

SECTION 1. Macroeconomic processes and regional economies management

Marek Meheš (Slovak Republic), Slavomíra Stašková (Slovak Republic), Adela Feranecová (Slovak Republic), Veronika Ragányová (Slovak Republic)

Selecting the savings account in the Slovak Republic

Abstract

There are currently many investment and financial products that can be used for capitalizing of savings. Although investments in various commodities, shares, securities, or funds can be with high yields, it requires some knowledge and experience. Unattempted investor may experience unpleasant surprise of possible losses of greater amount of money, as such investments are generally associated with a higher risk. For these reasons, the majority of the population remains in the Slovak Republic faithful to traditional forms of capitalizing of funds. One of these forms are savings accounts in banks. The main purpose of this paper is to find possibly the best savings account in the Slovak Republic. In cooperation with experts from the field of banking, the authors have defined the selection criteria of savings accounts, assessed their importance and, then, they have arranged savings accounts offered in the Slovak Republic according to achieved score. For this purpose, methods of multicriteria decision making were used. These methods are based on the evaluation of several alternative solutions based on multiple criteria. These criteria must be assigned by weights which represent their importance in decision making process. These weights were calculated using the Saaty's method, which is a method based on mutual comparison of all the criteria. For final ranking of term deposits, taking into account the weights of the criteria, the method TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) was used.

Keywords: savings, banking products, savings accounts, multicriteria decision making.

JEL Classification: E21, G21.

Introduction

Savings account is a short-term product that is a combination of current account and term deposit. Banks mostly do not charge any fees for establishment, management and dissolution of savings account. Savings account is suitable for clients who want to save only small amounts, and also for those who need to keep their money available at any time. This benefit of availability is accompanied by a lower interest rate, which is, on the other hand, still at a higher level than with current accounts. There are two types of savings accounts: a savings account without notice, from which one can withdraw funds at any time and savings account with a notice period where client's funds are available after some time, since the bank was declared (give notice) to withdraw a certain amount of funds. The notice period is variable and can take days, weeks, as well as months. In general, savings accounts should be used to store money for a period not exceeding one year. These funds should serve as a financial reserve, which may, if necessary,

be at disposal almost immediately. For money saving for long-term period, term deposits with higher appreciation are more appropriate.

1. Methodology

To meet our goal to select the most proper savings account in the Slovak Republic, we have used the methods of multicriteria evaluation of options. These methods are used in decisionmaking situations, where among the set of admissible alternatives (options) one alternative (option) is selected based on multiple criteria. The various criteria and options are before assessment grouped into criterial matrix $Y = (y_{ij})$, where the lines represent options of $a_1, a_2, \dots, a_m$ and columns represent criteria $f_1, f_2, \dots, f_n$. Criteria must be quantitative in nature. Otherwise, there are methods to transform the qualitative criteria like scoring, marking and so on. Particular savings accounts selection criteria were defined together with experts from the field of banking. After defining all relevant criteria (these criteria will be discussed later), it was necessary to assign weights to each criterion in order to determine their importance. According to these weights, we could conclude how much one criterion is more preferred over the other. In order to determine weight to each criterion the Saaty's method was used. Saaty's method or quantitative method of paired comparison is the most complex and the most widely used method of determining the weights of the criteria. The result of this method is called as objectified weight, because the aim is to reduce subjectivity. Saaty's method is based on paired comparison – compares each pair of criteria

© Marek Meheš, Slavomíra Stašková, Adela Feranecová, Veronika Ragányová, 2016.

Marek Meheš, Ph.D., Faculty of Business Economics with seat in Košice, Department of Economics, University of Economics in Bratislava, Slovak Republic.

Adela Feranecová, Ph.D., Faculty of Business Economics with seat in Košice, Department of Corporate Financial Management, University of Economics in Bratislava, Slovak Republic.

Slavomíra Stašková, Faculty of Business Economics with seat in Košice, Department of Quantitative Methods, University of Economics in Bratislava, Slovak Republic.

Veronika Ragányová, Faculty of Business Economics with seat in Košice, Department of Economics, University of Economics in Bratislava, Slovak Republic.

and results enter into the so-called Saaty's matrix $S = (s_{ij})$, where $i, j = 1, 2, \dots, n$. The elements of matrix s_{ij} can be interpreted as estimates of the proportion of weights of i -th and j -th criterion (Jablonský, 2007):

$$s_{ij} \approx \frac{v_i}{v_j}, i, j = 1, 2, \dots, n. \quad (1)$$

For elements of the matrix, S is valid, $s_{ii} = 1$, $i = 1, 2, \dots, n$, that means there is value of 1 on the diagonal, and it is also valid that $s_{ij} = 1/s_{ji}$, $i, j = 1, 2, \dots, n$, so that the elements under the main diagonal have the value of the inverse value of elements above this diagonal (Brozova, Buns, 2002):

$$S = \begin{bmatrix} 1 & s_{12} & \dots & s_{1n} \\ 1/s_{12} & 1 & \dots & s_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/s_{1n} & 1/s_{12} & \dots & 1 \end{bmatrix}. \quad (2)$$

To express a size of preference, the Saaty's point scale ranging from 1 – 9 was used. A value of 1 means that two criteria are of equal importance and value of 9 means that the importance of one criterion exceeds the absolute importance of the other. There is also an advantage that preferences can be expressed in a verbal way. Saaty's (Saaty, 1997) interpretation of individual point values can be seen in Table 1.

