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Article

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Selecting Suitable Building Savings for the Client in the Czech Republic Using a Multi-criteria Evaluation Procedure[1]

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Abstract

Recently, the popularity of building savings has grown. Many people thus are faced with selecting a suitable product. Unfortunately, most clients sign a contract with the bank holding their current account and/or other products. In this simplified manner of choosing, customer's preferences are often unnecessarily suppressed. To eliminate this, or to select the building savings most appropriate to customer's needs, a complex user-friendly multi-criteria evaluation procedure is proposed. This approach can consider, as opposed to other well-known methods, all requirements and conditions of a building savings selection. The application power of the proposed concept is illustrated using real situations that can occur on the Czech market. Two most frequent types of client are specified (primarily oriented to a deposit return, and getting a loan). Besides "standard" situations, some more specific cases (a non-traditional savings period of nine years, or building savings for children) are also studied in order to have a greater impact of study to the practice with this product. For each savings strategy, the most suitable building savings is selected. Subsequently, the results are compared and analysed.

Keywords: *building savings, multi-criteria evaluation, selection*

JEL Classification: C44, E21

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Introduction

Building savings are a special-purpose type of savings, in which the depositor deposits funds with a specialized bank for a long period of time, can obtain state support during the savings period and after which he/she is entitled to a building savings loan upon fulfillment of other conditions (AČSS, 2018h). As a recent survey by the Association of Czech Building Savings Banks (ACSS) shows, building savings are still the most popular savings product in the Czech Republic (AČSS, 2018a); more than 3.2 million active building contracts confirm this long-standing popularity. Moreover, in 2018, the demand for new contracts is growing, and this is expected to rise for the rest of the year.

Such a situation logically leads to the question of selecting the most suitable building savings for a particular savings strategy. It may seem that this question is not important because building savings (offered by five building societies) have similar parameters on the Czech market with this product. Based on this perception, the client usually chooses the building savings offered/arranged by his/her 'home' bank that holds their current account (or other products). This is very easy way to obtain the building savings without any deeper analysis. However, this approach is short-sighted because the client may lose access to a (slightly) more suitable product due to his/her preferences being overlooked. In addition, the number of clients of the banks not providing building savings (Air Bank, Fio banka, mBank, etc.) has significantly risen in the last few years (Aktuálně, 2018). These people must select the most appropriate building savings on the market. Therefore, I see a significant potential for improving/proposing a decision making mechanism to significantly support making a right decision in this area.

To make a satisfactory decision, building savings products should be comprehensively evaluated from a wide range more of perspectives. Significant characteristics may include deposit interest rate, loan interest rate, contract fee, and account management fee. The importance of each evaluative criterion may vary which is based on the client's preferences. These preferences can reflect the intention of savings (focus on deposit, or getting a loan), savings horizon, etc.

Many people don't even have enough information about all characteristics of this product, or they are not able to collect them. And even though they are able to find most of the information, their more complex evaluation under their personal savings preferences can naturally make them difficult. Not surprisingly, it is an effort to simplify making such a decision in various way (using only incomplete offer, data, information, preference etc.). Therefore, the main aim is to propose a decision making approach (procedure) that can act as an effective complex tool to select suitable building savings in light of the client preferences. From my point of view, multi-criteria evaluation method seems to be a suitable

quantitative approach. Such a method can simultaneously take into account all aspects of the building savings process. A variety of multi-criteria evaluation methods are present in the literature. They differ with regards to their evaluation principle, form of the result, necessity of additional information from a decision maker, and algorithm complexity. Every real decision making problem has some specifics that determine the selection of such an evaluation method. If the current methods are not able to solve the specified problem satisfactorily, a new method must be designed. An analogous situation is also detailed in this article.

I need the method to accept the following issues to be easily and purposefully applicable: 1. a multi-criteria problem; 2. the user-friendly principle of weights as an expression of the importance of each criterion; 3. no hardly available additional information from a decision maker (e.g. form of the utility function, threshold values, or aspiration levels); 4. basic division into 'good' and 'bad' alternatives with a possible sequential ranking; 5. no normalisation technique distorting the input data; 6. a simple algorithm for a user-friendly applicability. If all conditions and requirements are met, then the main mission of this article will be fulfilled. Therefore, a procedure based on such a method is proposed. The designed multi-criteria evaluation method, of course, is inspired by principles of the existing methods (namely the outranking methods). However, the whole multi-criteria approach to building savings selection is an innovative way of tackling the issue.

The aim of the application part of this article is to demonstrate the strong user power of the proposed concept in real decision making situations with building savings. The aim is to analyse the most possible decision making situations with this product to make this article beneficial for the widest range of the clients. Therefore, the two most typical types of the clients are specified – client primarily oriented to a deposit return and client primarily oriented to getting a loan. The analysis is also complemented by rarer situations, i.e. savings for nine years or more (compared to a standard length of six years), and building savings for children, teenagers and young people. These specific (non-standard) conditions can cause (based on the offer of a particular provider) changes in the parameters of building savings. For each type of client, the most suitable building savings is selected on the market in the Czech Republic. The results are further analysed and compared due to the specified preferences determining the criteria weights.

The structure of the article is as follows. After the introduction, the necessary information about building savings provided in the Czech Republic are introduced (section 1). Section 2 offers an overview of the current evaluation methods and defines their shortcomings. Subsequently, the proposed multi-criteria evaluation method/procedure is described in detail. In section 3, several situations involving the selection of building savings are specified, solved, and analysed. The

compromise solution (the most suitable building savings) in all cases is selected by the proposed evaluation method. The last section summarises the main ideas of the paper and outlines possible steps for future research.

1. Building Savings in the Czech Republic

Building savings were established almost simultaneously with the foundation of the Czech Republic (AČSS, 2018g). The basic legal regulation for the operation of building savings, savings bank activities and the determination of product parameters is Act No. 96/1993 Coll. This law has been amended several times (AČSS, 2018f). Even from the early days of building savings, this product has held an irreplaceable place on the Czech market (AČSS, 2018i).

