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Analysis of Selected Investment Fund Type Ranking Position – PROMETHEE Method Application

Abstract: We decided to use the PROMETHEE method to rank selected types of investment funds offered on the Polish market. In our deliberations, we took an interest in the investor with a certain aversion to risk who chooses from among treasury securities or stable growth funds. We took into consideration whole ranking lists made for half-yearly periods from 2010 to 2012 instead of the specific objects pointed by model.

We decided to check whether, among investment products of interest to us, there are stable relationships over time arising from their ranking positions that allow to identify regular groups of leaders and outsiders. Moreover, we checked the influence of the fund size measured by the value of its assets on its ranking position.

Key-words: PROMETHEE, ranking, investment funds, capital market.

Introduction

Polish investors have potentially at their disposal a broad spectrum of opportunities to invest their funds that satisfy various needs and preferences. Quite a considerable part of that range is products offered by Investment Fund Associations (IFAs). The great variety of proposed products is, however, becoming a problem. The choice of a future investment depends on preferences of the investor who evaluates interesting funds according to many criteria at the same time.

We decided to use the PROMETHEE method (deriving from the group of multicriteria programming tools) to rank selected types of investment funds offered on the Polish market. In our deliberations, we took an interest in the investor with a certain aversion to risk who chooses from among treasury securities or stable growth funds.

Although the PROMETHEE method serves rather to indicate a decision (the choice of a specific object) being the most beneficial from the point of view of the decision-maker's preferences, we will take into consideration whole ranking lists made for half-yearly periods from 2010 to 2012. We decided to check whether, among investment products of interest to us, there are

stable relationships over time arising from their ranking positions that allow to identify regular groups of leaders and outsiders. Moreover, we wish to answer the question about the influence of the fund size measured by the value of its assets on its ranking position.

The development of the PROMETHEE lasts since 1982 when it came to existence. It turned out to be enough flexible that it is being used not only in economics but also in chemistry, ecology, public services and many other fields. You can find a comprehensive list of bibliography on this subject on the www.promethee-gaia.net website. This list regularly is being replenished.

1. Short Description of the IFA market in 2012

We will begin with a short description of the Polish IFA market. It is based on a report prepared by the Chamber of Fund and Asset Management recapitulating operations of investment funds in 2012 [Raport 2012] but we will limit the presentation to only those parts of the report that concern two groups of funds being of interest to us.

Authors of the report drew attention, among others, to the way in which Poles' savings are used. The total value of Polish households' savings reached PLN 1,062 bn in 2012, which constituted an increase of 10.6% as compared to the preceding year. It is the record volume of funds accumulated in various types of investments. The dynamics of the increase in savings exceeded that of 2011, which was 5.2%. Poles, however, are not very willing to invest their free financial means in investment funds. In 2012 the share of domestic entities of that type in the structure of savings remained at the level similar to that of the preceding year (6.6% and 6.5% respectively).

Almost a half (48.9%) of held savings is kept by Poles in the form of PLN and foreign exchange deposits. The value is similar to that of 2011 (50.2%). The dynamics of changes measured year to year indicates a 13.2% increase in the net asset value of retail investment funds. If that is accompanied by an upturn on the stock exchange in 2012, it can be said that we witness a return of trust in capital markets whose crisis we still observed a year earlier.

In general, the value of assets accumulated in a majority of fund types was rising. The greatest beneficiaries of the increase turned out to be Open Investment Funds (a rise of 21.2% year to year) and insurance capital funds (20.5%). A slight decline in the value of assets occurred solely for state companies' shares as well as bonds and bills. As a result, the net asset value in GDP rose to 9.2% from 7.5% in 2011.

The value of means entrusted to the IFAs increased by PLN 31.2 bn (27.1%) as compared to 2011. That rise is mostly accounted for by an offer of funds addressed to individual investors. Except for May 2012, when a decline of PLN 1.9 bn was noted, the volume of assets was constantly on the rise. Throughout the year, however, an excess of purchases over re-purchases was observed, totalling PLN 14.2 bn for the whole year. The most popular were debt funds, non-public assets funds and absolute rate of return funds, which is consistent with the situation on the market of households' savings. The largest negative balance occurred for mixed funds. A considerable part of means flowed out of share funds, capital protection funds and cash funds too.