Table 1. Saaty's scale of importance

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance	Experience and judgement slightly favor one activity over another
5	Essential or strong importance	Experience and judgement strong by favor one activity over another
7	Demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between the two adjacent judgements	Where compromise is needed

Source: according to Saaty (1977).

There are many methods that are used to choose the compromise option from the set of all possible options. In this paper, a method TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) was used. It is a method that requires cardinal information about preferences between options. It offers a configuration of set of options and it is also intended to select one option. There is an advantage that the computation has always the same number of steps, no matter the magnitude of the problem. Its principle is to minimize the distance from an ideal option and maximize

distance from the basal option (Velasquez, Hester, 2013). Before the calculation, it is fair to note one important thing. Some sources say that it is necessary in the initial criterion matrix y_{ij} to convert minimization criteria to maximization criteria. However, the original version of the TOPSIS method from authors Hwang and Yoon (1981) does not perform this conversion. According to Houska, Domeova, Berankova (2012), this conversion can significantly distort results. In our paper, therefore, these calculations are carried out without conversion. The procedure of applying TOPSIS method is as follows (C. Muntean, Muntean, M., 2010; Baker, Furková, 2014):

Step 1: We create a standardized matrix $R = (r_{ij})$ according to formula:

$$r_{ij} = \frac{y_{ij}}{\sqrt{\sum_{i=1}^m y_{ij}^2}}, i = 1, 2, \dots, m, j = 1, 2, \dots, n. \quad (3)$$

Step 2: We create weighted criterial matrix $W = (w_{ij})$ according to formula:

$$w_{ij} = v_j r_{ij}. \quad (4)$$

Step 3: From the elements of the matrix W , we determine the ideal option H with the criterion values $(h_1, \dots, h_n)$ and basal option D with values $(d_1, \dots, d_n)$, where:

$$H_j = \max(w_{ij}), D_j = \min(w_{ij}), j = 1, 2, \dots, n. \quad (5)$$

Step 4: We calculate the distance of each option from ideal and basal option:

$$d_i^+ = \sqrt{\sum_{j=1}^n (w_{ij} - h_j)^2}, i = 1, 2, \dots, m, \quad (6)$$

$$d_i^- = \sqrt{\sum_{j=1}^n (w_{ij} - d_j)^2}, i = 1, 2, \dots, m. \quad (7)$$

Step 5: We calculate indicator c_i as a relative distance of options from basal variant:

$$c_i = \frac{d_i^-}{d_i^- + d_i^+}, i = 1, 2, \dots, m. \quad (8)$$

Values c_i are from interval $< 0, 1 >$, while value of 0 takes basal option and value of 1 takes ideal option. If we arrange the options c_i in ascending order, we will get comprehensive configuration of these options.

2. Selection of savings account in the Slovak Republic

As we have already mentioned, savings account is a type of savings products for clients who want to save especially small amounts and where money on deposit should be in case of need available at any moment. According to this fact, we have excluded

from the analysis the term savings accounts and savings accounts which require a minimum deposit of more than 1,000 €. On the other hand, products with notice have been included, because its length is only few days and more, and fees for withdrawing funds are considerably lower. Under consideration were also taken only products in their basic form with the basic interest rate, or the preferential rate. To obtain the preferential rate banks usually require the fulfilment of various conditions that could be divided into two groups:

1. One must have a current account at the bank, must monthly achieve a certain credit turnover, must make a certain number of regular payments or credit card payments and does not execute debit from the savings account.
2. Second group of conditions concerns the savings account itself (in order to obtain a preferential interest rate). It may involve the need of regular monthly deposits of certain minimum amount or limits for monthly deposits or limits for the maximum balance and so on.

In this paper, we present the results of finding the most proper savings account for clients who already have their current account at another bank and have interest to set up a saving account. The establishment of another current account as a condition for obtaining a preferential interest rate is quiet limiting. The conditions of the second group are more acceptable and, therefore, we will take them into account. The process of comparison after this initial selection will involve 28 options. These options represent 28 savings accounts, which we will term $a_1, a_2, \dots, a_{28}$. All these savings accounts are listed in Table 2.

Table 2. Basic set of savings accounts

Option	Name of savings account
a_1	Sporiaci účet Depozit (Československá obchodná banka, a. s.),
a_2	Sporiaci účet s Extra úročením (Československá obchodná banka, a.s.)
a_3	Sporiaci účet Štandard (Československá obchodná banka, a.s.)
a_4	otp SPORIACI účet k bežnému účtu otp KONTO (OTP Banka Slovensko, a.s.)
a_5	Dobré sporenie Rezerva (Poštová banka, a.s.)
a_6	Zlatý vklad (Poštová banka, a.s.),
a_7	Privatbanka BONUS konto (Privatbanka, a.s.)
a_8	Privatbanka SAVING konto (Privatbanka, a.s.)
a_9	Sporenie Lišiak (Prvá stavebná sporiteľňa, a.s.)
a_{10}	Sporiaci účet k programu služieb môjÚČETactive (Sberbank Slovensko, a.s.)
a_{11}	Sporiaci účet k programu služieb môjÚČETactive – zvýhodnená úroková sadzba (Sberbank Slovensko, a.s.)
a_{12}	Vkladový účet s výpovednou lehotou (Sberbank Slovensko, a.s.)
a_{13}	Sporenie k účtu – Osobný účet (Slovenská sporiteľňa, a.s.)
a_{14}	Sporiaci systém k balíku služieb Tatra Personal ^{ITB} (Tatra banka, a.s.)
a_{15}	Sporiaci systém k balíku služieb Tatra Personal ^{ITB} – zvýhodnená úroková sadzba (Tatra banka, a.s.)