Building savings are a purposeful type of savings held over a longer-time period (at least six years). During this period, state contribution can be yearly drawn. At the end of the period, entitlement to the loan under other specified conditions arises (AČSS, 2018e).

Building savings have several clear advantages making their popularity evident. The first benefit is its safety (similar to another savings products). Building savings can be managed only by specialised banks on the basis of a special provision. All building societies, i.e. *Českomoravská stavební spořitelna* (further abbreviated CSS), *Modrá pyramida stavební spořitelna* (MPSS), *Raiffeisen stavební spořitelna* (RSS), *Stavební spořitelna České spořitelny* (SSČS) and *Wüstenrot – stavební spořitelna* (WSS) are members of the ACSS.[2] The activities of the building saving providers are strictly regulated by the Czech National Bank and the Ministry of Finance. Primarily, all risky business activities are significantly limited (AČSS, 2018i). The second fact is that a deposit interest rate and a state contribution are contractually guaranteed. Another benefit is the large variety of savings purposes. In addition, there is the possibility of getting a 'smaller' loan under very advantageous conditions (AČSS, 2018b). On the other hand, a number of costs are connected with this type of savings product. There is a fee for contract arrangement, a fee for management of the building savings account and, of course, costs associated with the possible loan. However, the guaranteed net interest rate around 3.2% p.a. (thanks mostly 1% interest rate from the deposits and 2000 CZK state contribution) is very likeable for many (potential) clients. Such a yield for "risk-free" savings also overcomes a smaller liquidity (deposit for at least 6 years).

[2] The building savings of ČMSS is also offered by Českomoravská obchodní banka and Poštovní spořitelna. Furthermore, the building savings of WSS are offered by Moneta Money bank and Oberbank. Finally, Komerční banka also offers the building savings of MPSS.

According to a survey by International Business & Research Services on behalf of ACSS, since 2016, building savings are still the most popular type of product. Behind building savings are investments in precious metals, savings accounts, supplementary pension savings, life insurance, and open unit trusts, among others (AČSS, 2018a). Excellent position among term deposits confirms by a report on financial market developments in 2018 prepared by the Ministry of Finance (MF, 2019). It is evident that the aforementioned benefits of the building savings are very interesting for the current, or potential owners of the product. They mostly perceive their disadvantages as negligible. Moreover, according to the yearbook 2017, namely the demand for loans from the building savings grew. The size of the individual loan is increasing (growth of 143 000 CZK to 761 000 CZK). The main reason for this is the ever-growing demand for real estate coupled with a stable and guaranteed low interest rate from the building savings in the current environment of ever-rising interest rates (AČSS, 2018c).

2. Multi-criteria Evaluation Procedure for Selecting Building Savings

In this section, the multi-criteria evaluation procedure faithfully describing a real process of the building savings selection is proposed. It is based on a multi-criteria evaluation method. At the beginning of the process, the client's preferences must be clearly specified. The basic classification of the clients is their attitude to getting a loan. Most clients 'only' save their disposable income for future use. However, a non-negligible number of clients intend to use favourable conditions to obtain a loan. Additionally, some special cases can also be identified (see more in section 3). The client specifies the importance of the evaluative criteria (the characteristics of the building savings), thus determining their weight. If all the input data about the building savings are available, the multi-criteria analysis can begin. The aim of this analysis is primarily to divide the building savings into two groups – 'good' (effective) and 'bad' (ineffective). This information can be very helpful for the client in deciding whether to arrange a building savings with a client's 'home' bank or turn to another. If this division is not enough (for instance in the case of multi-element groups of effective alternatives), the ranking of the building savings can be carried out. The most suitable building savings is ranked in first place.

2.1. Overview of Multi-criteria Evaluation Methods and their Application/ Algorithmic Pitfalls

In the last few decades, many multi-criteria evaluation methods have been proposed. These methods can be classified according to the applied evaluation principle. One of the first method was the Weighted Sum Approach (WSA) from

Fishburn (1967) using the well-known utility function approach. Other typical representatives of this group of methods are Analytic Hierarchy Process (AHP) developed by Saaty (1977) and its generalisation called Analytic Network Process (ANP) described in (Saaty, 1996). These methods can be modified as needed. For instance, their fuzzy forms were proposed (e.g.) by Gu and Zhu (2006). Another big group is created by methods based on the principle of minimising distance from the ideal alternative. The typical representative is the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) designed by Hwang and Yoon (1981). This method has also been modified (fuzzy approach, various concept of distance measurement), and combined with other methods, mostly according to the requirements and conditions of a real-life problem. For example, some versions with vague elements are from Jin and Liu (2010) or Han and Liu (2011). A few other modifications/applications of this method can be seen in (Kahraman, 2008). The third well-known group is represented by multi-criteria methods evaluating the alternatives using a preference relation principle. One of the most popular outranking methods is the group of ELimination Et Choix Traduisant la REalité (ELECTRE) methods. ELECTRE I was proposed by Roy (1968); another versions then followed – ELECTRE II (Roy and Bertier, 1973), ELECTRE III (Roy, 1978), etc. These methods are often applied to solve the problems in practice, so they have been widely modified and extended, for example in Hatami-Marbini and Tavana (2011) or Leyva-López and Fernández-González (2003). A further group of outranking methods is created by the Preference Ranking Organisation Method for Enrichment Evaluations (PROMETHEE), for instance PROMETHEE I (Brans, 1982) and PROMETHEE II (Brans, 1985). Among enhanced versions of these methods the fuzzy form from Goumas and Lygerou (2000) can be included.