The analysis of dynamics of the net asset value (NAV) in December 2012 as compared to the corresponding period of the preceding year certainly indicates the greatest increase (of 67.2%) for debt funds. Thanks to that, they achieved the biggest, i.e. 28.3%, share in the market. Share funds, ranking second in that classification, accounted for 16.8%. Non-public assets funds ranked second as regards the year to year increase (63.9%) and third in respect of their share in the market (16%).

As for mixed funds, they recorded a 5% decline in NAV dynamics, which afforded them a 13.8% share in the market (the lowest since 2003) and the fourth position in that respect. It should be noted, however, that, in 2012, investors were willing to withdraw means from those funds; hence, the balance of payments and withdrawals amounted to PLN – 3.6 bn. The greatest declines in the dynamics of the asset value were recorded by raw material and capital protection funds – of 25.5% and 20% respectively.

As shown by the above data, the fortunes on the IFA market were declining for some types of funds. A majority of households decided to make bank deposits while investment funds were of interest to a small part of potential clients even though the value of accumulated savings was record high. Those, however, who decided to entrust their means to investment funds, chose ones characterized by a minimum risk level, mainly debt funds. That was to the biggest disadvantage of share and mixed funds that include, among others, stable growth funds.

2. PROMETHEE Method

Methods that support decision-making can be provisionally divided into single-criterion and multicriteria methods. The sheer nature of a decision-making problem often results in its multicriteria character. That is the case when decision-making requires considering at least several decision variants, each of which is affected by many factors that determine its acceptability. A review of strictly economic applications of multi-criteria methods can be found in [Zavadskas, Turksis 2011].

Multicriteria optimization is applied to indicate the best decision in an n -element, countable and finite set of decision variants based on evaluation according to k criteria [Trzaskalik 2008, p. 189]. The choice made is to correspond to preferences assumed by the decision-maker and determined by weights assigned by the decision-maker to specific criteria. Thus, the decision-making problem consists in choosing the subjectively best variant. That subjectivity refers to the importance of specific criteria as some factors are usually more important than others to the decision-maker [Ziemba, Piwowarski 2008]. Different decision-makers may of course perceive the same criteria in a different way. With pre-determined weights of criteria, specific variants are then objectively ranked as that is usually done by using a formalized algorithm.

In the algorithm, we assume that there is a certain utility function allowing to determine an order in the set of variants being considered [Kaliszewski 2008, p. 10]. The problem is solved through maximization of the above-mentioned function, i.e. finding such a variant (we will refer to “objects” fur-

ther in the text) for which the analytical form of the function has the highest value. As it has been proven in [Golderman, Schöbel 2011] and [Hajkowicz, Higgins 2008] various multicriteria programming methods are to some extent similar to each other. In our specific case, we will employ the PROMETHEE II method as the method to determine the utility function value. The abbreviation stands for *Preference Ranking Organization Method for Enrichment Evaluations*. It is a method presented by Bernard Roy in 1982 [Macharis, Springael, De Brucker, Verbeke 2004]. It allows to rank objects by going through the following steps:

1. determining the preference function value for all object pairs;
2. determining individual preference indices for all object pairs;
3. determining multicriteria preference indices for all object pairs;
4. determining negative outranking, positive outranking and net outranking flows for each object;
5. making a multicriteria ranking.

In the first step, we determine values of nondecreasing preference function ($r^{(k)}(i,j)$) which serves to compare specific pairs of objects (i,j) in the scope of consecutive k criteria.

In the second step, we determine individual preference indices (the $H^{(k)}(i,j)$ matrix) based on one of six so called generalized criteria that enable simultaneous comparison of object pair preferences for all the criteria. Their values depend on the preference functions computed in the first stage. Those criteria include:

1. usual criterion – only provides information that object i outranks object j or that they are indifferent to each other;
2. U-shape criterion – differs from the usual criterion in assuming the threshold of indifference at $q>0$ also referred to as the indifference index;
3. V-shape criterion – the value of the preference index grows linearly along with the rise in the value of the preference function until it exceeds the p level of the preference index;
4. level criterion – encompasses indifference and preference indices. The value of the function below q means that objects are indifferent to each other; when it is in the (q, p) range, object i weakly outranks object j ; for the value above p , strict outranking occurs;
5. V-shape with indifference criterion – differs from the preceding criterion in the way of calculating the preference index;
6. Gauss criterion.