a_{16}	Sporiaci účet – VÚB Účet (Všeobecná úverová banka, a.s.)
a_{17}	Sporiaci účet – VÚB Účet – zvýhodnená sadzba (Všeobecná úverová banka, a.s.)
a_{18}	BKS Online sporiaci účet (BKS Bank AG)
a_{19}	Sporiaci účet Fio konto (Fio banka, a.s.)
a_{20}	Sporiaci účet mSporenie (mBank S.A.)
a_{21}	Sporiaci účet eMax (mBank S.A.)
a_{22}	Sporiaci účet eMax plus (mBank S.A.)
a_{23}	Sporiaci účet ŠPECIÁL (Oberbank AG)
a_{24}	Effective účet (UniCredit Bank Czech Republic and Slovakia, a.s.)
a_{25}	Sporenie s ÚČTOM (ZUNO BANK AG)
a_{26}	Sporenie s ÚČTOM PLUS (ZUNO BANK AG)
a_{27}	Sporenie plus s ÚČTOM (ZUNO BANK AG)
a_{28}	Sporenie plus s ÚČTOM PLUS (ZUNO BANK AG)

Source: own research.

3. Establishment of criteria

As can be seen in Table 2, our conditions has met initially set of 28 savings accounts. To become familiar with the wide range of savings accounts and make a selection of one potentially the most proper product, a comprehensive approach was required. It was necessary to take into account several factors and, thus, determine the criteria on which the analysis was based. These criteria were selected after studying all available information about above listed savings accounts. Subjective view can't be removed completely, but we tried to reduce it. Suitability of selected criteria was, therefore, consulted with experts in the field of banking. As a result of the own research and conversations with experts, final selection of 11 criteria, which are designated as $f_1, f_2, \dots, f_{11}$, was set. Their description also with their nature, can be seen in Table 3 below.

Table 3. The list of criteria for selection of savings accounts in the Slovak Republic

f_n	Criteria	Nature of criteria
f_1	The need to keep the current account (qualitative criterion)	MIN
f_2	Account management fee (EUR/month)	MIN
f_3	Minimum deposit (EUR)	MIN
f_4	The notice period (days, months)	MIN
f_5	Interest rate (% per annum)	MAX
f_6	Frequency of interests ascription (qualitative criterion)	MAX
f_7	The minimum monthly deposit (EUR)	MIN
f_8	Withdrawal fee (EUR)	MIN
f_9	Limited amount of monthly deposit (EUR)	MAX
f_{10}	Maximum balance (EUR)	MAX
f_{11}	Minimum balance (EUR)	MIN

Source: own research.

The need to have a current account – a criterion in itself carries the information, if it is possible to set up a savings account as an individual product, or it is linked to the current account in the bank. At first glance, it is perhaps an insignificant criterion, but a

potential client, who has the current account already established elsewhere, may have a problem with that. Therefore, we propose to minimize this criterion. *Account management fee* – if the bank charges fees for management of savings account, an indication of the amount of the fee can be found right here in this criterion. If it is necessary to set up the current account (with periodical fee) to savings account, this information is also included here. Since the fee is cost, it should be minimized.

Minimum deposit indicates the amount of money that should be deposit on savings or current account at its opening. Typically, when is savings account linked to the current account, bank will automatically transfer the amount to a savings account. In other cases, it is up to client. For the client is better that the opening of the account is linked to the lower deposit amount, thus, we minimize this criterion. *The notice period* – some savings accounts are offered with notice period, which ranges from 7 days to 3 months. Although these products should allow "immediate" withdrawal of funds, if necessary, which is disrupted with this criterion, short notice period may still be acceptable. The criterion is to minimize, because for the client, the opportunity of immediate withdrawal is preferable. *Interest rate* – higher interest rate means higher returns and, therefore, this criterion is maximized.

Frequency of interest ascription – it is the frequency (period), in which the interest is deposit to the account. In this case, we can meet the annual, half-yearly, quarterly and monthly frequency. It is valid that the more often interest is received, the more profitable is the product, thus, we maximize the criterion. *The minimum monthly deposit* means that the client is required to deposit each month a minimum amount of money to the savings account (in order to get preferential rate). We chose to minimize the nature of this criterion, because the fewer restrictions, the better. *Withdrawal fee* – some banks have savings accounts with withdrawal fees. Banks don't determine The hight of these fees in the same way and they are given in different units (in percentage, in Euro, in loss of interest, etc.). If we wanted this criterion to be included in the comparison, it was necessary to transform the data. Therefore, we set a model example that allowed us to compare the amount of the fee – the client has on savings account an amount of 3,500 EUR. However, there was a malfunction of his car and the repair will cost 1,000 EUR. The client decides to use funds from the savings account to cover the repair. As the car is used on a daily basis, the defect must be

removed as soon as possible and funds must be available almost immediately. Criterion is minimized, because withdrawal fee of funds in case of savings account is disadvantageous.

Limited amount of monthly deposit indicates the maximum amount of money, that can be deposit on savings account during a particular period (in order to get preferential rate). We have chosen to maximize the nature of the criterion, because if the client decides to save money, it should not be restricted to the amount, which he/she can deposit into the account. *Maximum balance* – in our case, this criterion determines the maximum amount of funds that a client may have in the account. If this amount is exceeded, the client will lose the preferential rate, which is undesirable, therefore we maximize the criterion. *Minimum balance* a client can handle only with funds in the amount of the minimum balance, so, we minimize this criterion. When exceeded this minimal balance, the bank asks the client to deposit funds to this limit, or close the savings account. If the savings account is linked to the current account and the current account has a minimum balance, this is also referred in this criterion

4. Assessment of weights of the selected criteria

The next step, following the establishment of criteria based on which savings products were compared, was determination of their weights. Weights reflect the importance of individual criteria, while the higher the weight, the more important the criterion. Thus, particularly by virtue of them, the potential client will decide to select the savings product. As we have already mentioned, the weights were set by using the Saaty's method based on pairwise comparisons. Similar to the selection of criteria, determining their importance took place also on the basis of interviews with experts in the banking sector. The entire calculation and data entry associated with it have been carried out in an application of MS Excel – Sanna.