This is a basic overview of the main multi-criteria evaluation methods. Of course, other methods have been developed over time. Some methods have been modified, improved or combined, as indicated above. The necessity of these operations depends on finding a solution to a particular problem. Let us now look at the principal starting points of each group of methods and their possible algorithmic or application shortcomings, especially with regard to the real-life problem solved in the practical part. The first item to analyse is an evaluation principle. In my opinion, the concept of utility function is very abstract and impalpable for many decision makers. The utility is difficult to measure; thereafter a determining the shape of the utility function can be problematic. On the other hand, some methods using the utility function are helpful and do not require such information from a decision maker. From my point of view, this concept is more tangible, especially since it is strictly based on the computational formula of distance.

However, there is another potential problem; it is a technique of distance calculation. Of course, each chosen approach can significantly affect the results. The preference relation concept can also be disadvantageous, i.e. a determining the threshold values can be arduous, particularly for less experienced users (e.g. in ELECTRE I). Fortunately, as in the utility function principle, some methods are able to set these values themselves (e.g. ELECTRE III). Next, a critical aspect of the applied method related to the solved problem is the form of the results. Most methods from the first and second group provide a ranking of alternatives (WSA, TOPSIS, etc.). Outranking methods rather classify the alternatives into certain groups (e.g. effective and ineffective in ELECTRE I). Moreover, many methods from the first two groups use such a normalisation technique, which frequently distorts the original input data (e.g. WSA, TOPSIS). Outranking methods often do not need to make such a normalization that could affect the results. In all three groups, the algorithm of some methods is problematic to use effectively in real decision making problems due to its complexity.

Under the outline of the ideas and related deficiencies, no current (multi-criteria evaluation) method is fully suitable for solving the specified building savings problem satisfactorily, or without (implementation) difficulties. I was therefore looking for inspiration for my own approach. Designing an adequate multi-criteria method was mainly influenced by the outranking methods. Despite their shortcomings, older ELECTRE I and III methods (see their algorithm in Appendix) are an excellent basis for designing a method tailored to our decision making problem. The first reason is the shape of the result. Primary aim is a division of the alternatives (building savings) to 'good' and 'bad', or effective and ineffective. Another pleasant feature of these methods is the needlessness of the normalisation distorting the original evaluations of the alternatives according to the criteria. The proposed algorithm attempts to be user-friendly. Based on the result of the method, the client makes an important decision, so it is better if s/he at least basically understand the decision making principle. The user-friendliness is greatly enhanced by eliminating the demand on any additional information from the side of the decision maker. The proposed multi-criteria evaluation method, which respects all the aforementioned features and requirements, is a significant supporting tool for selecting suitable building savings. Its algorithm can be described in the following several steps.

2.2. Algorithm of the Multi-criteria Evaluation Method

Step 1: Let $\mathbf{Y}=(y_{ij})$ be the matrix with the elements $y_{ij}, i=1,2,...,n; j=1,2,...,k,$ representing the evaluation of the *i*-th alternative by the *j*-th criterion. The importance of the *j*-th criterion is quantified as the weight w_j. For its purpose, the

user-friendly scoring method is applied (Fiala, 2013). A decision maker signs an integer score from the interval $\langle 0,10 \rangle$ to each criterion, where 1, or 10 represents the lowest, or highest importance. If the criterion is not relevant, the score is 0. Subsequently, the weight of the *j*-th criterion can be calculated by using the following formula

$$w_j = \frac{s_j}{\sum_{j=1}^{k} s_j} \qquad j = 1,2,...,k$$

where $s_j, j = 1,2,...,k,$ is a score assigned to the *j*-th criterion. The vector of criteria weights can then be denoted as $\mathbf{w} = (w_1, w_2, ..., w_k)^T$.

Step 2: Similarly to the ELECTRE III method, two sets of criteria indices for each couple of alternatives are specified

$$I_{iPj} = \left\{ r \vee s \mid y_{ir} > y_{jr},\ y_{is} < y_{js};\ \ r \in I^{\max}, s \in I^{\min} \right\} \qquad i, j = 1,2,...,n, i < j$$
$$I_{jPi} = \left\{ r \vee s \mid y_{jr} > y_{ir},\ y_{js} < y_{is};\ \ r \in I^{\max}, s \in I^{\min} \right\} \qquad i, j = 1,2,...,n,\ j > i$$

where set $I^{\max}$, or $I^{\min}$ contains the indices of maximising, or minimizing criteria.

Step 3: Two matrices of the preference grades are determined. The matrix $\mathbf{S} = (s_{ij})$ is formulated as in the ELECTRE III method. Thus, the following holds

$$s_{ij} = \sum_{q \in I_{iPj}} w_q \qquad i, j = 1,2,...,n, i < j$$
$$s_{ji} = \sum_{q \in I_{jPi}} w_q \qquad i, j = 1,2,...,n,\ j > i$$
$$s_{ij} = \times \qquad i, j = 1,2,...,n, i = j$$

where w_q is the weight of the *q*-th criterion. The element s_{ij} , or s_{ji} represents the intensity of a preference of the alternative *i*, or alternative *j* over the alternative *j*, or alternative *I*, which is expressed on the interval $\langle 0,1 \rangle$. The second matrix takes into account the (vital) differences among the alternatives. The concept of the matrix **R** is inspired by the ELECTRE I approach. However, the benefit of this concept (unlike ELECTRE I) is the inclusion of the criteria importance and normalised non-distorted criteria values. Such an element of the matrix has a better predictive value. For couple of alternatives *i* and *j*, it is calculated as follows

$$r_{ij} = \frac{\sum_{h \in I_{iPj}} \left(w_h \mid y'_{ih} - y'_{jh} \mid \right)}{\sum_{h=1}^{k} w_h \mid y'_{ih} - y'_{jh} \mid} \qquad I_{iPj} \neq \varnothing$$

$$r_{ji} = \frac{\sum_{h \in I_{jPi}} \left(w_h \mid y'_{jh} - y'_{ih} \mid \right)}{\sum_{h=1}^{k} w_h \mid y'_{jh} - y'_{ih} \mid} \qquad I_{jPi} \neq \varnothing$$

$$r_{ij} = \times \qquad i = j$$

$$r_{ij} = 0 \qquad \text{else}$$

where y'_{ih}, or y'_{jh}, $i, j = 1,2,...,n;\ h = 1,2,...,k,$ is a normalised criteria value (due to the comparability of the criteria values) specified as

$$y'_{ij} = \frac{y_{ij}}{H_j} \qquad i = 1,2,...,n;\ j = 1,2,...,k$$

where $H_j = \max_i (y_{ij}),\ j = 1,2,...,k$.

