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*Expense Ratio as an Effect of Fund Attributes' Impact*

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Wskaźnik kosztów uczestnictwa jako efekt oddziaływania atrybutów funduszy inwestycyjnych

**Keywords:** mutual funds; fund attributes; expense ratio; charges

**Słowa kluczowe:** fundusze inwestycyjne; atrybuty funduszy; wskaźnik kosztów; opłaty

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### Introduction

According to the assumptions of the idea of benefits from economies of scales along with the increase in the volume of production or services provision, long-term average costs get lower. In the context of financial institutions, e.g. mutual funds, bigger entities that are widely accepted by clients – which is expressed, *inter alia*, by a long period of functioning on the market, as well as those belonging to investment fund companies or capital groups holding a considerable market share – may accrue additional benefits in the form of, e.g. the possibility of cost allocation to a larger capital group. Moreover, if these entities hold a relatively large market share, they are able to reduce transaction costs by negotiating brokerage fees. However, some

declining economies of scale should be noted. It concerns the situation in which along with the increase in undertakings for collective investment institutions, the trading volume held by an investment company may increase, which also brings about higher costs and transaction problems with bigger holdings of securities on the less liquid markets.

Khorana et al. [2009] show that the level of fees charged by funds varies considerably from country to country. According to the research by the international rating agency Morningstar [2016], ongoing charges made by clients of funds in Europe have been getting lower over a few years in all the most important segments of investment funds. This study, however, does not cover the Polish market. Fees collected by Polish investment companies compared to other European Union countries are still the highest [see: Keswani et al., 2016]. While the diversification in the amount of fees among classical investment fund segments is a well-known and understandable issue, the heterogeneity of costs within a given segment may be caused by organizational factors of funds. Therefore, it seems reasonable to determine a possible impact of such attributes as the fund's age, size or the size of an investment fund company that holds a given fund on the level of costs charged during investment.

Study of the economies of scale in operating costs of investment funds appears to be essential both from a theoretical and a practical perspective. These economies of scale, or the lack thereof, allow extending the knowledge of the structure of a given market as well as of the intensity of competition in the sector. In turn, the analysis of the discussed area allows assessing the case for fees charged by investment funds for management and distribution and that are incurred by the clients of these financial institutions.

The paper consists of three parts and a summary. Part one provides a short review of the literature devoted to the relationship of organizational attributes and fund costs or expenses. The second part describes the data used and a set of research procedures. The third part of the study is devoted to the results achieved. Final comments constitute the summary.

## **1. Theoretical background**

Studies on economies of scale in the functioning of financial institutions became popular as early as the 1980s [see: Clark, 1988]. The main subjects of the investigations dealt, however, with banks, and their results were not unambiguous. For example, Benston et al. [1982] concluded, from the perspective of bank deposit and lending activities, that large entities holding more than USD 100 million achieve economies of scale. In turn, Mester [1987], while examining investment banks and entities allowing mortgages, concluded that they record negative effects of economies of scale. In studies on markets from our regions, including Poland, some analyses take into account the bank size as a determinant of, for example, an increase in lending

activity [e.g. Allen et al., 2017] and financial stability [e.g. Pawłowska, 2016], or a decrease of interest costs [Jackowicz et al., 2013].

The literature concerning investment funds seems less extensive, and the analysed economies of scale referred mainly to the effect of asset allocation. Within this trend, Hooks' [1996] work seems interesting with its comparison of load and non-load funds. Hooks showed that funds including sales charges have better results than those that do not. More frequent were studies in which funds were able to achieve better results when management fees were lower. This dependency was backed by managerial skills in the selection of stocks to the portfolio [cf. Bers, Madura, 2000] and a higher transaction activity [cf. Dahlquist et al., 2000], but this one might be reflected in higher operational costs of the fund itself.

Recent studies also ambiguously pointed in the direction of this dependency. For example, Chen et al. [2004], with the use of Fama and MacBeth's [1973] approach, proved that the results of funds, regardless of including the costs and expenses, decrease along with an increase in the assets the fund holds. It was also noted that the fund results do not get worse with the growth of assets of the investment fund company within which a given fund runs its activity. Belonging to a bigger investment fund company allows incurring lower fixed costs. It might mean that economies of scale is favourable in terms of the fund's organization and management, while decreasing economies of scale and reduced liquidity are recorded in the area of managing the investment portfolio.