Table 4 depicts the input data that were the basis for the calculation of weights. It is a Saaty's matrix S with elements s_{ij} , where all the criteria are compared with each other, and values are assigned by Saaty's point scale. On the diagonal, there is always the value of 1, because in this case, the criterion is compared with itself. For example, we can mention the element s_{89} with value 3, which means that the criterion of payment for "withdrawal" has less importance than the criterion "limited amount of monthly deposit" and, thus, we can discuss all the elements of the matrix.

Table 4. Saaty's matrix for savings accounts

	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}
f_1	1.00000	0.14286	0.25000	0.20000	0.14286	0.50000	0.20000	0.16667	0.20000	0.25000	0.25000
f_2	7.00000	1.00000	5.00000	2.00000	1.00000	5.00000	2.00000	1.00000	2.00000	4.00000	4.00000
f_3	4.00000	0.20000	1.00000	0.16667	0.16667	0.50000	0.25000	0.20000	0.25000	4.00000	4.00000
f_4	5.00000	0.50000	6.00000	1.00000	0.25000	3.00000	0.50000	0.25000	0.50000	3.00000	3.00000
f_5	7.00000	1.00000	6.00000	4.00000	1.00000	6.00000	3.00000	1.00000	3.00000	4.00000	4.00000
f_6	2.00000	0.20000	2.00000	0.33333	0.16667	1.00000	0.33333	0.16667	0.33333	0.50000	0.50000
f_7	5.00000	0.50000	4.00000	2.00000	0.33333	3.00000	1.00000	0.33333	1.00000	3.00000	3.00000
f_8	6.00000	1.00000	5.00000	4.00000	1.00000	6.00000	3.00000	1.00000	3.00000	3.00000	3.00000
f_9	5.00000	0.50000	4.00000	2.00000	0.33333	3.00000	1.00000	0.33333	1.00000	3.00000	3.00000
f_{10}	4.00000	0.25000	0.25000	0.33333	0.25000	2.00000	0.33333	0.33333	0.33333	1.00000	1.00000
f_{11}	4.00000	0.25000	0.25000	0.33333	0.25000	2.00000	0.33333	0.33333	0.33333	1.00000	1.00000

Source: own processing.

After filling the entire Saaty's matrix, we could proceed to the calculation of the weights. Although we have speeded this process by using MS Excel application Sanna, it can be quite easily calculated in

Excel through GEOMEAN (geometric mean of line) and SUM (sum of geometric means). Subsequently, geometric means of lines are divided by their sum. The values of weights of criteria are shown in Figure 1.

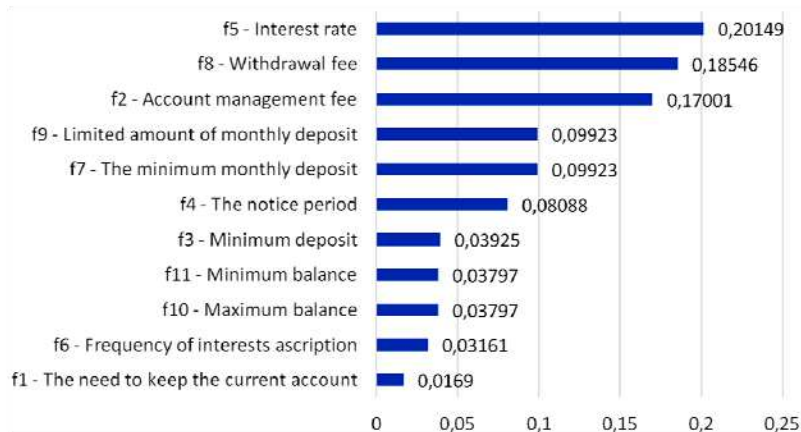


Fig. 1. Criteria weights of savings accounts

Source: own processing.

It is obvious from Figure 1 that the individual criteria could be, according to the value of their weights, divided into three groups. The first group would be made up of criteria – interest rate, payment for withdrawal and account management fee, which together reach a majority share (57%) of the weights of all criteria. The highest weight of 0.20149 achieves the criterion of interest rate, which is followed by a withdrawal fee (0.18546) and account management fee (0.17001). We can conclude that this is a set of criteria that has the highest importance for customers in the selection of savings account. It is quite logical that the first places in importance were occupied precisely by these criteria. The funds in the savings account should serve as a reserve, which the client, in case of need, should be able to use almost immediately. Withdrawal fee is, therefore, necessary to minimize and also due to the low interest rate should be maintained at a low level. Finally, several surveys have shown (e.g., survey conducted for Post bank) that for the clients, it is important to have their

money available at any time, even at the cost of lower interest rate. It is also important to consider fees for account management (also for current account if it is required) in order to avoid the situation where the amount of fees exceeds interests.