Step 4: In the next step, the preferences (by all criteria) of the *i*-th alternative over the *j*-th alternative can be aggregated according to the following rule

$$s_{ij} > s_{ji} \wedge r_{ij} > r_{ji}$$

If these relations hold then the alternative *i* is preferred over the alternative *j* from the perspective of all criteria. This rule is a modification of the ELECTRE III approach; the threshold values are eliminated. The *effective* ('good') alternative has the highest discrepancy between the number of alternatives over which it is preferred and the number of alternatives that are preferred over it. Other alternatives are *ineffective* ('bad'). This concept is a combination of the ELECTRE I and ELECTRE III approaches. This concept eliminates an essential shortcoming of the ELECTRE I method by recognising that the effective alternative may not exist.

Step 5: The fifth step is proposed as an alternative. The basic division into two groups can be supplemented (if necessary) by ranking of the alternatives. This way, the alternatives in both groups can be actually distinguished. For each chosen alternative *i* the following indicator is proposed

$$c_i = \sum_{j \in C_{iPj}} (s_{ij} - s_{ji}) + (r_{ij} - r_{ji}) \tag{1}$$

where the set C_{iPj} contains all alternatives j over which the alternative i is preferred. The alternatives are ordered by the decreasing value of the indicator (1). This process can be applied to both groups. The ranking is created by the order of effective alternatives followed by the order of ineffective alternatives.

3. Selection of a Suitable Building Savings in the Czech Republic

The practical aim of this article is the selection of a suitable building savings in real-life situations in the Czech Republic via a proposed multi-criteria evaluation procedure. According to the results of survey[3] (supported my personal experiences with this product and its users), a few largely typical real-life decision making situations with a building savings are studied. This analysis is inspired by the work of Borovička (2017), who began to solve the problem of building savings selection. However, this article makes a wider and deeper multi-criteria analysis. More types of clients were included, in addition to my personal experiences accompanying by the survey, which makes the analysis more real. The first stage of the proposed procedure is the determination of the type of client. In the second stage, all evaluative criteria (characteristics) are comprehensively specified. Furthermore, the client's preferences are formulated. Subsequently, the weights of the criteria can be calculated. If all data is available, the multi-criteria analysis can be carried out. Of course, these phases can blend in a decision making process.

3.1. Various Situations with the Building Savings, Types of the Client

In this section, three situations and two types of clients are specified to cover most real-life cases with the choice of building savings.

Situation 1

The first type of client describes the most common case in a reality as can be seen in the survey. 71.4% of respondents prefer a monthly payment of 1 667 CZK because this amount ensures a maximum state contribution of 2 000 CZK per year. This strategy will naturally be considered in all specified cases. In this case, a saving time period of six years is specified. This period of time is standard

[3] The survey was conducted, for the most part, among university students and younger academic scholars (at the Faculty of Informatics and Statistics, University of Economics, Prague). Approximately 80 people (of 200 recipients) answered ten questions about the clients' savings preferences in January 2018. They are related to the purpose of savings, size of the monthly saving, duration of saving, choice of criteria and their importance. The survey was primarily conducted for the purpose of this paper. Its partial results are published within three specified situations.

for building savings. Thus, it is preferred by 50.6% of respondents. At the end of the 6-year period, the expected gross savings amount is the sum of the following amounts: 120 000 CZK (deposit), 10 000 CZK (state contribution) and approximately 4 200 CZK (interests based on the conditions of a particular institution). It should not be forgotten that the saved amount is reduced by the account management fee (approximately 2 000 CZK according to the particular conditions) and tax (approximately 630 CZK based on the level of interest). Without a potential loan, the target amount[4] is usually set at 150 000 CZK. A determination of the target amount value should be thought out because a contract fee is derived from this amount.

On the other hand, exceeding this amount is not possible and increasing it is also charged. If the loan is planned, then the target amount should be adjusted (increased) by the size of the loan. It is assumed that the client is not a child or older person who could get a discount from a contract fee.[5] This strategy can be specified for two typical types of client, i.e. a *client oriented to a deposit return* and a *client oriented to getting a loan* (see more below Situation 3).

Situation 2

The second situation arises from the responses to the following survey question: *What savings time horizon would you choose?* We can see above that approximately half of respondents prefer a period of six years. However, 49.4% of respondents prefer a longer period for savings. Specifically, 35.1% of respondents want to save their funds over a 9-year period and 14.3% of respondents prefer even more than nine years. One of the main reasons for a specification of just nine years is the fact that some institutions differentiate a deposit interest rate in cases of six and nine years. A period of more than nine years is simply not possible. Clients with such a time preference can arrange a new building savings account after nine years or save money through another product (at the beginning of the period or after nine years). Based on the survey results, an analysis of building savings for 9-year time period makes sense. Situation 2, therefore, is based on the 9-year savings period. Other characteristics are the same as in the

[4] The target amount represents the amount of funds in the future (at the end of the building savings). It is equal to the sum of the deposits and their interests, state contributions, loan reduced by deposit interest tax. Exceeding the target amount is not allowed. However, it can be increased (AČSS, 2018d).

