

THE IMPACT OF THE SIZE OF FUNDS ON THE USE OF SELECTIVITY AND MARKET TIMING BY INVESTMENT FUNDS

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Abstract

Research background: Investment funds are an important part of the capital market. Household savings in this type of asset are increasing every year. From an investor's point of view, the performance of funds is important. These, along with the risks, are what most often determine the choice of fund type and finally the specific fund. The performance of a fund is often determined by both the size of the fund and the application of the managers' selectivity and market sense.

Purpose: The aim of this research is to investigate the impact of fund size on performance through the use of selectivity and market sense by managers. Dividing funds into size groups will allow the search for patterns in terms of managers' use of market timing.

Research methodology: The research used a Treynor-Mazuy model as a market timing model and Ward's method as the cluster analysis methods. The performance of the funds was determined using an investment performance indicator, i.e., Omega.

Results: The obtained results indicate that the funds are similar within the groups. However, there were differences in the results between the groups. During periods of high volatility, it is recommended to invest in units of funds with an average size below the median.

Novelty: The added value is the study of market timing in groups of funds similar in size. In each group, the results of the Treynor-Mazuy model estimation, and the Omega investment efficiency index were determined, and the differences in the obtained results between the groups were examined. Finally, all funds were clustered using the Ward method.

Keywords: market timing, selectivity, fund size, classification, open-ended mutual funds, performance funds, decision making

JEL classification: C01, C22, G14

Introduction

The issue of choosing the right type of fund, and finally the fund itself, is a very important decision from the investor's point of view (Soongswang, Sanohdontree, 2011). At the initial stage, the MIFID II survey, which is completed by the future investor at the fund's distributor, may help. This look at the choice of the fund in terms of results and risk that the investor is ready to take is very important and gives the first information about the type of fund. In turn, the performance of the fund is influenced by many determinants. They may be related to the characteristics of the fund itself, but also to the characteristics of the managers and their investment policy. Not all of these determinants have a significant or minor impact on fund performance. The size of the fund is one of the important determinants commonly studied in the literature. In most markets, there is a relationship between the size of the fund and its performance or effectiveness. This relationship is in the shape of an inverted U (Ding et al., 2015). This means that, up to a certain point, as the size of the fund increases, so does the performance of the fund. Then there is a negative relationship (results decrease in the case of the largest funds).

Another important determinant is the skills of managers, which include selectivity and a sense of the market. Research on market timing is extensive in most markets. It turns out that the appropriate selection of assets for the portfolio is used by managers in most markets. It has a positive impact on the results of the funds. The skills of the right moment to enter or exit the market are also often studied in the literature. However, they are less frequently found and even if they occur, they often affect the achieved results (Cuthbertson et al., 2010).

Studies on the effect of size on fund performance and market timing are usually conducted separately. It is essential, however, to what extent in individual groups, in terms of size, selectivity, and market timing is used and how it affects the results and effectiveness of the funds. Therefore, taking these two elements into account at the same time becomes very important from the investor's point of view. The division into groups will help identify funds that are similar to each other, facilitating the appropriate selection of the fund. Basing this choice on the occurrence of significant determinants has a chance to be more stable than only on historical results that may not happen in the future.

Research conducted for the Polish market has a chance to prove itself also for other markets, especially those from post-communist countries. Markets are interconnected (Blahun, Blahun, 2020; Dias et al., 2020) and such correlations appear both locally and globally (Gębka, Serwa, 2007). This is also confirmed by the reaction of stock exchanges to the outbreak of the

COVID-19 pandemic, which affected stock exchanges in developed and post-communist countries, but with varying intensity (Żebrowska-Suchodolska et al., 2021) and the integration of most global indices (Pardal et al., 2020).