Another group with share of 27.93% also consists of three criteria – limited amount of monthly deposit, minimum monthly deposit and notice period, while first two of these criteria have the same weight of 0.09923. If the client has already decided to save some funds, he should not be limited by the amount, which may be deposit to the account. In our case, the same applies to the obligation to deposit the certain minimum amount each month. Although it is recommended to regularly save some share of income, establishing this minimum amount by the bank is restrictive and may not suit everyone. The third group includes the remaining five criteria. The lowest weight of 0.01692 and, therefore, the least important criterion considered is the need to keep the current account in the bank.

Results

Once the criteria for analyses of savings accounts were set and weights that represent the importance of these criteria in the decisionmaking process were determined, we could proceed to the overall evaluation of options (in our case, the savings accounts). We have used the method TOPSIS, which has provided the best option with respect to the chosen criteria and also has arranged all options in descending order. Similarly, as by the determination of weights, also in this case, the calculation was carried out in MS Excel application Sanna.

The basis for the analysis were data of the value of the criteria, which have achieved individual options. This data are summarized in the so-called criterial matrix Y , where rows represent individual savings accounts and columns represent criteria. Selected options $a_1, a_2, \dots, a_{28}$, and the criteria $f_1, f_2, \dots, f_{11}$ have been presented above. Some of the criteria are of qualitative nature, or contain values which, for the purposes of further analysis, were needed to transform. Table 5 presents the criterial matrix of values after the transformation of data.

Table 5. Criterial matrix – savings accounts

a_m	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}
a_1	0	0.00	15.00	3	0.30	4	0.00	0.94	2	4	0.00
a_2	0	0.00	15.00	2	0.10	4	15.00	5.00	2	4	0.00
a_3	0	0.00	15.00	2	0.10	4	0.00	5.00	2	4	0.00
a_4	1	2.69	0.00	1	0.40	4	0.00	0.00	2	4	7.00
a_5	0	0.00	10.00	1	0.50	4	0.00	1.02	2	4	10.00
a_6	0	0.00	7.00	5	0.90	1	0.00	40.00	2	4	7.00
a_7	0	0.00	20.00	1	0.15	3	0.00	0.00	2	4	20.00
a_8	0	0.00	0.00	1	0.80	3	0.00	0.00	2	3	0.00
a_9	0	0.00	0.00	1	0.50	1	0.00	0.00	2	4	0.00
a_{10}	1	4.99	10.00	1	0.05	4	20.00	0.00	2	4	10.00
a_{11}	1	4.99	10.00	1	1.05	4	20.00	2.09	2	3	10.00
a_{12}	0	0.00	300.00	3	0.80	3	0.00	5.00	2	4	0.00
a_{13}	1	5.90	0.00	1	0.30	4	10.00	0.00	1	4	10.00
a_{14}	1	7.00	0.00	1	0.01	4	0.00	0.00	2	4	0.00
a_{15}	1	7.00	0.00	1	0.50	4	15.00	1.02	2	4	0.00
a_{16}	1	6.00	6.00	1	0.30	4	0.00	0.00	2	3	6.00
a_{17}	1	6.00	6.00	1	0.50	4	10.00	0.42	1	3	6.00
a_{18}	1	3.00	100.00	1	1.00	1	0.00	0.00	2	4	0.00
a_{19}	1	0.00	10.00	1	0.03	1	0.00	0.00	2	4	10.00
a_{20}	1	0.00	0.00	1	1.40	4	0.00	0.00	2	1	0.00
a_{21}	0	0.00	0.00	1	0.05	4	0.00	0.00	2	4	0.00
a_{22}	1	0.00	0.00	1	0.15	4	0.00	0.00	2	4	0.00
a_{23}	0	0.00	0.00	1	0.125	1	0.00	0.00	2	4	0.00
a_{24}	0	0.00	50.00	4	0.20	4	0.00	10.00	2	4	50.00
a_{25}	1	0.00	0.00	1	0.40	4	0.00	0.00	2	4	0.00
a_{26}	1	2.80	0.00	1	0.60	4	0.00	0.00	2	4	0.00
a_{27}	1	0.00	0.00	1	0.80	4	0.00	1.67	2	2	0.00
a_{28}	1	2.80	0.00	1	1.10	4	0.00	2.29	2	2	0.00

Source: own, according to products' portfolios of banks.

From the Table, it is clear that the criteria f_1, f_4, f_6, f_9 and f_{10} have undergone modification. The meaning of their individual values, respectively, a defined method of quantification is shown in the table below.

Table 6 Quantification of qualitative criteria of savings accounts

Criterion	0	1	2	3	4	5
f_1 : The need to have a current account	NO	YES				
f_4 : Notice period		NO	<1 day, 1 month)	<1 month, 2 months)	<2 months, 3 months)	<3 months, ∞)
f_6 : Frequency of interest ascription		per annum	per semester	per quartale	per mensem	
f_9 : Limited amount of monthly deposit		(0 EUR, 5 000 EUR>	(5 000 EUR, ∞>			
f_{10} : Maximum balance		(0, 10 000 EUR>	(10 000 EUR, 25 000 EUR>	(25 000 EUR, 50 000 EUR>	(50 000 EUR, ∞>	

Source: own calculations, according to products' portfolios of banks.

As can be seen, two criteria f_1 and f_6 are purely of qualitative nature, therefore, the transformation was necessary. By the criteria f_4 , f_9 and f_{10} , ranges have been established because of the large distance of values, which could lead to undesirable distortion of the results. Interval (EUR 5 000, ∞) at f_9 criterion carries information that the deposit amount is not limited and interval (50 000 EUR, ∞) at f_{10} criterion carries information, that the height of the maximum balance is not determined.