We will discuss the last criterion in slightly more detail due to its later application. In that criterion, the preference index is computed based on the normal distribution density function. Formula (1) illustrates how the preference index is calculated:

$$H^{(k)}(i, j) = 1 - \exp\left(-\frac{(r^{(k)}(i, j))^2}{2\sigma^2}\right) \quad (1)$$

where:

σ – standard deviation of objects in the scope of specific criteria.

Criteria one through five require earlier determination whether objects are indifferent to each other or one outranks the other. They also introduce certain thresholds of indifference or preference that can be transformed by means of the set function.

We decided to assume the Gauss criterion owing to its advantages as, first of all, it is not necessary to provide values of additional indices, which is the case for the other criteria. Moreover, preference indices are close to each other for very low or very high values of the preference function, whereas for average values the index is approximately linear, which almost proportionally reflects relationships for pairs of objects. Thus, the criterion becomes, on one hand, easier to apply and, on the other hand, gains objectivity.

In the third step of the PROMETHEE method, we calculate a multicriteria preference index for each pair of objects (i, j) according to the formula:

$$\Pi(i, j) = \frac{\sum_{k=1}^K w_k H^{(k)}(i, j)}{\sum_{k=1}^K w_k} \quad (2)$$

where:

w_k – weight of the k criterion.

In the fourth step, we compute positive outranking flows (for rows) and negative outranking flows (for columns) for elements of the matrix provided by formula (2):

$$\Phi^+(i) = \frac{1}{n-1} \sum_{j=1}^n \Pi(i, j) \quad (3)$$

$$\Phi^-(i) = \frac{1}{n-1} \sum_{j=1}^n \Pi(j, i) \quad (4)$$

Afterwards, we determine net outranking flows as differences between positive and negative outranking flows for each of the objects. Net outranking provides information on the size and character of a given object's outranking of the other $n-1$ objects. If the net flow is positive – the object is in the outranking group, if it is negative – it is outranked by the other objects.

The last, fifth, step of the method is to order objects according to their decreasing net flows, which allows us to rank the objects as required. Objects that fit the decision-maker's preferences the most are at the top of the ranking.

Please note that PROMETHEE and other multicriteria methods assume that decision-maker has a perfect information. We also assume that. In practice, this condition is not always met. In [Ben Amor, Mareschal 2012] you can find a proposal to include imperfect information into PROMETHEE.

3. Ranking of Funds and Its Analysis

One of the aims of the study is to rank investment funds according to selected criteria. Financial statements supply a multitude of data and indices, out of which we decided to use values describing the investment policy and the fund as a quoted entity.

A common way to analyse the functioning of investment funds is quotations of share units (SU) and net asset value (NAV) as well as changes they undergo [Marcinkowska 2007, p. 443–444]. We compute the value of a share unit by dividing the net asset value by the number of units arising from the fund's records.

Furthermore, it is worth looking at changes concerning sold and repurchased share units as those impact on changes in the fund's capital. The sale of units increases the capital, whereas re-purchase – decreases it. In consequence, it affects the situation of the whole entity, which justifies considering those values when ranking funds.

In the part dedicated to results of calculations, we will use the mean NAV in the period to which the statements referred and an index describing the relationship of the net asset value to the share unit quotation.

We will also take into account the efficiency of fund management and, in particular, the level of costs it generates. It so happens that a majority of management costs comprises remuneration for the fund (fee collected from each member). Hence, we will use the fund's cost level as a criterion.

The study concerned stable growth funds and bond funds or (in the case of some Investment Fund Associations) their equivalents of a similar profile of activity. Out of the open investment funds present on the market, we only excluded the offer of AXA TFI S.A. due to its incomplete financial statements for the analysed period. Data were provided by half-yearly financial statements for 2010–2012. Therefore, we established six sets of ranking lists for each of the fund groups concerned, separately for each semi-annual period.

The choice of the investor having at least partial risk aversion imposed a limit of two types of funds. On the market, however, operate many types of funds. They have a different approach to risk or are interested in specific market and financial instruments. In [Abaldvi, Charsooghi, Esfahanipour 2007] a similar problem appeared but towards listed companies. A two-time use of PROMETHEE turned out to be the solution. First time to distinguish the entire branches meeting the decision-maker's criteria and for the second time to create the ranking of specific companies.

Multicriteria optimization requires the earlier specification of weights for the applied criteria. It is the task of the decision-maker who, for example, fills in an appropriate questionnaire. In the PROMETHEE method, there is no arbitrarily imposed manner to determine weights¹, of which we will take advantage and propose our own solution, alternative to the traditional approach.