The aim of the work is to search for similarities between the size of the performance fund by applying selectivity and market timing by managers. The division of funds into groups in terms of size will make it possible to search for regularities in the use of market timing by managers. The Polish investment fund market was chosen for the study as an example representative of the market in post-communist countries. Research on the Polish market will focus on equity funds, which are a group of funds expected to generate the highest profit. The use of skills by managers is particularly desirable here. 15 equity funds in the period March 2020–February 2022 were accepted for the study. The period selected was that of the COVID-19 pandemic, a situation in which the capital market was in a period of crisis caused by a non-financial factor. Funds that have been operating on the Polish market for a long time were selected for the study. There were 15 such equity funds. In the case of young funds, the effect of new funds is found, which could lead to an erroneous picture of the situation. The Treynor-Mazuy model was used to test selectivity and market timing. This is a model that has already become part of the canon of issues related to the study of managerial skills. The performance of the funds was determined using an investment performance indicator, i.e., Omega. The funds were clustered by using Ward's method.

The work is organized as follows. The second section includes a review of the literature. The third section contains the characteristics of the investment fund market, with particular emphasis on equity funds. The fourth section describes the methods used for the research, the results of which are presented in the fifth part. The work ends with a summary, which includes a discussion of the results and main conclusions.

1. Literature review

The COVID-19 pandemic, which appeared in Europe at the beginning of 2020, became not only the cause of illness and death of many millions of people around the world but also affected global economies and their sectors. Earlier, however, it had a huge impact on the stock markets of developed and developing countries due to the increasing number of cases and uncertainty related to the spreading pandemic. This was manifested by an increased volatility of stock exchange indices (Baek et al., 2020; Souza de Souza, Augusto, 2020; Zaremba et al., 2020; Albulescu, 2021) in most cases causing a global financial crisis (Svabova et al.,

2021), although with the profitability of some industries (Żebrowska-Suchodolska, Piekunko-Mantiuk, 2022),

The results of the funds, apart from the risk, determine the choice of the fund at the first stage. They can be related to the adopted benchmark (Basu, Huang-Jones, 2015), which provides the basis for, for example, the determination of efficiency indicators (Witkowska, 2012). They can also be considered in the context of risk understood neutrally, negatively, or as a value at risk. Much fund performance research focuses on the US market (Shukla, Singh, 1997). Both studies for the American and European markets indicate that the funds achieve worse results in most cases than in the market identified with the relevant benchmark.

Many factors affect fund performance. These may be factors related to the characteristics of the fund itself, but also factors related to the fund managers. One of the characteristics of the fund itself is its size. Extensive research shows that the relationship between fund performance and size is both positive (Holmes, Faff, 2007; Gharghori et al., 2007; Amenc, Martellini, 2003; Liang, 1999; Chen et al., 2004), and negative (Ammann, Moerth, 2005; Beckers, Vaughan, 2001; Yan, 2008). Different results depend on the size of the fund, and this relationship resembles the shape of an inverted U (Ding et al., 2015). It can be both linear and square (Brennan, Hughes, 1991; Bodson et al., 2011). Studies for the Polish market indicate the existence of a linear relationship (Bałkowski, Otten 2011; Filip, 2017; Żebrowska-Suchodolska, 2021).

An important issue discussed in the literature is also the ability of managers in terms of selectivity and market timing. Treynor and Mazuy and Henrikson and Merton laid the foundations for these issues. Treynor and Mazuy (1966), examining 57 American market funds from the period 1983–1995, noticed one fund showing the property of market timing. Later, in 1984, Henrikson and Merton (1981) proposed a different model, which they tested for funds from 1968–1980. They observed 3 funds characterized by skillful asset management. The observed negative values of market timing for these funds testified to the funds' inability to achieve good investment results. The results achieved by Henrikson and Merton were confirmed for the same market in the period 1971–1979 by Chang and Lewellen (1984). For the period 1975–1994, Daniel et al. (1997) examined over 2,500 funds, mainly aggressive growth funds, finding selectivity in many cases with a lack of market timing. Research for the US market also moved to other markets. For the Malaysian market, poor selectivity and market timing skills were indicated by Abdullah et al. (2007) and Elfakhani et al. (2005). Individual cases of market timing were observed by Gupta (2001) for the Indian market. In the case of the Chinese market, market timing skills used by managers were confirmed by Kiymaz (2015) and Rao et al. (2017). The differences in the results are explained by the frequency of data that was used for

research (Bollen, Busse, 2001) or the benchmark (Dellva et al., 2001). For the Polish market, research on market timing was conducted, among others, by Olbryś (2011), Zamojska (2009), and Witkowska et al. (2009). Swinkels and Rzezniczak (2009), Jamróz (2011), Żebrowska-Suchodolska and Karpio (2020, 2022).