In the next step, we have done a test of dominance (also in Sanna), because an option, which dominates

cannot be involved in the analyses. It is for the reason that to these dominated options, there is another option, which reaches better values across all criteria. Therefore, it is appropriate at the beginning of evaluation to remove these dominated options, which will also lead to the reduction of permissible options. After the test of dominance, we have discarded from the set of all permissible options 12 options. So, in the analyses, we have taken into consideration only a set of 16 non-dominated options, namely a_1 , a_3 , a_5 till a_9 , a_{11} , a_{12} , a_{18} , a_{20} , a_{21} , a_{25} till a_{28} .

Table 7. Weighted criterial matrix for savings accounts

	MIN f_1	MIN f_2	MIN f_3	MIN f_4	MAX f_5	MAX f_6	MIN f_7	MIN f_8	MAX f_9	MAX f_{10}	MIN f_{11}			
a_1	0,00000	0,00000	0,00185	0,03159	0,01999	0,00917	0,00000	0,00427	0,02481	0,01066	0,00000	0,07639	0,24267	0,76058
a_3	0,00000	0,00000	0,00185	0,02106	0,00666	0,00917	0,00000	0,02273	0,02481	0,01066	0,00000	0,09017	0,23014	0,71848
a_5	0,00000	0,00000	0,00123	0,01053	0,03331	0,00917	0,00000	0,00464	0,02481	0,01066	0,01490	0,06197	0,24513	0,79822
a_6	0,00000	0,00000	0,00086	0,05265	0,05996	0,00229	0,00000	0,18184	0,02481	0,01066	0,01043	0,19001	0,17134	0,47416
a_7	0,00000	0,00000	0,00247	0,01053	0,00999	0,00688	0,00000	0,00000	0,02481	0,01066	0,02981	0,08851	0,24610	0,73548
a_8	0,00000	0,00000	0,00000	0,01053	0,05329	0,00688	0,00000	0,00000	0,02481	0,00799	0,00000	0,04013	0,25307	0,86315
a_9	0,00000	0,00000	0,00000	0,01053	0,03331	0,00229	0,00000	0,00000	0,02481	0,01066	0,00000	0,06035	0,24993	0,80550
a_{11}	0,00640	0,12048	0,00123	0,01053	0,06995	0,00917	0,09923	0,00950	0,02481	0,00799	0,01490	0,15896	0,19363	0,54917
a_{12}	0,00000	0,00000	0,03703	0,03159	0,05329	0,00688	0,00000	0,02273	0,02481	0,01066	0,00000	0,06273	0,23158	0,78687
a_{18}	0,00640	0,07243	0,01234	0,01053	0,06662	0,00229	0,00000	0,00000	0,02481	0,01066	0,00000	0,07872	0,22926	0,74440
a_{20}	0,00640	0,00000	0,00000	0,01053	0,09327	0,00917	0,00000	0,00000	0,02481	0,00266	0,00000	0,01024	0,26381	0,96264
a_{21}	0,00000	0,00000	0,00000	0,01053	0,00333	0,00917	0,00000	0,00000	0,02481	0,01066	0,00000	0,08993	0,24822	0,73404
a_{25}	0,00640	0,00000	0,00000	0,01053	0,02665	0,00917	0,00000	0,00000	0,02481	0,01066	0,00000	0,06692	0,24923	0,78832
a_{26}	0,00640	0,06760	0,00000	0,01053	0,03997	0,00917	0,00000	0,00000	0,02481	0,01066	0,00000	0,08632	0,22626	0,72384
a_{27}	0,00640	0,00000	0,00000	0,01053	0,05329	0,00917	0,00000	0,00759	0,02481	0,00533	0,00000	0,04153	0,24760	0,85637
a_{28}	0,00640	0,06760	0,00000	0,01053	0,07328	0,00917	0,00000	0,01041	0,02481	0,00533	0,00000	0,07175	0,22585	0,75892
Váhy	0,01692	0,17001	0,03925	0,08088	0,20149	0,03161	0,09923	0,18546	0,09923	0,03797	0,03797			
Ideální	0,00000	0,00000	0,00000	0,01053	0,09327	0,00917	0,00000	0,00000	0,02481	0,01066	0,00000			
Bazální	0,00640	0,12048	0,03703	0,05265	0,00333	0,00229	0,09923	0,18184	0,02481	0,00266	0,02981			

Source: own calculations.

Subsequently, we have created a normalized criterial matrix R . The elements of this matrix were multiplied by the appropriate weights and a criteria-weighted matrix W was established. From its elements, we have

reached by several calculations the value of the indicator c_i . We have got the final layout of options (savings accounts) and so the recommendation of the best option after arrangement of c_i values (Table 8).

Table 8. Final arrangement of savings accounts according to chosen criteria

Order	a_m	Option	c_i
1	a_{20}	Sporiaci účet mSporenie (mBank S.A.)	0.96264
2	a_8	Privatbanka SAVING konto (Privatbanka, a.s.)	0.86315
3	a_{27}	Sporenie plus s ÚČTOM (ZUNO BANK AG)	0.85637
4	a_9	Sporenie Lišiak (Prvá stavebná sporiteľňa, a.s.)	0.80550
5	a_5	Dobré sporenie Rezerva (Poštová banka, a.s.)	0.79822
6	a_{25}	Sporenie s ÚČTOM (ZUNO BANK AG)	0.78832
7	a_{12}	Vkladový účet s výpovednou lehotou (Sberbank Slovensko, a.s.)	0.78687
8	a_1	Sporiaci účet Depozit (Československá obchodná banka, a.s.)	0.76058
9	a_{28}	Sporenie plus s ÚČTOM PLUS (ZUNO BANK AG)	0.75892
10	a_{18}	BKS Online sporiaci účet (BKS Bank AG)	0.74440
11	a_7	Privatbanka BONUS konto (Privatbanka, a.s.)	0.73548
12	a_{21}	Sporiaci účet eMax (mBank S.A.)	0.73404
13	a_{26}	Sporenie s ÚČTOM PLUS (ZUNO BANK AG)	0.72384
14	a_3	Sporiaci účet Štandard (Československá obchodná banka, a.s.)	0.71848
15	a_{11}	Sporiaci účet k programu služieb môjÚČETactive – zvýhodnená úroková sadzba (Sberbank Slovensko, a. s.)	0.54917
16	a_6	Zlatý vklad (Poštová banka, a.s.)	0.47416

