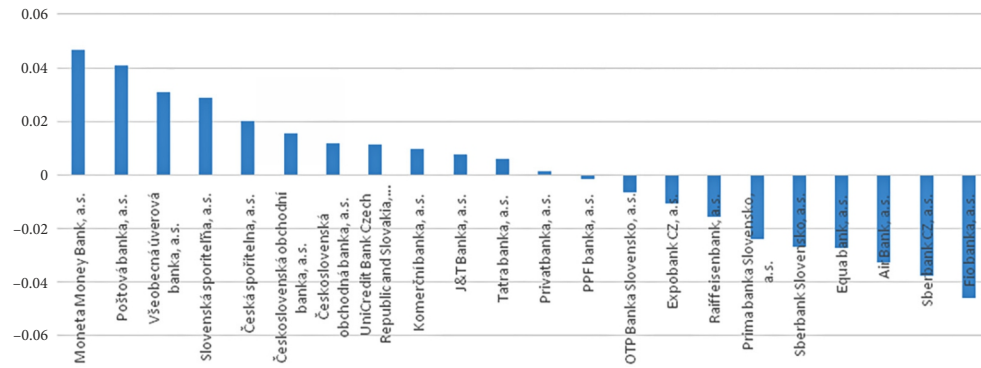

Fig. 5. Ranking of the analyzed Czech and Slovak banks according to the obtained PROMETHEE values
Source: prepared by authors.

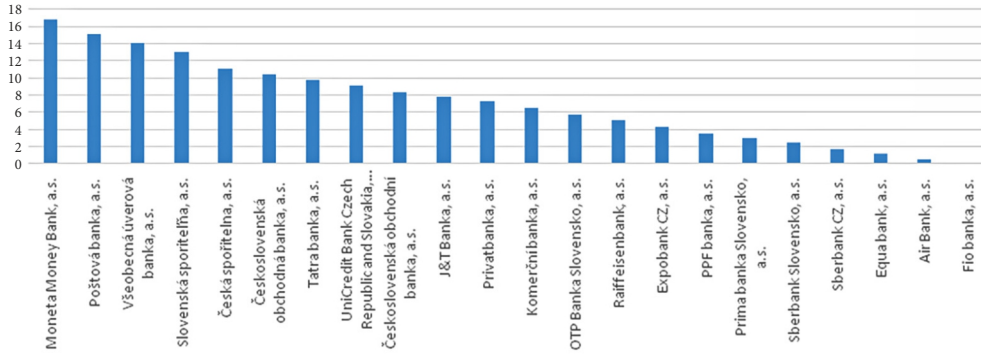

Fig. 6. Ranking of the analyzed Czech and Slovak banks according to MAPPAC values
Source: prepared by authors.

Table 5. Final ranking based on individual methods

Bank	Ranking method	Performance Index	SAW	ORESTE	PROMETHEE	MAPPAC
Československá obchodná banka, a.s. (SK)	6.5	6	7	8	7	6
OTP Banka Slovensko, a.s. (SK)	14	14	13	13	14	13
Poštová banka, a.s. (SK)	1	2	2	2	2	2
Prima banka Slovensko, a.s. (SK)	18	17	17	17	17	17
Privatbanka, a.s. (SK)	12	12	10	12	12	11
Sberbank Slovensko, a.s. (SK)	18	19	18	18	18	18
Slovenská sporiteľňa, a.s. (SK)	2.5	4	4	4	4	4
Tatra banka, a.s. (SK)	11	5	6	11	11	7
Všeobecná úverová banka, a.s. (SK)	4	3	3	3	3	3
Air Bank, a.s. (CR)	21	22	22	20	20	21
Česká spořitelna, a.s. (CR)	6.5	10	9	5	5	5
Československá obchodní banka, a.s. (CR)	5	7	11	7	6	9
Equa bank, a.s. (CR)	16	18	20	19	19	20
Expobank CZ, a.s. (CR)	18	15	14	15	15	15
Fio banka, a.s. (CR)	22	21	21	22	22	22
J&T Banka, a.s. (CR)	10	11	8	10	10	10
Komerční banka, a.s. (CR)	9	13	12	9	9	12
Moneta Money Bank, a.s. (CR)	2.5	1	1	1	1	1
PPF banka, a.s. (CR)	13	8	16	14	13	16
Raiffeisenbank, a.s. (CR)	15	16	15	16	16	14
Sberbank CZ, a.s. (CR)	20	20	19	21	21	19
UniCredit Bank Czech Republic and Slovakia, a.s. (CR)	8	9	5	6	8	8

Source: prepared by authors.