As there was a sharp withdrawal of capital from equity funds, particularly in the case of the COVID-19 pandemic, this significantly impacted the management of fund managers. As studies of various markets show, performance related to the application of selectivity and market sense changed during the pandemic period. For the US, the UK and Chinese markets, there were only isolated instances of market timing (Yin et al., 2024). Most equity mutual funds in Indonesia did not show selectivity and market timing (Madeline, Rizkianto, 2022).

Classification methods are known and widely used in the literature. However, in the case of issues related to investment funds, they appear very rarely. A few studies found to use of the classification to assess the performance of new funds (Sakakibara et al., 2015), or to organize funds in terms of return and risk (Pattarin et al., 2004; Lytkin et al., 2008; Otranto, 2004). Among the classification methods, the k-means method (Acharya, Sidana, 2007) is most often chosen.

This work fills a gap in research on the investment fund market. By combining the determinants of fund performance and classification in the research, it will be possible to answer whether, depending on the size of the fund, the applied investment policy has an impact on its performance. In a broader context, such knowledge has a chance to translate into other markets as well.

2. Equity funds in Poland

The establishment of investment funds in Poland took place after 1989 when the Warsaw Stock Exchange was established and the Act on Public Trading in Securities and Trust Funds was passed (OJ of 1991, No. 35, item 155). The first fund, called a trust fund, was established in 1992. The next ones appeared after a few years when the Act on investment funds and management of alternative investment funds was passed in 2004 (OJ of 2004, No. 146, item 1546). This enabled the operation and functioning of open, closed, and alternative funds and enabled the development of the investment fund market. The emergence of new funds led to the division of funds into different risk groups, i.e., equity, balanced, debt, and money market funds. The current investment fund market consists of 57 Investment Fund Companies that manage 1,063 investment funds (at the end of 2022). The number of investment funds has been

successively decreasing in the last three years, but this has not changed the order of shares of individual types of funds in their total number. Closed-ended funds (42.33%) were ranked first, followed by open-ended (30.10%) and open-ended (27.56%) funds, with the number of open-ended and specialized open-ended funds being similar (Figure 1).

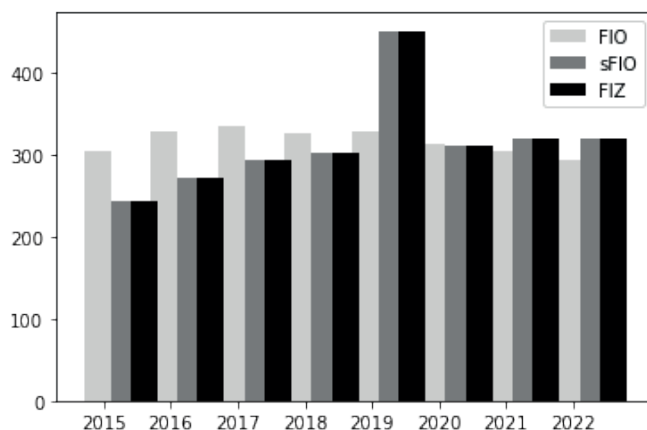


Figure 1. The number of investment funds

Source: own study based on NBP.

Table 1. Value of net assets of investment funds (in PLN billion), data for the fourth quarter of the year

Funds	2015	2016	2017	2018	2019	2020	2021	2022
FIO	83	82	97	102	110	113	114	88
SFIO	50	47	54	50	52	56	63	48
FIZ	140	146	152	142	143	130	140	137
Shares	16.28	16.32	20.04	16.85	16.85	18.41	29.53	20.83
Balanced	7.09	6.39	7.25	6.21	4.91	5.21	5.80	3.87
Debt securities	45.69	46.61	52.83	64.82	76.70	78.05	68.80	53.59
Stable growth	8.72	8.06	10.64	9.20	7.65	7.59	9.01	8.76
Others	4.38	4.06	4.93	4.98	3.43	3.70	1.24	0.47

Source: own study based on NBP.