Source: own processing.

In the above table, we can see the final alignment of individual savings accounts, from the best to the worst, based on specified criteria. In the first place with the value of 0.96264 is savings account mSPORENIE from mBank, which was, in 2014 and 2015, also awarded by the Golden Coin for the best savings account in Slovakia. In the second place with value of 0.86315 is savings account of Privatbanka (SAVING konto), which is followed by savings account of ZUNO BANK (Sporenie plus) with the value of 0.86537. The last two places were placed savings accounts mŕjÚČETactive of Sberbank and Zlatý vklad of Pořtová banka.

The domain of savings account mSPORENIE is its interest rate of 1.40% per annum, which is the highest among all savings accounts. The second highest interest rate offers savings account Sporenie plus by ZUNO BANK, but this product lost points compared to mSPORENIE in criteria – the need to have current account in the bank, where ZUNO Bank charges a monthly fee of € 2.80 for account management and also has a higher withdrawal fee in the form of loss of all interest.

mSPORENIE does not require any minimum deposit or balance, is also without notice and although its establishment is determined to the existence of the current account in the bank, its management is free of charge. First withdrawal in the month is free, for each additional is charged 1 €. The monthly amount of money that the client has to deposit to the account mSPORENIE has no limit. Maximum allowable account balance is 4,000 EUR, if this amount is excessive, the interest rate will be reduced to 0.15% per annum. As a second alternative product, savings account by Privatbanka called SAVING konto is recommended. Compared with mSPORENIE, SAVING konto does not require the establishment of a

current account in the bank and the client may deposit funds at any time and in any amount. The maximum amount of the balance is 29,999 EUR, which is quite sufficient for savings account and, moreover, the withdrawal of funds is not limited in any way. On the other hand, the disadvantage is the lower interest rate of 0.80% per annum, which still can be included among those above the market average.

Conclusions

This paper aimed to compare and select the most advantageous savings account in Slovakia. Initially, we have selected and compared 28 savings accounts. After consultation with experts from the field of banking, we have selected 11 criteria on which the savings accounts were compared. It were the criteria – need to keep the current account, account management fee, minimum deposit, notice period, interest rate, frequency of interests ascription, minimum monthly deposit, withdrawal fee, limited amount of monthly deposit, maximum balance and minimum balance. Subsequently, the weights were set by using the Saaty's method based on pairwise comparisons. The entire calculation and data entry associated with it has been carried out in an application of MS Excel – Sanna. Finally, after the use of multicriteria evaluation method TOPSIS, after the dominance test, from 28 products, 16 savings accounts were selected that were ranked from best to worst. As the best alternative for saving resources by savings account, our analysis has shown a savings account mSPORENIE by mBank, mainly due to highest interest rate. Interestingly, savings accounts of traditional banks such as Slovenská sporiteľňa, Tatra Banka, Všeobecná úverová banka did not even take place in final ranking.

References

1. Brožová, H., Houška, M. (2002). *Základní metody operační analýzy*. Praha : ČZU v Praze.
2. Černý, M., Glůckaufová, D., Toms, M. (1980). *Metody komplexního vyhodnocování variant*. Praha: ACADEMIA.
3. Černý, M., Glůckaufová, D. (1988). *Vícekritériální vyhodnocování v praxi*. Praha: SNTL.
4. Eurostat. (2016). Household saving rate European Commission. Available at: <http://ec.europa.eu/eurostat/web/products-datasets/-/tsdec240>. Accessed on 01-05-2016.
5. Fiala, P., Jablonský, J., Maňas, M. (1994). *Vícekritériální rozhodování*. Praha: Vysoká škola ekonomická v Praze.
6. Frendáková, A. (2010). Vývoj sklonu k úsporám slovenských domácností v čase hospodárskej recesie, *National and regional economics VIII*. Available at: http://www3.ekf.tuke.sk/konfera2010/zbornik/files/konfera2010_zbornik.pdf. Accessed on 01/05/2016.
7. Friebelová, J. (2009). Vícekritériální rozhodování za jistoty. Available at: <http://www2.ef.jcu.cz/~jfrieb/tspp/data/teorie/Vicekritko.pdf>. Accessed on 01/05/2016.
8. Houska, M., Domeova, L., Berankova, M. (2012). The conversion of cost and benefit criteria in the TOPSIS method, *International Journal of Applied Decision Sciences*, 5 (4).
9. Hwang, C.L., Yoon, K. (1981). *Multiple Attribute Decision Making Methods and Applications*. Berlin : Springer Verlag.
10. Jablonský, J. (2007). *Operační výzkum: Kvantitativní modely pro ekonomické rozhodování*. Praha : Professional publishing.
11. Janda, J. (2011). *Spořit nebo investovat?* Praha: GRADA Publishing.
12. Jílek, J. (2009). *Akciové trhy a investování*. Praha: GRADA Publishing.
13. Kořteková, V., Nový, M. (2011). *Banky a finanční trhy*. Praha: Vysoká škola hotelová v Praze 8, spol. s r.o.