Among the less numerous works comparing the scope of investment fund activity and costs is Latzko's [1999] study. He indicated that the level of costs is dependent on the level of assets held by the fund. The value of elasticity of expenses due to the fund size proved to be significantly lower than 1 in all the categories of analysed funds. This proved the existence of positive economies of scale in the functioning of investment funds.

Zera and Madura [2001] pointed out that generally, the elasticity of expenses in relation to the scope of the fund activity and the investment fund company itself does not differ significantly in particular fund categories. Nevertheless, there were statistically significant differences within the analysed dependencies when the funds were grouped by investment objectives. Then, larger entities and investment companies holding given funds generated lower expenses. Malhotra et al. [2009], on a sample of closed-end investment funds operating in the years 1995–2005, analysed determinants of cost efficiency. On the basis of the results, they claimed that the increase in costs in the market of closed-end funds was proportionally lower than the increase in their assets, which also proved the existence of economies of scale in this sector. Control variables included fund age, investment company size and portfolio turnover ratio.

Other studies, e.g. by Geranio and Zanotti [2005], were devoted to the analysis of determinants of fees charged by Italian mutual funds. Among the likely reasons for fixing charges, the authors identified such fund attributes as fund age, fund size,

investment company size and obtained return rate from the previous period. Both age and size were measured logarithmically due to a non-linear relationship with mutual fund fees. The authors showed that larger funds belonging to larger investment companies as well as foreign funds charged lower costs. The total expense ratio turned out to be lower for load funds. Similarly, in studies of non-American markets, Na Lamphun and Wongsurawat [2012] compiled an original set of data of Taiwanese equity funds, mixed funds and bond funds operating in the period of 2005–2007. Within these determinants of fees and expenses, they pointed out fund age and the size of a fund and of an investment group in a logarithmic approach. They agreed that among bond funds and mixed funds, fees charged for management decreased with an increasing value of assets. For equity funds, this dependency was less noticeable. They also observed that funds belonging to larger investment companies have a lower level of the expense ratio than their competitors from smaller investment companies.

In the Polish literature, this issue has not yet been the subject of more detailed studies. One of the initial works on factors determining individual investors' decisions on selection of investment funds was Przybylska-Kapuścińska and Gabryelczyk's [2004] study. Still, the issues brought up therein dealt mainly with macro factors. Palica [2007] and Białkowski and Otten [2011] were among the first to use expense ratios in their research into Polish funds. They agreed that fees charged by funds have a negative effect on the results. Fraś [2018] investigated the correlation between good past investment results of funds and current fees. She found that performance are not a significant factor that would raise fees. She suggested fees may be dependent on image and behavioural aspects. Also Perez and Szymczyk [2018] tried to investigate the relationship between performance and management fees' level of Polish mutual funds. They found that high fees of Polish funds are not related to the performance. Moreover, they noticed the strong relationship of management fees with the fund size and fund age. Oleksy [2015], in turn, revealed an erosive impact of the expense ratio on capital value for individual investors on the basis of the so-called final wealth index as it was functioning in the literature. Filip and Karas [2018] dealt with determining relationships between expense ratio and investment effects of funds in the long term. They showed, for a relatively large research sample comprised of four basic fund segments, that there is a long-term relationship. This conclusion was based on the non-parametric tests applied in the cointegration analysis.

## **2. Research procedure and the applied data**

This analysis deals primarily with the main segments of mutual funds, classified by the requirements of the Chamber of Fund and Asset Management (IZFiA) following the adopted investment strategy as equity funds, mixed funds, bond funds and money market funds. The constraints introduced into this paper refer to the handicap

of regional investments. The research covered only domestic mutual funds operating on the Polish market. The collected data come from the years 2002–2015, in which variable values were determined for yearly sub-periods taking into account the level obtained at the end of the year.