At the end of 2022, the Undertakings managed assets worth more than PLN 273 billion (Table 1). This value was one of the lowest in the last 8 years. Closed-end funds had the largest percentage share in total assets, followed by open-end funds. Classifying individual types

of funds in terms of net asset value, equity funds were the next type after debt securities funds. The highest net asset value for debt securities funds amounted to PLN 78.05 billion in 2020, and for equity funds – PLN 29.53 billion in 2021. At the end of 2022, the share of equity funds in the value of net assets amounted to 23.8%, and debt securities to 61.23%. Over the last eight years, the share of equity funds in the value of net assets ranged from 15.38% in 2015 to 25.82% in 2021. In the case of debt securities funds, it ranged from 55.21% in 2017 to 70.02% in 2019.

3. Research methods

The first stage of the research was the division of funds into four groups in terms of net asset value. In each of the groups, a study of the presence of selectivity and market timing was carried out. For this purpose, daily rates of return were determined for the units of each fund. The rate of return is understood here as $r_{t,A} = \frac{p_t - p_{t-1}}{p_{t-1}}$ where p_t, p_{t-1} are the values of the fund's units at time t and $t - 1$. Daily data was selected because of the chance of obtaining better results in the study of market selectivity and timing (Bollen, Busse, 2001).

The Treynor-Mazuy model was used in the market timing research. This is one of the most popular models. It is described by the following formula (Treynor, Mazuy, 1966):

$$r_{t,A} - r_{t,f} = \alpha_A + \beta_A(r_{t,M} - r_{t,f}) + \delta_A(r_{t,M} - r_{t,f})^2 + \varepsilon_{t,A} \quad (1)$$

where $r_{t,f}$ is the risk-free rate (measured with the Wibor rate), $r_{t,M}$ is the change in the market index in period t , α_A and δ_A are measures of managers' skills. α_A determines the efficiency of the portfolio selection by managers, and δ_A is a measure of market timing, describing the ability of managers to select the right moment to enter or exit the market. The β_A coefficient in the model describes the manager's ability to take advantage of market trends.

Because the alpha coefficient measures the fund's ability to achieve rates of return exceeding the rate of risk-free assets, the verification consists in setting the null hypothesis $\alpha_A = 0$ against the alternative hypothesis $\alpha_A \neq 0$. No grounds for rejecting the null hypothesis will indicate a lack of management skills in terms of selectivity.

In the case of the coefficient β_A , the null hypothesis is $\beta_A = 0$ and the alternative hypothesis is $\beta_A \neq 0$. Rejecting the null hypothesis, in this case, will mean following market trends by imitating the market.

The assessment of investment effectiveness in terms of market timing boils down to examining the significance of the δ_A parameter and its sign if it is different from zero from the statistical point of view. An entity that is characterized by a greater positive value of the δ_A coefficient selects the moments of making transactions, increasing the profit on investment when the market situation changes. Thus, managers, by skillfully selecting the moments of portfolio composition change, increase the efficiency of investments when the portfolio is characterized by a greater positive coefficient δ_A .

In each group, the results were analyzed, and there were average differences in the coefficient markets between the groups due to the Treynor-Mazuy model coefficients. For this purpose, a one-way analysis of variance ANOVA was used to check whether the difference between the results in individual groups is statistically significant. The null hypothesis was that the average values of individual indicators are equal for all groups against the alternative hypothesis that at least one value differs from the others. The test of test is the F statistic (Aczel, Sounderpandian, 2009)

$$F = \frac{MSTR}{MSE} \quad (2)$$

where $MSTR = SSTR/(n - 1)$, $SSTR$ – the sum of squares between groups, MSE – mean square error calculated from the formula $MSE = SSE/(n - k)$, SSE – the sum of squares of errors.

The null hypothesis is valid if (2) has an F distribution with $n - 1$ and $n - k$ degrees of freedom.