Table 6 lists the comparison of results between individual methods based on correlation coefficients. It is obvious that there is almost perfect positive correlation between these methods. Almost perfect correlation has been found not only among the methods of multi-criteria evaluation but also among the other investigators. Highest correlation coefficient values were found between PROMETHEE and ORESTE, and PROMETHEE and Ranking method. The lowest correlation coefficient was found between the SAW method and the Ranking method. Although the correlation coefficient value in the sample is the lowest, it still indicates almost perfect positive correlation.

Table 6. Correlation matrix of the results of the investigated methods

Method	Ranking method	Performance index	SAW	ORESTE	PROMETHEE	MAPPAC
Ranking method	1					
Performance index	0.932128	1				
SAW	0.917422	0.931112	1			
ORESTE	0.975680	0.923207	0.948052	1		
PROMETHEE	0.981902	0.935630	0.935630	0.995483	1	
MAPPAC	0.949662	0.935630	0.977414	0.970638	0.968379	1

Source: prepared by authors.

The reason for the almost perfect correlation between the results of the individual methods may be the fact that all the methods were applied to the same data set formed not only by the same banks but also by the same evaluation criteria. As mentioned above, the sample of banks under examination was made up of banks with a stable market position, which also reflected weight values of individual criteria, moving at approximately the same level. This could lead to a high correlation not only between methods based on the use of weights, but also between Ranking method, which did not take into account the scales in the calculation. If the individual weights were diametrically different, this could lead to differences in the results obtained from different methods. The scope of applied approaches to assessing the performance of banks is wide, from overly simplified approaches to approaches involving a wide range of economic variables at micro or macroeconomic level. Available methodologies of credit rating agencies as well as current methodologies revised and applied by the ECB are currently insufficient to eliminate the informational asymmetry in the commercial banks market. For this reason, several methodologies are being developed and applied, with the aim of creating an effective comparator platform for national and international benchmarking. From a comprehensive view of the stability of banks, it is a complex task involving a large number of multidimensional criteria. According to experts, this is an idiosyncratic role influenced by the complicated structure of banks, interconnections of cash flows, market conditions, dynamic economic changes in the economy, etc. As is clear from the findings of experts, there is no universal, best MCDA method that would guarantee the

highest accuracy of the evaluation. Each MCDA method has its own specific properties and logic, so there may be discrepancies in the evaluation results obtained with each method. Some authors point to the existence of model risk associated with deformation of results obtained by applying different methods, while reflecting on the results of research studies. Therefore, to complement the reliability of the results, complementary application and subsequent comparison of the results of several methods to solve a given complex problem is recommended. This study reflects on this fact and it focuses on the analysis and assessment of stability of the Czech and Slovak commercial banks using selected methods. Consequently, quantification of potential differences in the results of individual methods and justification of the causes were applied.

The results of the study are consistent with the results of the study by authors Ginevičius and Podviezko (2013), they also show the least variation in the results obtained by applying various methods of MCDA. Therefore, they recommend the application of multiple MCDAs at the same time and confront their results to increase their reliability. Examining only one type of bank may not reveal parameters of change in performance, as confirmed by the results of the study by Diaconu and Oanca (2014), Kosmidou and Zopounidis (2008) and Groeneveld and De Vries (2009) in investigating the stability of commercial and cooperative banks. Their results in the group of investigated commercial banks are consistent with our findings, where no significant determinants were found. Examining the performance and stability of multiple groups of banks at the same time will make it easier to uncover the causes of changes in performance by setting benchmarking criteria common to multiple groups of banks. The accuracy of the results can also be enhanced by sensitivity analysis, scenarios, application simulations and neural networks (Stehell *et al.* 2016). Research findings need to be interpreted with the results of macroeconomic analyzes of the country and support the creation of benchmark parameters at national and international level. This requires access to the quality data base of each country.