¹ It is different, among others, in the AHP method where the application of paired comparisons matrix requires verifying the consistency of weights specified by the decision-maker.

First, let us assume that weights will come from the 1 to 5 range, with 1 being the lowest importance of the criterion and 5 – the highest. The assumed range is of the continuous character. The PROMETHEE method takes into consideration the importance of criteria upon the earlier normalization of weights. Thus, using the random number generator of computing environment R, we generated 1000 values of each such normalized weight. Parameters of distribution were chosen in such a way so that, upon reversal of normalization, weights were in the [1,5] range for each criterion. The generated values are interpreted as the simulation of results of administered questionnaires.

The beta distribution is well suited to modelling variables whose values are subject to limitations and for which asymmetry is of additional importance. In our case, the asymmetry of distribution determines the scale of importance of a given criterion. Left skewness will mean higher likelihood of assuming a weight above its mean value (the criterion becomes more important), while the right skewness expresses the lower importance of the criterion.

The asymmetry was measured according to the formula:

$$As = \frac{n}{(n-1)(n-2)} \sum_{i=1}^n \left(\frac{x_i - \bar{x}}{\sigma} \right)^3 \quad (5)$$

where:

As – skewness coefficient;

$\bar{x}$ – arithmetic mean;

σ – standard deviation.

For each criterion, α and β parameters of beta distribution were selected in such a way so that the coefficient provided by formula (5) equalled the assumed value expressing the criterion importance level. We considered two weight approaching scenarios. In the first scenario, weights for randomly selected $k-1$ criteria (k – total number of criteria) came from the $[0, 1/k]$ range and were generated from beta distribution with right asymmetry. The skewness coefficient (separately generated for each of the drawn weights) was in the 0.6 to 1 range. The last weight was the complement of the sum of the other weights to one. Such a procedure reflects a situation where one of criteria is of a considerably higher importance to the decision-maker as compared to the others whose importance is at a similar, not very high level.

In the other scenario, importance, i.e. asymmetry of distribution, was arbitrarily decided for each criterion. Then, using the random number generator, we generated 1000 values from the 0 to 1 range for each weight.

We also assumed that the set weights will remain at the same level for the whole studied time period. We present below the criteria applied in ranking along with the symmetry type assigned to them for the case of the individual determination of the degree of importance in decision-making:

1. investment earnings ($As = -0.8$);
2. fund's costs ($As = 0.5$);
3. mean net asset value ($As = -0.6$);

4. number of sold share units ($As = -0.8$);
5. number of re-purchased share units ($As = -0.8$);
6. net asset value per share unit ($As = 0.1$).

Values generated based on beta distribution were averaged and the received means became weights in the PROMETHEE method. For the second scenario, additional normalization was necessary because the sum of averaged weights exceeded 1. Ranking was performed applying the Visual PROMETHEE program².

Having received the rankings, we decided to check whether distributions of objects' ranks for both the scenarios can be considered similar from the statistical point of view. We compared scenario pairs separately for stable growth funds and bond funds. We employed the Wilcoxon signed rank test³ [Aczel 2009, p. 723]. The test is a non-parametric alternative to the *t* paired observations test but, unlike that, it does not require meeting the assumption of the normal distribution of observation differences. It takes into account not only the sign of paired observations but also the size of the difference between them and, to be more precise, of the ranks of those differences.

In our case, accepting the verified hypothesis means that distributions of ranks do not differ between the compared scenarios and differences in funds' ranks are not statistically significant. Thus, verification also concerns the hypothesis of the impact of changes in preferences as to specific criteria on the funds' ranking positions.

Results of the Wilcoxon signed rank test (received by means of the STATISTICA package) confirmed that distributions of ranks do not significantly differ when comparing scenarios for the groups of stable growth funds and bond funds. Certainly, one should not expect a specific fund to retain its ranking for three years. The range of changes within the specific scenarios, however, proved to be small. Therefore, due to the considerable similarity of results between the considered scenarios, we focused on the second variant where there is a differentiated approach to the assumed funds evaluation criteria.

Table 1 contains rankings of stable growth funds received for consecutive periods. The number of bond funds was higher by one because two funds offered by BPH were included in the study.