Then, in each of the groups, performance indicators were determined to notice how much selectivity and market timing affect the results obtained. The Omega indicator was used (Keating, Shadwick, 2002):

$$O = \frac{\frac{1}{N} \sum_{r_i > m} (r_i - m)}{\frac{1}{N} \sum_{r_i < m} (m - r_i)} \quad (3)$$

where m is the minimum required rate of return (here $r_{\min} = 0$).

The Omega ratio is the quotient of the average rate of return above the break-even point and the average rate of return below the break-even point. Thus, it reflects the expectations of investors seeking to achieve maximum profit with as little risk as possible.

The last stage was the cluster of funds using the Ward method in terms of the Treynor-Mazuy model coefficients (beta, delta) and the Omega index. Ward's method (Ward, 1963; Ward method in package `scipy.cluster.hierarchy`¹) is a hierarchical clustering algorithm that is often used in cluster analysis. It aims to identify similar groups in the dataset. It starts by calculating the distance between each pair of groups to find the closest connection. Then the nearest groups are combined into one group and the distances between the remaining groups are recalculated. The process is repeated until one group is obtained. The decision on the choice of classes was based on the silhouette index.

The described methods will allow verifying the following research hypothesis: fund size determines fund performance and market timing.

4. Results

The research concerned 15 equity funds in the period from March 12, 2020, to February 23, 2022. These were the following funds: Allianz Polskich Akcji (Allianz), Esaliens Akcji (Esaliens), Generali Korona Akcje (Generali), Investor Akcji Spółek Dywidendowych (Investor D), Investor Akcji, Investor Top 25 Małych Spółek (Investor T25), Millennium Akcji (Millennium), NN Akcji (NN), Novo Akcji (Novo), Pekao Akcji Polskich (Pekao), PZU Akcji Krakowiak (PZU), Rockbridge Akcji Małych i Średnich Spółek (Rock MS), Rockbridge Akcji (Rockbridge), Santander Akcji (Santander), Skarbiec Akcja (Skarbiec). They were selected due to the length of their activity on the market, to avoid the effect of new funds. The research began on March 12, when the state of an epidemiological emergency was introduced in Poland and was completed on the eve of the war in Ukraine. The period of the pandemic turned out to be favorable for the activity of investment funds, it was characterized by an upward trend and net asset values (in 2020 and 2021) were the highest in the last eight years. As research shows, the reaction to the pandemic in the case of the capital market and thus investment funds took place earlier, in the period of the first information about emerging cases of the virus in the world. The author believes that the period of war in Ukraine should be considered separately due to other factors that caused uncertainty and volatility in the capital market.

The research began with the division of funds into four groups in terms of their size. The average values of net assets are presented in Table 2. After the division, four funds were included in groups 1, 3, and 4, and three funds were in group 2.

¹ <https://docs.scipy.org/doc/scipy/reference/generated/scipy.cluster.hierarchy.ward.html>; package was used for Python calculations.

Table 2. Average net asset values in individual groups
in the period March 2020–February 2022 (in PLN million)

	G1	G2	G3	G4
Net asset value	856.534	516.134	197.025	80.443
Funds	Allianz, Esaliens, NN, PZU	Generali, Pekao, Santander	Investor D, Investor T25, Millennium, Skarbiec	Investor, Novo, Rockbridge, Rock MS

Source: own calculation.

Structural coefficients of the Treynor-Mazuy model (1) were estimated for daily participation units of funds from individual groups using the least squares method. In the adopted methodology, the WIG20 was adopted as the market index, as in most cases the assets from this index accounted for the largest share in the case of the funds under consideration. Table 3 shows the results of the structural parameter estimators in this model.

Alpha coefficients indicating the ability to selectively select assets for portfolios turned out to be statistically insignificant in all cases. Therefore, during the pandemic, managers did not select assets for the portfolio that would increase investment results. These results are different from those observed by (Żebrowska-Suchodolska, Karpio, 2022) for the period 2007–2019 when managers showed these skills to a negligible extent.