In addition to these findings, the significant contribution of the study may be visible in addressing the issue in the possibility of creating specific reference groups of methods (including selected types of methods for precisely defined groups of banking entities) the applicability of which would be linked either to entities with different performance, different product portfolios, branches, with a very specific structure of bank services offered, etc. This would greatly clarify the process of selecting appropriate methods in the context of set goals of different comparisons. It would create pressures for further development and criticism of the results of application of methods, both by the research community, as well as professional sphere in order to improve their applicability and usability (analysts, policy makers, etc.). Consequently, it would result in more accurate results of analyzes and evaluations, eliminating interpretation constraints as well as limiting international and national benchmarking of rated entities. In view of the stronger processes of globalization and the impact of the economic crisis, the justification for the permanent development and improvement of the methodologies mentioned, their applicability and usability in the various types of policies has increased significantly. This also contributes to the increased activation of international research teams.

Conclusions

The aim of the study was to evaluate the performance of the Czech and Slovak banking sector through selected methods and to compare the results obtained through these methods, to quantify the differences and to justify the reasons for their existence. The results of the analysis show that all the performance evaluation methods that were reviewed have roughly the same results. For some banks, there may be visible more significant shifts between different methods. This could lead to a high correlation not only between methods based on the use of weights, but also between Ranking method, which did not take into account the scales in the calculation. If individual weights were diametrically different, this could lead to differences in results obtained from different methods. Research limits: In the future, it is also advisable to orient research to verify this assumption, and we can use other methods to determine weights. In practice, the frequently used method is also to conduct a questionnaire survey among expert bankers who, on the basis of personal experience and subjective perception, attach importance to individual criteria. Consequently, using basic scoring methods, ordering methods, or more sophisticated methods, for example Saaty or Fuller method determined the weighting of the individual evaluation criteria. The comparison of our results with foreign research findings has revealed further possibilities for obtaining more accurate results, both by applying a wider spectrum of MCDA methods, as well as by selecting and testing the evaluation criteria on a heterogeneous sample. Significant recommendations from research teams abroad can be seen in the application of support methods, for example sensitivity analysis, simulation applications, and analyzes of the macroeconomic environment in which banks operate. This may reveal many facts and help set specific assessment criteria within applied multi-criteria methods. These findings open up scope for further investigations and other methodological lines that would support the development of analytical methods even in the case of homogeneous samples of banking entities. Attention is also paid to the role of non-financial indicators, which may greatly eliminate the disadvantages of the unified structure of some methods, and take more into account the specific processes of banks. These may have a significant impact on the growth of their competitiveness.

As the novelty of our research can be considered the application of multi-criteria methods to evaluate the performance of banks within the specified group. The advantage of these methods is, that in the process of evaluation we can take into account not only one criterion, but several criterions can be considered. The evaluated banks are compared each other from the point of view of each criterion. As the result of the analysis is the ranking of the most performed banks, which have been identified as the most performed following all criteria. The significant advantage of multi-criteria methods compared to simple ratio analysis is, that the banks within the evaluation set are evaluated simultaneously on a number of criteria. The bank which could be evaluated as the most performed based on the one criterion in ratio analysis, may not be the most performed taking into account all criteria. The advantage of multi-criteria methods is that there is no limitation how many criteria could be evaluated. This method could be also used to set up the most performed banks, or bank branches, but also to find the most suitable bank products (e.g. loan, mortgage, bank account) for potential bank clients. This method uses the pairwise comparison which able to compare different alternatives and criteria.

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Contribution

Jaroslav Belas initiated a research and a manuscript. Jaroslav Belas and Beata Gavurova proposed study design, conducted literature search and data analysis. Kristina Kocisova and Tomas Kliestik participated in the analysis of data and their interpretation and creation of conclusions. All the authors participated in the final assembly of the manuscript and approved the final form.

Disclosure statement

The authors do not have any competing financial, professional, or personal interests from other parties.

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