Among stable growth funds presented in Table 1, the highest ranking were: ING Stable Growth, Legg Mason Senior and PZU Stable Growth Mazurek. Over the period of three years, all three were always top ranking funds and only exchanged positions with one another. At the other end of the list were: Amplico Stable Growth (last or one but last ranking position for all the half-yearly periods), SKOK Stable of Changeable Allocation, BPH Stable Growth Subfund and Skarbiec Protection of Capital. The potential buyer of unit shares with the above described preferences should also not be interested in: Millennium Stable Growth, Idea Stable Growth and KBC Stable Subfund.

² The program is available at www.promethee-gaia.net.

³ Also referred to as the Wilcoxon matched pairs test.

While looking at results contained in Table 1, it can be noticed that, in general, small changes in funds' positions prevail from one period to the next. Only the fund belonging to BPH dramatically improved its ranking in the list in the second half of 2010 to record an equally dramatic fall as early as in the following year. An interesting situation can be observed for Pioneer Stable Growth characterized by the most stable, unchanging ranking position. Over the three years a regular fall in the ranking position occurred for the earlier mentioned Idea Stable Growth (from the 8th to the 13th position). The greatest improvement in the position in the list was observed for UniStable Growth (from the 12th to the 8th place).

In the period from the beginning of 2010 to the end of 2012 half of the funds were characterized by a negative net flow, which from the point of view of the PROMETHEE method is tantamount to being excluded from the sphere of the decision-maker's interest.

Table 1. Rankings of stable growth funds for half-yearly time periods

Fund name	Jun 10	Dec 10	Jun 11	Dec 11	Jun 12	Dec 12
Allianz Stable Growth	9	12	10	7	8	10
Amplico Stable Growth	16	16	16	15	16	15
ARKA Stable Growth	6	6	6	6	7	7
AVIVA Investors Stable Invest.	7	7	8	8	6	6
BPH Stable Growth Subfund	15	8	13	16	15	16
Idea Stable Growth	8	9	9	10	12	13
ING Stable Growth	4	1	1	1	3	3
KBC Stabilny Subfund	11	11	12	12	9	9
Legg Mason Senior	2	3	2	3	1	2
Millennium Stable Growth	10	13	11	11	11	11
Pioneer Stable Growth	5	5	5	5	5	5
PKO Stable Growth	1	4	3	4	4	4
PZU Stable Growth Mazurek	3	2	4	2	2	1
Skarbiec Protection of Capital	13	14	14	13	13	14
SKOK Stable of Changeable Allocation	14	15	15	14	14	12
UniStable Growth	12	10	7	9	10	8

Source: own work.

We believe we can attempt to state that the investment policy and the way of stable growth funds' management guarantee a kind of continuity of their behaviour. Interestingly, strategies assumed by managers of such funds seem to affect relations among the entities themselves. Hence, in consequence, we observe slight shifts in the lists in consecutive periods. Of course, it should be taken into account that such funds focus on long-term investment.

It could seem that funds that deal with investing in bonds – securities ensuring small but continuous profit – ought to be characterized by similar (or even lower) changeability of ranking positions as compared to stable growth funds. Table 2 shows that it is not necessarily the case.

While it was easy to identify groups of leaders and outsiders within the group of stable growth funds, it is more difficult to as clearly indicate one entity in the case of bond funds. Although they are theoretically less risky and less susceptible to market turbulence, bond funds were characterized by greater changes in ranking positions over time.

Undoubtedly, the most attractive for the decision-maker with the assumed preferences will be Pioneer Bonds Plus which ranked either first or second over the three years. An interesting alternative is Millennium Deposit Subfund. Although it featured quite low in the first half of 2010, it quickly improved its ranking to gain the first position in 2012. Moreover, apart from the second half of 2011, the other of the BPH funds systematically retained its ranking among the top five funds.

The four lowest ranking funds in Table 2 are: SKOK Bonds, Legg Mason Bonds, Amplico Bonds and Allianz Bonds. They all ranked low for almost the whole three year period.

Table 2. Rankings of bond funds for half-yearly time periods

Fund name	Jun 10	Dec 10	Jun 11	Dec 11	Jun 12	Dec 12
Allianz Bonds	10	14	16	12	16	17
Amplico Bonds	6	17	17	13	17	16
ARKA Bonds	4	7	5	5	7	6
AVIVA Investors Bonds	15	13	11	9	8	7
BPH Bonds 1	8	5	6	16	12	11
BPH Bonds 2	3	1	2	6	4	4
Idea Bonds	9	10	9	8	6	13
ING Bonds	16	8	8	7	9	8
KBC Debt Securities	13	12	12	11	13	10
Legg Mason Bonds	14	15	14	14	15	15
Millennium Deposit	7	4	4	2	1	1

Pioneer Bonds Plus	2	2	1	1	2	2
PKO Bonds	1	3	3	3	5	5
PZU Debt Securities Polonez	11	11	10	10	11	9
Skarbiec Bonds	12	9	13	15	14	12
SKOK Bonds	17	16	15	17	10	14
UniKorona Bonds	5	6	7	4	3	3

Source: own work.