In the case of the beta coefficient, they were significantly different from zero for all funds. Their positive values prove that the portfolio follows the market situation. However, it can be noticed that the values of the coefficients decrease in individual groups (they are the highest for the largest group in terms of size). However, they are all less than unity. This means that the managers failed to build better portfolios than those offered by the market (measured by the excess rate of return of the WIG20 over the risk-free rate). The average value of beta coefficients was 0.655, which gives a similar result to that from 2007–2019.

Delta coefficients associated with market timing skills are statistically significant in most cases. All values were statistically significant for the first group, and in the remaining groups, there was one statistically insignificant value. The lowest average value of delta coefficients occurred for the fourth group and the highest for the third group. However, all these values were negative. This means that managers react to changes in the market. However, this reaction is the opposite of what should take place.

A one-way ANOVA used to examine between-group differences in beta and delta coefficients indicated significant beta coefficient results ($F = 2.81$, $p\text{-value} = 0.09$). Groups 1 and 4, i.e., the group of the largest and smallest funds, differed the most. In the case of the

delta coefficient, there were no significant differences between the groups in total, although the greatest differences were observed between groups 3 and 4.

Table 3. Estimation results of the structural parameters of the model in 2020–2022

		Treynor-Mazuy model					Coefficient of determination
		α_A	β_A		δ_A		R^2
1	Allianz	2.69E-05 0.00	0.90 0.01	***	-1.77 0.46	***	0.87
	Esaliens	-0.00051 0.00	0.59 0.02	***	-3.25 0.65	***	0.68
	NN	5.08E-05 0.00	0.78 0.01	***	-1.96 0.35	***	0.92
	PZU	-0.00 0.00	0.70 0.01	***	-3.20 0.38	***	0.90
2	Generali	0.00 0.00	0.67 0.03	***	-4.40 0.79	***	0.66
	Pekao	2.02E-05 0.00	0.75 0.01	***	-2.58 0.39	***	0.90
	Santander	-0.00 0.00	0.66 0.03	***	-0.86 0.79		0.61
3	Investor D	-0.00 0.00	0.61 0.03	***	-1.38 0.78	*	0.59
	Investor T25	-0.00 0.00	0.54 0.02	***	-2.63 0.70	***	0.61
	Millennium	-0.00 0.00	0.76 0.01	***	-1.88 0.34	***	0.92
	Skarbiec	0.00 0.00	0.78 0.02	***	-2.56 0.53	***	0.84
4	Investor	-0.00 0.00	0.66 0.03	***	-1.25 1.08		0.46
	Novo	-3.4E-05 0.00	0.55 0.04	***	-5.91 1.17	***	0.40
	Rockbridge	1E-05 0.00	0.50 0.03	***	-4.67 0.88	***	0.48
	Rock MS	6.38E-05 0.00	0.48 0.03	***	-6.09 0.97	***	0.44

*, **, *** statistically significant values were marked at the significance level of 0.1, 0.05, 0.01.

Errors in their estimation are given under the parameter values.

Source: own calculation.

Then, the values of the Omega ratio were determined for each group. They are shown below in Table 4.

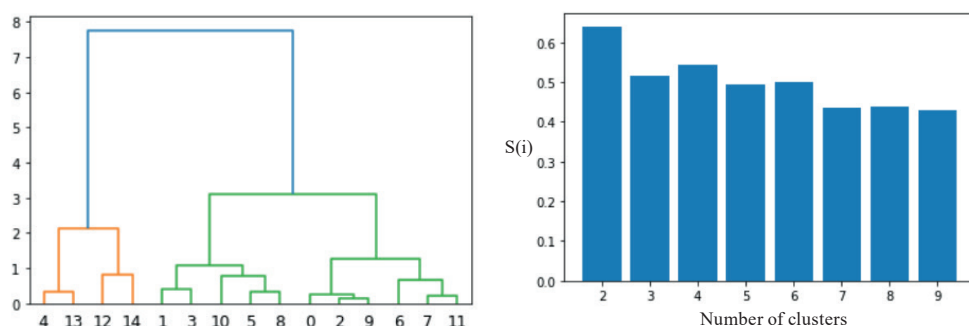
Table 4. Omega ratio values

Fund	Omega ratio
Allianz	2.12
Esaliens	2.06
NN	1.92
PZU	1.67
Generali	1.59
Pekao	1.80
Santander	1.75
Investor D	2.17
Investor T25	2.06
Millennium	2.01
Skarbiec	2.60
Investor	2.01
Novo	0,87
Rockbridge	1.66
Rock MS	1.65

Source: own calculation.