[5] The yearly amount saved by the client may not be more than 20 000 CZK for the highest state contribution. This amount is also created by the interest from previous year and also reduced by account management fee. For instance, the interest from the previous year is 1000 CZK and the account management fee is 300 CZK. For the next year, the deposited amount of 19 300 CZK will be sufficient for the highest possible state contribution. However, because this does not influence the result, it is not considered in the analyses.

previous situation. In this scenario, the deposit is 180 000 CZK, the state contribution is 18 000 CZK and the interest is 9 000 CZK. Thereafter, the target amount can be rationally set at 220 000 CZK (without or probably without a loan). A 9-year period (or longer) is long enough to potentially chance many things. I cannot think of a situation where there is no chance of any interest on the loan.

Situation 3

Recently, an exclusive offer of the building savings for children or young people became popular. Some institutions provide a discounted contract fee or a flexible (higher) deposit interest rate according to the client's age. Saving banks differ in their age range. According to the survey, almost 20% of respondents said that the building savings was contracted by the parents for their children (and their future consumption). There is no doubt that such a case should be analysed. This special condition can influence the client's preferences in the building savings selection.

As mentioned previously, several situations are specified for two types of clients – *client oriented to a deposit return* and *client oriented to getting a loan*. The first type of client saves his/her free funds either for regular future consumption (e.g. clothes, electronics, meals, holidays, etc.) or to finance his/her housing. Only 13% of respondents save money through building savings for a regular consumption. The main purpose of the building savings is financing housing as was the cause for 68.9% of respondents. Third of these respondents plan to finance their housing with the help of a loan obtained from the building savings. Moreover, a demand for such a loan is increasing according to the ACSS expectation (AČSS, 2018f).

On the other hand, the main limit of such a loan is its amount. It is rather a small loan, i.e. up to 1 million CZK without securing real estate (according to the rules of the savings bank). A typical use of this housing loan is covering a part of the price of a property that cannot be financed by the mortgage. Recently, this situation has become more common. New mortgage conditions prohibit 100% mortgages in the Czech Republic. Instead, banks usually offer 80% or 90% mortgages. The rest of the price of a property must be financed from another source. However, recently, the Czech Central Bank tried to eliminate these activities; their intention is that 10%, (or 20%) of the property's value must be covered the mortgagor's by own money. Another purpose of the loan from building savings can be for housing reconstruction. For our analyses, a loan amount is specified: 760 000 CZK, the average loan in 2017 (AČSS, 2018c). The aforementioned target amounts for client oriented to getting a loan will be increased by this amount.

3.2. Criteria

To comprehensively analyse the data and make responsible decision, building savings should be evaluated from more perspectives. This is the only way to get an idea of all its features that may affect product selection. The specification of the evaluative criteria (product characteristics) is one of the important integral part of the entire decision making process. The following six criteria are undoubtedly more or less essential characteristics of this product. The *contract fee* (abbreviated as CF) is an input cost for the signing of the contract. It is calculated (except for special cases) as a percentage of the target amount. The *account management fee* (AMF) represents a yearly cost connected with the management of the building savings account. The *deposit interest rate* (DIR) is a yearly interest rate for the deposits. The *loan contract fee* (LCF) is an input cost for getting a loan from the building savings. The *loan account management fee* (LAMF) represents the yearly cost connected with a loan account management. The *loan interest rate* (LIR) is an early interest rate from the pertinent loan. The first three criteria are directly related to the particular building savings. The other three are related to a potential loan. These specified criteria are ranked according to their importance as per the aforementioned survey.[6] A few respondents (a significant minority) specify another criteria, the *name of the institution providing the building savings and its credibility* or *contract termination fee*. It is obvious that these criteria are not sufficiently important to include them in the analyses. The main reason of the low importance of the first additional criterion is that all providers of building savings are stable companies with sufficient credibility. The second criterion is unimportant because the incidences of early contract termination is low. Moreover, the conditions of contract termination are very similar for all providers. Of course, the main characteristic of the building savings is the *state support*. However, conditions for the payment of state support are the same for all institutions. Therefore, this characteristic is not specified as one of the evaluative criteria in terms of the multi-criteria analyses.

3.3. Client Preferences and Appropriate Data

The essential part of the multi-criteria analysis is the determination of the weights of the criteria. Of course, these weights are determined on the basis of client preferences. Section 3.3 will focus on the individual situations specified in section 3.1 which are set into the environment of the Czech building savings market. In addition to the weight calculation, related data is collected.

[6] Each respondent expresses quantitatively the importance of each specified criterion. The process is described in section 3.3. *Situation 1* in more detail.

Situation 1

The statistics for 2017, issued by AČSS (2018c), confirm that the most common client is focused on the returns from the deposits (without planning a loan). This client regularly saves money for six years to obtain a maximum possible profit. It is no wonder (as the survey shows) that the deposit interest rate (besides state support) is the most important criterion. Other characteristics which decrease the client's return, for example, the contract fee and account management fee, are also important, but naturally not as much the interest from deposits. It is not a surprise that the account management fee is more important than the contract fee. From my point of view, the main reason is that a contract fee is one-shot payment at the beginning of the process, whereas an account management fee is a periodic cost continuously reducing return. What about the 'loan' characteristics? One the one hand, such a client may not be interested in these criteria. On the other, a future need for a loan is often difficult to predict. Therefore, the 'loan' criteria can usually play a smaller role. The most important characteristics connected with a loan is logically the loan interest rate.

The survey confirms the aforementioned ideas. Each respondent assigns an integer score from the interval $\langle 0,10 \rangle$ to each criterion according to their preference. An evaluation of 0 means that the criterion does not affect the client in the selection of suitable building savings. The higher the score, the higher the importance of the criterion. According to the algorithm, the weights are calculated by a scoring method. In this process, the results of the survey are employed. At first, the average score for each criterion is calculated from all the answers expressing the individual assignment of the criteria scores. In the second step, the average score is weighted by its relevancy according to the frequency of denomination of the criterion, as per the following question: *What criteria are relevant for you when choosing building savings?* The average score and relevancy of all criteria can be seen in Table 1.