As already mentioned, rankings in Table 2 are characterized by considerably higher changeability as compared to rankings in Table 1. The greatest improvement over the 3 years occurred for AVIVA Investors Bonds, which rose from the 15th position in the first half of 2010 to the 7th position at the end of 2012. A similarly strong rise was observed for ING (from the 16th to the 8th place). The Millennium group fund has already been discussed. In turn, a dramatic fall was recorded by Amplico Bonds (from the 6th to as low as the 16th position). A slightly smaller but still significant decrease (from the 10th to the 17th place) was also noted for Allianz Bonds.

When analysing net flow values, it can be observed that they were below zero for almost a half of the bond funds throughout the three years. Of course, that group included all entities listed as those being beyond the area of the decision-maker's interest.

While describing results of the Wilcoxon test, we drew attention to the fact that the scenarios of weights for preferences produce rankings that do not differ in a statistically significant manner. Thus, a question arises whether a certain factor (except for the decision-maker's preferences) may determine the ranking of a fund.

Funds differ in their financial potential reflected by the value of assets they hold. Therefore, we decided to check whether ranking positions are significantly affected by the fund size measured by the real value of all its assets. To that end, we decided to estimate parameters of two single-equation econometric models, one for each group of funds. Due to the fact that the explained variable is of the ordinal nature, we cannot use the least squares method. Hence, we applied an ordered probit model for ordered polynomial variables which was described in detail in [Gruszczyński 2010]. The model is a generalization of the binomial model where the variable may assume one of J levels and the levels themselves are ordered, while $J > 2$.

We present below results of the estimation – first for the stable growth and then for the bond funds:

$$R\hat{A}\hat{N}KSW_{it} = -0.0024AKTR_{it} \quad (6)$$

$$z = -9.124 \ (p=0.0000), \text{ likelihood ratio test: } \chi^2 = 91.9602 \ (p=0.0000)$$

$$R\hat{A}\hat{N}KOB_{it} = -0.0004AKTR_{it} \quad (7)$$

$$z = -4.012 \ (p=0.0001), \text{ likelihood ratio test: } \chi^2 = 16.1651 \ (p=0.0001)$$

Variables: RANKSW and RANKOB describe the ranking position of a given fund, whereas AKTR – the real⁴ asset value expressed in millions of PLN. The estimation was performed in the GRETl package.

The negative sign of the explanatory variable parameter means that the bigger the fund (i.e. the more accumulated assets it holds), the higher it ranks. We treat that as the confirmation of reliability of multicriteria optimization results. Values of parameters of models (6) and (7) inform, however, that the impact remains slight.

Z statistics of the Wald test indicate statistical significance of both the models' parameters. Similar information is provided by the likelihood ratio test. It should be emphasized, however, that the summed up R^2 proved to be low and was 12.5% for model (6) and 21.6% for model (7). That means that the explanatory variable explains a fund's ranking position to a small degree.

To sum up, based on estimation results of equations (6) and (7), we find a statistically significant, though not very strong, impact of the fund size on its ranking position resulting from the PROMETHEE method application.

Summary

In the studied period stable growth funds pursued an investment policy that did not significantly change their ranking positions arising from the use of the PROMETHEE method. In their case, it was possible to clearly indicate both the funds that should be of interest to the decision-maker and those that were beyond the area of interest of the decision-maker. In turn, in the same period, bond funds were characterized by considerably higher changeability of their ranking positions. That may indicate the fact that the choice of portfolio components and their management did not guarantee full resistance to changes in the situation on financial markets. It is difficult to indicate as clearly other leaders of that group of funds, apart from Pioneer Bonds Plus. It is, however, still possible to identify funds that do not meet the assumed criteria.

Moreover, we find that the size of the fund affects its ranking position but not to a very large degree. It was probably fund size differences that made both the preference weight scenarios produce similar ranking lists.

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⁴ Assuming the CPI level of January 2010.

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