The main hypothesis of this paper assumes that organizational factors such as a fund's age, size and the size of the investment company to which a given fund belongs do not affect the level of costs charged during investment. This will be verified by proper research procedures, i.e. with the use of regression analysis. To identify economies of scale in the costs of service, a statistical inference is referred to actual amounts of total annual expenses in relation to assets under management. In this approach, the expense ratio, which correspond well with management fee in Polish reality [cf. Miziołek, 2016], is a dependent variable. In turn, a set of attributes constituted a scope for independent variables. The general formula for the applied model presents itself thus:

$$Expense_i = \alpha_{0,i} + \alpha_{1,i}LNage_{i,t} + \alpha_{2,i}LNsize_{i,t} + \alpha_{3,i}LNfamily_{i,t} + \varepsilon_i$$

where:  $Expense_i$  means the expense ratio is the annual fee that fund  $i$  charge their shareholders to cover its yearly expenses;  $LNage$  is a natural logarithm of the number of months since the first value estimation of participation units;  $LNsize$  is a natural logarithm of net asset value of a given fund; and  $LNfamily$  is a natural logarithm of net asset value of the investment company to which fund  $i$  belongs. The part of the model marked with  $\varepsilon$  is called an error term that takes into account the total impact of the remaining factors not covered in the model by explanatory variables or possible errors made while measuring variables or determining an analytical form of the model.

To describe the most significant information on the use of explanatory variables, descriptive statistics were selected that included mean values, median, standard deviation, minimum and maximum. In this set of variables, there appeared some outliers that were dropped. Table 1 shows information on the basic data describing the expense ratios in four segments of investment funds. Discussion of them is provided in the next section.

Table 1. Descriptive statistics for expense ratio in particular fund segments

	Observations	Mean	Median	Standard deviation	Minimum	Maximum
equity funds	676	0.03928	0.04012	0.01398	0.00093	0.14747
mixed funds	614	0.03158	0.03057	0.01145	0.00036	0.09707
bond funds	439	0.01485	0.01537	0.00606	0.00100	0.04002
money market funds	360	0.01083	0.01000	0.00480	0.00091	0.04963

Source: Authors' own study.

For the models described by the equation mentioned earlier, three procedures of the regression model estimation were applied:

- the classical method of ordinary least squares (OLS), a standard method of estimating structural linear parameters of linear regression models that is an unbiased estimator, consistent and most efficient in the class of unbiased estimators;
- Fama–MacBeth method, a cross-sectional rolling regression procedure that is a traditional approach to capital asset pricing models in which the estimation of model parameters for portfolios is created on a ranking basis and then used in regression models for particular funds; and
- iteratively reweighted least squares method (IRLS), a method of iteratively calculated weights that is a particular case of a generalized method of least squares with iterative updating weights that allows attributing particular weights to observations with different value of variances.

The models were subject to verification in terms of statistical significance of independent variables and goodness of fit to empirical data. To verify the significance of parameters for independent variables, the *t*-Student distribution was applied. For testing regression model fitting to the data, the Fisher–Snedecor test was used. To evaluate the quality of goodness of fit against empirical data, a classical  $R^2$  determination coefficient was used. Due to the use of OLS method to estimate parameters, which assumes that variances of random components are constant (homoscedasticity), the heteroscedasticity test for standard errors was also performed, i.e. the White test.

### 3. Results

According to the adopted assumptions, this study dealt with dependencies of expenses of particular investment funds in four basic segments on organizational attributes characterizing these funds. Therefore, the conclusions drawn in the empirical section will refer to each fund segment separately.

Funds investing their assets in ownership securities are characterized by the highest charges of all the analysed segments. The average expense ratio made by funds in the period covered by the research, as well as the value of the median, accounted for about 4% (see: Table 1). Table 2 presents the research findings on the relationship of the expense ratio and organizational attributes for equity funds, to which three econometric approaches were applied.

Table 2 shows that the findings achieved with the three methods are quite similar. The value of regression parameters set for variables determining fund size and family fund size turned out to be slightly negative, yet statistically significant. That means the higher an investment fund and the investment fund company, the marginally lower the administrative and operating expenses of such institutions might incur. This conclusion might be viewed as an argument for small economies of scale in the form of lower costs, which results from the capital base managed in the discussed fund

Table 2. Impact of equity fund attributes on expense ratio

	<i>OLS</i>	<i>Fama-MacBeth</i>	<i>IRLS</i>
const	0.12154 *** (0.00806)	0.05794 *** (0.00209)	0.10375 *** (0.01124)
LNage	0.00138 * (0.00072)	0.00025 (0.00018)	0.00086 (0.00063)
LNsize	-0.00132 *** (0.00037)	-0.00036 *** (0.00009)	-0.00018 (0.00036)
LNfamily	-0.00294 *** (0.00044)	-0.00055 *** (0.00011)	-0.00301 *** (0.00055)
R-squared	0.07616	0.04997	0.05422
F-S test	36.94528 ***	16.96590 ***	11.56197 ***
White test	40.76767 ***	11.16260	33.02200

Note: \* – significant at the 10% level; \*\* – significant at the 5% level; \*\*\* – significant at the 1% level

Source: Authors' own study.

segment. However there are relatively low values of R-squared that might signify omitted variable bias. It should be determined in subsequent studies.