T a b l e 1

Average Scores and Relevancy of the Criteria

Criterion	CF	AMF	DIR	LCF	LAMF	LIR
Average score [from $\langle 0,10 \rangle$]	5.42	7.18	8.60	6.81	5.55	4.12
Relevancy [% respondent]	38.3	75.3	87.7	59.3	44.4	12.3

Note: CF – contract fee, AMF – account management fee, DIR – deposit interest rate, LCF – loan contract fee, LAMF – loan account management fee, LIR – loan interest rate.

Source: Own calculation.

The weighted score (a product of the average score and relevancy) is adjusted by the purpose of the savings in order to take into account two basic focuses (on the return and getting a loan). According to the survey, the main purpose of 19%

of the respondents is getting a housing loan from the building savings; 49.4% of the respondents plan to use the savings for housing, or housing reconstruction (without a loan); 12.7% respondents will use funds for regular consumption (clothes, electronics, holiday, etc.); and 16.8% of the respondents received building savings from their parents (without any particular purpose). The rest of the respondents were still undecided about the purpose of the savings. Moreover, according to the yearbook 2017, the proportion of loans to new contracts was approximately 17.5% in 2017 (AČSS, 2018c). As mentioned previously, there is a significant potential to increase the number of loans in the future. It would then be possible to declare that the weight of the 'return' criteria is (approximately) 0.8 and the weight of the 'loan' criteria 0.2. However, to get a loan, the weights are reversed. In this case, the weighted score of the criteria are multiplied by these indicators. The criteria weights are then calculated as a division of the multiplied weighted score and the sum of the multiplied weighted scores over all criteria. The weights of the criteria for both types of clients are in Table 2.

T a b l e 2

Weights for the Client Oriented to a Deposit Return and Getting a Loan

Client focus	CF	AMF	DIR	LCF	LAMF	LIR
Deposit return	0.124	0.322	0.450	0.008	0.037	0.059
Getting a loan	0.048	0.126	0.175	0.047	0.229	0.375

Source: Own calculation.

In the case of the irrelevance of the 'loan' criteria, the (standardised) weights of the 'return' criteria are calculated by dividing the sum of their values. The weights are as follows: CF – 0.138, AMF – 0.36, DIR – 0.502. To be comprehensive, a brief comment about the criteria weights of loan-oriented client should be added. Of course, the most important criterion for such a client is a loan interest rate which is confirmed by the survey. Interest is clearly the greatest cost associated with a loan. The loan account management fee is shown as the second most important criterion because it is a continuous cost for the entire duration of the loan. On the other hand, the one-time cost as (loan) contract fee is not as important in the process of building savings selection. The third and fourth most important criteria are the deposit interest rate and account management fee. Although clients aim to get a housing loan with favourable conditions from their building savings, they are naturally interested in the deposit return and costs that continuously reduce this return.

For client oriented to deposit return, the data can be seen in Table 3. They are collected from the web pages of particular savings banks (ČMSS, 2018; MPSS, 2018; RSS, 2018; SSČS, 2018; WSS, 2018).

T a b l e 3

Building Savings Data for the Client Oriented to a Deposit Return

Bank	CF [CZK]	AMF [CZK]	DIR [%]	LCF [CZK]	LAMF [CZK]	LIR [%]
ČMSS	1500	360	1	7600	330	3.5
MPSS	1500	300	1	4400	300	3.49
RSS	750	320	1	0	360	3.5
SSČS	495	325	1	0	325	2.99
WSS	1500	324	1.2	0	0	4.19

Source: Web pages of ČMSS, MPSS, RSS, SSČS, WSS (2018).

Data is selected under the most advantageous conditions for client oriented to a deposit return. The contract fee is usually 1% of the target amount (1500 CZK in our case). The exceptions are RSS and SSČS, which offer online contract arrangement at the lower price of 750 CZK (0.5% from the target amount), or 495 CZK (regardless of the target amount up to 400 000 CZK). Because a loan interest rate is not so important factor for this savings strategy, the deposit interest rate is set to the maximum possible level (sometimes at the expense of a higher loan interest rate). The LFC of ČMSS is determined as 1% of the size of the loan. The LFC of other banks is fixed.

For client oriented to getting a loan, his/her main interest is focused on the 'loan' parameters. Several differences (compared to the previous case) in the input data can be identified. At first, the contract fee may be changed. The target amount is calculated as the sum of 150 000 CZK and 760 000 CZK (the average loan).[7] The lowest possible loan interest rate of RSS is 2.99% which is redeemed at a lower deposit interest rate (0.1%).

However, it is acceptable. A similar situation occurs in WSS. The best loan interest rate is 1.99% with a 0.5% deposit interest rate. All other data are the same as in the case of client oriented to deposit interest.

Situation 2

Nowadays, the length of the savings does not affect the deposit interest rate as much as it did in previous years. In reality, only SSČS offers a higher deposit interest rate for a 9-year savings period. This building society provides a bonus deposit interest rate of 1.2% for years seven, eight, and nine of saving. However, this single parameter can significantly affect the results, especially for client oriented to a deposit return.

[7] The contract fee is calculated as standard, except RSS and SSČS. In RSS, the discount of 50% is up to 200 000 CZK target amount. For the rest of the amount, a standard rate of 1 % holds. Thereafter, the contract fee for RSS from the target amount of 910 000 CZK is 8100 CZK. In SSČS, 495 CZK holds up to a target amount of 400 000 CZK; the rest is 1 %. The contract fee is then 5 595 CZK. For other savings banks, the contract fee is 1% of the target amount (9 100 CZK).