The highest values of the Omega index were observed in group 3, and the lowest in group 4. The comparison of the mean values in the groups indicated the existence of differences between the groups ($F = 3.40$, $p\text{-value} = 0.06$). The biggest differences occurred between groups 3 and 4.

The last step was to cluster all funds using the Ward method in terms of beta and delta ratios and the Omega ratio. The results of the cluster and the number of classes in terms of the Silhouette index value are shown in Figure 2.



0 – Allianz, 1 – Esaliens, 2 – NN, 3 – PZU, 4 – Generali, 5 – Pekao, 6 – Santander, 7 – Investor D, 8 – Investor T25, 9 – Millennium, 10 – Skarbiec, 11 – Investor, 12 – Novo, 13 – Rockbridge, 14 – Rock MS.

Figure 2. Ward method results

Source: own calculation by Python package.

The division into two clusters turned out to be the most optimal. In this division, the first cluster included the smallest funds and the Generali fund, which, in terms of the results obtained, better-fit class 4. The second cluster included funds from groups 1, 2 and 3. It is also worth noting that in most cases these funds from a given group in terms of size were more often combined with each other.

5. Discussion

The paper analyzes the results of market timing in terms of the size of the researched funds. The size of the fund has a significant impact on its results, as indicated by foreign and Polish research. In the case of Polish equity funds, such an impact was indicated by Filip (2017) and Żebrowska-Suchodolska (2021), who observed a significant negative linear relationship for equity funds in the initial period of the pandemic. This means that as the size of the fund increases, its performance becomes worse. This may be related to the difficulties in purchasing or selling large packages of assets in a short time. In times of major change, this is very important (Beckers, Vaughan, 2001).

Research on selectivity and market timing for the period 2007–2019 (Żebrowska-Suchodolska, Karpio, 2022) indicated the existence of selectivity and market timing to a limited extent. Only in the case of individual funds, the results were statistically significant. During the pandemic, however, these results are different. The use of selectivity by managers has not been found at all, while managers in most cases started to use market timing. Probably the uncertainty prevailing in the market at that time influenced the need to look for the right

moments of active action. Studies of investment funds in other countries also show different results for selectivity and market timing during the pandemic (Yin et al., 2024).

The limitation of the study here, therefore, is that the research is carried out for one period, without comparison with other periods. Another limitation of the study may be the use of mutual fund data from free portals. Such data is often incomplete. Another limitation of the study may be that it is not possible to compare this research with others, as the author could not find the same research conducted for other countries.

Conclusions

The aim of the research was to search for similarities between the size of the performance fund by applying selectivity and market timing by managers. The funds were divided into 4 groups in terms of size. In each group, the results of the Treynor-Mazuy model estimation, and the Omega investment efficiency index were determined, and the differences in the obtained results between the groups were examined. Finally, all funds were clustered using the Ward method.

The obtained results indicate that the funds are similar within the groups. Funds from a given group were more often characterized by smaller distances between them than with other funds. However, there were differences in the results between the groups. The largest was noticeable between groups 3 and 4. Group 4, which gathered the smallest funds, achieved the worst results measured by the Omega index. Group 3, a group of medium-sized funds, achieved the best results. It is worth noting that group 3 achieved the best result in terms of market timing, while group 4 – was the worst. The group with the largest funds has a result between the best and the worst. What is interesting, it reaches the highest value in terms of the beta coefficient, which may mean that in the case of the largest funds, the managers tried to imitate only the market. Therefore, the hypothesis is positively verified.

The obtained results allow the investor to recommend the choice of equity funds. During periods of high volatility, it is recommended to invest in units of funds with an average size below the median.

The author's future research will attempt to compare the results obtained during the pandemic with periods of other crises in history.

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