At the stage of data analysis, there appeared quite high variations in costs that were used in particular groups of mixed funds. Nevertheless, due to a relatively small number of entities in particular fund types of the examined segment, all the mixed funds were grouped as one. It should be noted, however, that, for example, the average values of the expense ratio in the stable growth funds were 2.7%, in the balanced funds were 3.8%, and in the active allocation funds were 4%. Table 3 presents the findings for the research on economies of scale in charges by this segment.

Table 3. Impact of mixed fund attributes on expense ratio

	<i>OLS</i>	<i>Fama-MacBeth</i>	<i>IRLS</i>
const	0.07676 *** (0.01117)	0.05391 *** (0.00541)	0.05687 *** (0.00795)
LNage	0.00088 (0.00092)	-0.00032 (0.00044)	-0.00007 (0.00062)
LNsize	-0.00349 *** (0.00047)	-0.00101 *** (0.00023)	-0.00051 (0.00039)
LNfamily	0.00081 (0.00067)	-0.00010 (0.00032)	-0.00073 * (0.00042)
R-squared	0.11367	0.01171	0.01954
F-S test	23.78914 ***	13.77736 ***	3.76845 **
White test	225.92734 ***	3.71147	4.58965

Note: \* – significant at the 10% level; \*\* – significant at the 5% level; \*\*\* – significant at the 1% level

Source: Authors' own study.

The analysis of the impact of fund attributes on the level of operating expenses did not provide convincing evidence to verify the assumed null hypothesis in the

segment (see: Table 3). In the majority of cases related to the examined organizational attributes, as well as in the majority of used methods of parameter estimation, no arguments were achieved to confirm the existence of economies of scale in fund costs. However it was concluded with a 99% probability that the size of mixed funds has a negative impact on the expense ratio for OLS and Fama–MacBeth approaches. Therefore, only for this attribute may economies of scale be noticed. Nevertheless, the used models were biased by relatively low level of goodness of fit.

Another segment of funds to be analysed was bond funds. Due to the specificity of the portfolio of these funds, costs charged during investment were far lower compared to those from the two segments discussed earlier (see: Table 1). The average value of expense ratio was at about 1.5%. Table 4 presents the detailed findings for the research on economies of scale.

Table 4. Impact of bond market attributes on expense ratio

	<i>OLS</i>	<i>Fama-MacBeth</i>	<i>IRLS</i>
const	0.03805 *** (0.00518)	0.02717 *** (0.00576)	0.02484 *** (0.00221)
<i>LNage</i>	0.00055 (0.00041)	0.00017 (0.00035)	0.00053 *** (0.00017)
<i>LNsize</i>	-0.00061 ** (0.00026)	-0.00068 ** (0.00029)	-0.00043 *** (0.00012)
<i>LNfamily</i>	-0.00064 ** (0.00029)	0.00010 (0.00028)	-0.00012 (0.00011)
R-squared	0.05914	0.01583	0.01283
F-S test	7.83642 ***	2.00578 *	6.38457
White test	29.90193 ***	5.98538	1.55297

Note: \* – significant at the 10% level; \*\* – significant at the 5% level; \*\*\* – significant at the 1% level

Source: Authors' own study.

Because it results from the research carried out on the expense ratio related to bond funds, the only organizational attribute that is reflected in the amount of fees charged is the size of assets managed by funds (see: Table 4). For the two research approaches (OLS and Fama–MacBeth), some similar findings were recorded. Along with the increasing capital base, managed by the entities within the examined segment, the amount of expenses was subject to some small alterations. That means there are little grounds to reject the null hypothesis in the context of one of the analysed organizational attributes. The same as before, the limited goodness of fit was observed.

Due to its specificity, the segment of money market funds is characterized by the lowest costs. The average level of expense ratio for this type of entities was 1%, while the value of standard deviation was around 0.005 (see: Table 5). Table 5 presents the results of charges dependencies on attributes of the money market funds.