Situation 3

ČMSS offers a free contract fee for children under the age of six years. This is also true in MPSS for children up to 10 years of age. For clients aged 11 to 21, the fee is reduced by half. RSS gives a generous deposit interest rate 1.5% for children or young people under 25 years old. On the other hand, this product has a higher level of loan interest rate, at the value of 4.5%. A zero contract fee is also offered by WSS for individuals under 24 years of age. SSČS offers only some toy for children, which apparently plays an insignificant role in the selection process. The analysis deals with the most common case of 6-year saving period, in which contract is arranged for 12 years old children. After the individual turns 18, therefore, they have some basic financial security.

3.4. Multi-criteria Analysis

After determining the type of client, strategy and data collection, the multi-criteria analysis can be made in order to select the most suitable building savings product.

Situation 1 – Results

At first, the non-dominancy test for client oriented to a deposit return was carried out. As we can see in Table 3, all alternatives, with the exception of ČMSS building savings, are non-dominated. The effective alternative is a building savings from WSS. This result is expected, because this building savings has the best value of the most important criterion deposit interest rate and the third best value of the second most important criterion account management fee. These importance of these two characteristics accounts for almost 80% of all criteria. This product also has good 'loan' characteristics, which underlines its dominance. It is not possible to easily predict a ranking on other places (except the last one), because SSČS, MPSS and RSS building savings have similar parameters. In the end, the SSČS is in second place namely due to the lowest level of contract fee and very good 'loan' characteristics. MPSS is in the third place because it ranks higher for the second most important criterion account management fee than RSS. The last position is represented by a dominated alternative ČMSS. MPSS and SSČS products are better alternatives (they rank better at least one criterion, and are not worse others) than building savings from ČMSS.

On the basis of the preferences of client oriented to getting a loan, the WSS building savings is still in first place because of its perfect 'loan' characteristics, although it is at the expense of its deposit interest rate, which is not as important in this strategy. This time, the bank in second place was quite predictable. SSČS

has very good 'loan' parameters (after WSS). However, it was not clear which was better between the building savings of MPSS and RSS. In third place, MPSS is mainly supported by its deposit interest rate (0.1% for RSS vs. 1% for MPSS) because its other criteria are more balanced. Due to this characteristic, the building saving RSS accompanied by the dominated alternative ČMSS end up in the last position.

Let us focus on two special cases in terms of the first situation. These special cases consist in changing the settings of selected characteristics of some building savings, which may potentially change the evaluation result. The first one is presented by the change of the deposit and loan interest rate of WSS building savings to their 'original' value. The deposit interest rate of WSS building savings is then 1.2% with a loan interest rate of 4.19%. The last position is the same as in the previous 'loan' case. There are two effective alternatives, SSČS and WSS. The interesting question is which alternative is in the first place. In this case, the value of the most important criterion (loan interest rate) of the WSS has significantly increased. On the other hand, this product still has quite strong power in its zero loan account management fee, which is also a very important characteristic in this strategy. In the end, SSČS building savings product is preferred over three alternatives, compared to two alternatives for WSS building savings. SSČS is therefore in the first place. The ranking of the ineffective alternatives is the same as in the previous case. There is no doubt that this parameter modification is significant in the selection making process of building savings.

The second change lies in a compromise between the deposit and loan interest rate of RSS building savings. Regardless, some people may consider a deposit interest rate of 0.1% to be too small. However, the RSS can change its deposit interest rate to 0.5% under its 3.3% loan interest rate, but such a change is not enough to shift its negative ranking. A rise in the deposit interest rate would have to be higher ceteris paribus; a rise of 0.65% would cause a preference of RSS over MPSS, meaning it would be in fourth position. Thus, the result is the same as in the cases of client oriented to getting a loan.

Situation 2 – Results

Firstly, building savings for client oriented to a deposit return is selected to a longer 9-year time period. Due to a higher deposit interest rate of ČMSS building savings, all alternatives are non-dominated. But the effective alternative is still WSS followed by SSČS product. We cannot really expect that this smaller increase would significantly help the building savings from ČMSS. There would have had to make a fundamental change, for example at 2%, for this to be the case. The rest of the building savings share the third position.

Can a longer savings period help ČMSS building savings in the 'loan' strategy? Put simply, no. The increase of its deposit interest rate is too small. Moreover, the strategy is to get a loan. The rise would have to be rapid (more than in the previous case). Such a small change in the unimportant criteria is unlikely to increase its ranking for client oriented to getting a loan in a 'standard' 6-year period.

Situation 3 – Results

The third situation takes into account special conditions connected to building savings for children and young people. Unlike its poor position in some previous cases, the RSS building savings product is non-dominated. This is largely due to the increased deposit interest rate tailored to children and young people. This indicator is clearly the highest of all savings. As for a 'standard' client oriented to a deposit return, ČMSS building savings is still the dominated alternative. We have two effective alternatives – RSS and WSS. These alternatives are preffered over other three building savings. However, they are not preffered among themselves. In the entire ranking, WSS is in the first place because its ranking on average (in all criteria) is better than the ranking of RSS building savings. However, a small positive change in the deposit interest rate (from 1.5% to 1.56%) of RSS building savings would be enough to make it the only effective alternative. For the 'getting a loan' strategy, of course, RSS savings product has no chance of being an effective alternative because of its high loan interest rate and loan account management fee. In this situation, the WSS is the clear winner.

3.5. Results Summary and Application Benefits of the Proposed Procedure

In the first situation in all analysed cases, the selection of building savings is very easy for the client of the banks Wüstenrot and Česká spořitelna. This also occurs for clients of Moneta Money bank and Oberbank that also offer this building savings. The clients of Modrá pyramida and Komerční banka (offering the building savings of MPSS) should think about whether they would prefer the products of another bank than their 'home' bank. The clients of other banks and people without a bank should focus on building savings from WSS or SSČS. This decision can be further determined by (e.g.) personal inclinations or other rather qualitative perspectives.