14. Medveď, J. a kol. (2012). *Banky : teória a prax*. Bratislava: Sprint 2 s.r.o.
15. Muntean, C., Muntean, M. (2010). Multicriterial Methods used in Expert Systems for Business Decision Making, *Informatica Economica*, 14 (3).
16. Národná banka Slovenska. (2016). Banky a iné úverové inštitúcie. Available at: <http://www.nbs.sk/sk/dohlad-nad-financnym-trhom-prakticke-informacie/zoznamy-subjektov-registre-a-formulare/zoznamy-subjektov/bankovnictvo/banky-a-ine-uverove-institutcie>. Accessed on 27/12/2016.
17. Pekár, J., Furková, A. (2014). *Prípadové štúdie z viackriteriálneho rozhodovania*. Bratislava: Ekonóm.
18. Pennels, S. (2015). Money & Savings Available at: http://www.legalandgeneral.com/_resources/pdfs/brand/RG_Money_and_Savings.pdf. Accessed on 27/12/2016.
19. Poštová banka, a.s. (2015). V bankách si šetíme najmä pre obavy z budúcnosti a výnosy, máme v nich uložených v priemere 6 platov Available at: https://www.postovabanka.sk/novinky/tlacove_spravy/v_bankach_si_setime_najma_pre_obavy_z_buducnosti_a_vynosy_mame_v_nich_ulozenych_v_priemere_6_platov/. Accessed on 18/1/2016.
20. Product's portfolio of mBank. Available at: <http://www.mbank.sk/>. Accessed on 14/03/2016.
21. Product's portfolio of Fio banka. Available at: <http://www.fio.sk/>. Accessed on 14/03/2016.
22. Product's portfolio of ČSOB. Available at: <https://www.csob.sk/>. Accessed on 14/03/2016.
23. Product's portfolio of J&T Banka. Available at: <https://www.jtbanka.sk/>. Accessed on 14/03/2016.
24. Product's portfolio of KDB Bank Europe Ltd. Available at: <http://sk.kdbbank.eu/>. Accessed on 20/03/2016.
25. Product's portfolio of OBERBANK AG. Available at: http://www.oberbank.sk/OBK_webp/OBK/oberbank_sk/index.jsp. Accessed on 25/03/2016.
26. Product's portfolio of OTP Banka Slovensko, a.s. Available at: <http://www.otpbanka.sk/>. Accessed on 02/04/2016.
27. Product's portfolio of Poštová banka, a.s. Available at: <https://www.postovabanka.sk/>. Accessed on 02/04/2016.
28. Product's portfolio of Prima banka Slovensko, a.s. Available at: <https://www.primabanka.sk/>. Accessed on 02/04/2016.
29. Product's portfolio of Privatbanka. Available at: <http://www.privatbanka.sk/>. Accessed on 11/04/2016.
30. Product's portfolio of Slovenská sporiteľňa, a.s. Available at: <https://www.slsp.sk/sk/ludia>. Accessed on 11/04/2016.
31. Product's portfolio of Sberbank Slovensko, a.s. Available at: <http://www.sberbank.sk/sk/domov>. Accessed on 15/04/2016.
32. Product's portfolio of Tatra banka, a.s. Available at: <http://www.tatrabanka.sk/sk/>. Accessed on 15/04/2016.
33. Product's portfolio of UniCredit Bank Czech Republic and Slovakia, a.s. Available at: <http://www.unicreditbank.sk/sk/Obcania>. Accessed on 27/04/2016.
34. Product's portfolio of VÚB, a.s. Available at: <https://www.vub.sk/sk/osobne-financie/>. Accessed on 27/04/2016.
35. Product's portfolio of BKS Bank AG. Available at: http://www.bksbank.sk/BKSWebp/BKS/bks_sk/Osobne_financie/index.jsp. Accessed on 02/05/2016.
36. Product's portfolio of ZUNO. Available at: <https://www.zuno.sk/>. Accessed on 02/05/2016.
37. Product's portfolio of Wüstenrot stavebná sporiteľňa, a.s. Available at: <http://www.wuestenrot.sk/>. Accessed on 09/05/2016.
38. Saaty, T. (1977). A Scaling for Priorities in Hierarchical Structures, *Journal of Mathematical Psychology*, vol. 15. Available at: https://www.researchgate.net/profile/Thomas_Saaty/publication/221955622_A_scaling_method_for_priorities_in_hierarchical_structures/links/55ab3d2008aea99467241e0e.pdf. Accessed on 02/02/2016.
39. Štatistický úrad SR. (2016). Spotrebiteľský barometer I. Available at: https://slovak.statistics.sk/wps/wcm/connect/6866da08-e0c0-40dd-b840-9f49f5125c3d/Spotrebiteľsky_barometer_I_januar_2016.pdf?MOD=AJPERES. Accessed on 01/02/2016.
40. Velasquez, M., Hester, P. (2013), An Analysis of Multi-Criteria Decision Making Methods, *International Journal of Operations Research*, vol. 10, no. 2.
41. Zlatá minca. (2016). Výsledky súťaže finančných produktov Zlatá minca 2015. Available at: <http://www.zlataminca.sk/vysledky-sutaze-financnych-produktov-zlata-minca-2015/cmsarticle/#.VyTumr7z9Qy>. Accessed on 25/03/2016.