Table 5. Impact of money market attributes on the expense ratio

	<i>OLS</i>	<i>Fama-MacBeth</i>	<i>IRLS</i>
const	0.03119 *** (0.00505)	0.01865 *** (0.00345)	0.02988 *** (0.00443)
<i>LNage</i>	0.00015 (0.00037)	-0.00010 (0.00025)	-0.00021 (0.00032)
<i>LNsize</i>	-0.00045 ** (0.00022)	-0.00004 (0.00015)	-0.00044 ** (0.00020)
<i>LNfamily</i>	-0.00057 ** (0.00026)	-0.00034 * (0.00018)	-0.00045 ** (0.00022)
R-squared	0.05315	0.06197	0.06650
F-S test	6.006427 ***	6.26530 ***	7.62204 ***
White test	7.135707	5.16751	2.16116

Note: \* – significant at the 10% level; \*\* – significant at the 5% level; \*\*\* – significant at the 1% level

Source: Authors' own study.

Table 5 provides partial and very restricted arguments for rejecting the null hypothesis and adopting the alternative hypothesis on the existence of economies of scale in costs for, among others, operational area of funds. The analysed organizational attributes, in which the results were statistically significant, have a negative impact on the expense ratio. It should be noted, however, that for money market funds, the parameters' significance was not higher than 95%, while their value was small.

## Summary

The aim of the study was to determine the impact of fund attributes such as age, fund size or family fund company's size on the level of expenses of the examined financial intermediaries. Due to the expense ratio corresponds well with management fee, the rationale for this lies in both the theoretical and practical spheres.

The main hypothesis that organizational attributes do not affect the level of total expenses related to fund's operational activity was verified as negative for some used explanatory variables with the rather limited scope. It was concluded that the size of funds has a negative effect on the expense ratio. In this case, it indicates the existence of small economies of scale because the increase in assets being managed by institutions of collective investment is accompanied by the decrease in the costs charged during investment. It is also worth noting that the recorded degree of size factor's impact, in relationship to the expense ratio, decreased along with the change in the analysed segments of funds from equity to debt instruments in portfolios. Moreover, for equity funds, a negative impact of the size of investment fund companies on the expense ratio was recorded. In the analysis of particular segments of investment funds, a relatively strong sensitivity of the received results

to the applied research approach was noticed. Nevertheless, all used models were biased by relatively low level of goodness of fit. Thus, this research should be treated as preliminary study and obtained results deserve a further analysis applying more advanced research approaches.

In the future, more attention should be paid to the issues connected with the impact of the received return rates at the level of fees charged by funds. Perez and Szymczyk [2018] suggested that lagged performance should be applied as an explanatory variable in regression models. The relationship between these two variables seems appropriate in the context of the issue of portfolio management quality that might be justified by higher costs.

To sum up, these economies of scale in operational costs of investment funds might be noticed from the perspective of the clients of these funds. In general, the increase in the asset value being in the possession of these financial intermediaries led to the decrease in real level of costs charged during investment. The conclusions arising from this study might give reasonable grounds for further empirical research.

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### Wskaźnik kosztów uczestnictwa jako efekt oddziaływania atrybutów funduszy inwestycyjnych

Celem artykułu jest ustalenie wpływu atrybutów funduszy inwestycyjnych, takich jak wiek, wielkość funduszu oraz wielkość towarzystwa, do jakiego należy dany fundusz, na wysokość opłat pobieranych przez omawianych pośredników. W tym celu wykorzystano analizę regresji wielorakiej dla danych przekrojowych z wykorzystaniem trzech metod estymacji paramentów (OLS, Fama–MacBetha oraz IRLS). Analizę zależności wskaźników kosztów uczestnictwa od cech organizacyjnych oparto o dane dotyczące czterech segmentów polskich funduszy inwestycyjnych. Otrzymane wyniki potwierdzają istnienie niewielkich korzyści skali w opłatach pobieranych przez fundusze w związku ze zwiększaniem się wartości posiadanych aktywów.

### Expense Ratio as an Effect of Fund Attributes' Impact

The aim of this paper is to examine if fund attributes such as size, age and family size influence the expense ratio. The study employs multiple regression analysis for cross-section data with the use of three methods of estimation (OLS, Fama–MacBeth and IRLS). The analysis is conducted using data from four segments of Polish mutual funds. The results confirm the existence of small economies of scale in the case of the expenses incurred in connection with the increasing assets under management.