Perhaps it is a surprise a little that building savings are often an inferior product, because as ČMSS is the only institution specialising in this product. This is not covered by any bank offering the standard banking product. Nevertheless, the number of clients appears to be ever-growing.

For a longer (non-standard) 9-year savings period, the results are not dramatically different than in the previous cases. Indeed, the ČMSS building savings is non-dominated alternative, but it still remains disadvantageous. The best building savings for children is also from WSS. However, the RSS offers significantly higher deposit interest rate for children and young people, which shifts this product into at least second place. Of course, such a good result for this savings cannot be also achieved for the 'loan' strategy.

Based on the results of the multi-criteria analyses, the result is not always known in advance, nor is it predictable. In all cases, however, decision making tool is appropriate. As we can see in the performed analyses, the proposed multi-criteria evaluation procedure enables us to consider any strategy or type of client. The client's preferences can be expressed via a user-friendly concept of weights. Another strong advantage of the proposed approach is its easy applicability. Special software is not required. This quantitative process gives a clear recommendation of the most suitable building savings, or 'bad' and 'good' building savings, for any type of client in any situation. Complexity, flexibility, easy applicability and user-friendliness make the designed decision making procedure better than the current concepts.

Conclusion

The article deals with somewhat of a neglected problem, i.e. selecting a suitable building savings for the client. Despite current practices, it shows that making decision about the building savings can be influenced by several relevant factors with their subsequent importance. To make such a complex decision, a multi-criteria evaluation approach is proposed. This user-friendly concept is able to accept all the requirements and circumstances of a building savings selection problem, unlike existing evaluation methods. All algorithmic and application benefits of the designed supporting procedure are demonstrated using the most frequent cases of building savings selection problems regularly seen in practice. Additionally, the performed analyses show that a client automatically deciding to use his/her 'home' bank's building savings can be near-sighted. A thorough quantitative analysis leads to more responsible decisions.

Although the developed multi-criteria procedure is a significant supporting tool for a building savings selection, some modifications and improvements are possible. Future research should deal with the instability of loan interest rate. For instance, the client's preferences must be expressed on the quantitative scale. In some cases, a linguistic expression of the criteria importance could be more user-friendly. This aspect could be considered by the concept of fuzzy sets (numbers).

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Appendix

ELECTRE I

The ELECTRE I algorithm can be described in the following several steps (Roy, 1968).

Step 1: Let $\mathbf{Y} = (y_{ij})$ be the matrix with the elements $y_{ij}, i = 1,2,...,n;\ j = 1,2,...,k$, representing the evaluation of the i-th alternative by the j-th criterion. The importance of the j-th criterion is quantified via the weight w_j.

Step 2: Specify the set C_{ij} containing the indices of all criteria according to which the i-th alternative is evaluated equal or better than the j-th alternative. The set D_{ij} then includes the indices of the criteria according to which the i-th alternative is evaluated worse than the j-th alternative. For each couple of alternative i and j, two indices are specified:

concordance index: $c_{ij} = \sum_{h \in C_{ij}} w_h \qquad i, j = 1,2,...,n, i \neq j$

discordance index: $d_{ij} = \begin{cases} 0 & D_{ij} = \varnothing \\ \dfrac{\max\limits_{h \in D_{ij}} \left| y_{ih} - y_{jh} \right|}{\max\limits_{h} \left| y_{ih} - y_{jh} \right|} & else \end{cases}$

Step 3: Then, the i-th alternative is preferred over the j-th alternative whether the following holds

$$c_{ij} \geq \overline{c} \wedge d_{ij} \leq \overline{d}$$

where $\overline{c}$, or $\overline{d}$ presents the concordance, or discordance level.

Effective alternatives are those for which there is no alternative that is preferred over them and at the same time they are preferred over at least one alternative. All other alternatives are specified as *ineffective*.

ELECTRE III

The algorithm of this multi-criteria evaluation method can be basically presented through the following steps (Roy, 1978).

Step 1: The criteria matrix $\mathbf{Y} = (y_{ij})$ and vector of weights $\mathbf{w} = (w_1, w, ..., w_k)^T$ are specified.

Step 2: For each couple of alternative *i* and *j*, two sets of the criteria indices are specified. I_{ij}, or I_{ji} includes the indices of criteria according to which the *i*-th, or *j*-th alternative is better than *j*-th, or *i*-th alternative. Then a grade of preference of the *i*-th, or *j*-th over *j*-th, or *i*-th alternative is formulated as follows

$$s_{ij} = \sum_{h \in I_{ij}} w_h \text{ , or } s_{ji} = \sum_{h \in I_{ji}} w_h \qquad i, j = 1, 2, ..., n, i \neq j$$

Step 3: The alternative *i* is preferred over the alternative *j* whether it holds

$$s_{ij} > s_{ji} \wedge s_{ij} > c^*$$

where c^* denotes a threshold, which is gradually generated. First, the highest grade of preference c^0 is formulated as $c^0 = \max(s_{ij})$. The first threshold of preference c^1 is specified as

$$c^1 = \max_{s_{ij} < c^0} (s_{ij})$$

The following difference is calculated for the *i*-th alternative

$$d_i^1 = p_i^1 - q_i^1 \qquad i = 1, 2, ..., n$$

where p_i^1, or q_i^1 is a number of alternatives over which the *i*-th is preffered, or which are preffered over the *i*-th alternative, with the threshold c^1.

Step 4: Alternatives with the highest d_i^1 form the set. If this set consists of only one alternative, then a single element indifferent class is created. If not single element, then a possible "preference ranking" of these alternatives is studied. This process is analogous to the previous one. Second highest value after c^1 is specified. The differences d_i^2 are calculated, etc. Such a formed indifference class is separated from the others. The remaining alternatives are evaluated by the same procedure starting by a specification of c^0 (see more Roy, 1978). At the end, the set (ranking) of indifference classes is made.