

# Competitiveness analysis of ESG qualified investment funds available in Hungary

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**ABSTRACT:** The aim of this study is to examine the factors influencing the annual returns and total expense ratio (TER) of equity funds operating in Hungary, with a particular focus on funds with ESG ratings. The study is based on data from the period between 2021 and 2023 and targets public equity investment funds. We used OLS and quantile regression methods for the analysis, taking into account the extreme inflationary environment and the economic changes caused by COVID-19 and the Russian-Ukrainian war. The results show that ESG ratings have a significant negative impact on annual returns according to the OLS model, while based on quantile regression, this negative impact is particularly evident in the upper quantiles of returns. In contrast, the impact on the total expense ratio is not significant, although funds focusing on emerging markets show significantly higher cost levels in the higher quantiles. In addition, it can be concluded that funds with higher net asset values operate at lower costs, which indicates the prevalence of economies of scale. The age of the funds shows a positive correlation with the total expense ratio, indicating that older funds typically have higher operating costs. Our results contribute to a better understanding of the performance and cost structure of ESG funds and highlight that sustainability considerations should be assessed in a differentiated manner in terms of both returns and costs when making investment decisions.

**KEYWORDS:** equity mutual funds, performance, ESG rating, TER, COVID19, Russian-Ukrainian conflict

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## Introduction

Sustainable investment has seen a remarkable growth rate in recent years, making it clear that a significant proportion of investors are considering environmental, social and governance (ESG) criteria alongside financial performance in their investment decision-making process. This is supported by the fact that only a small proportion of investors now consider ESG investing to be a passing trend (Papathanasiou et al., 2022). Bloomberg Intelligence reports that the value of ESG assets under management worldwide was \$40 trillion in 2022 and is forecast to exceed \$50 trillion by 2025 (www.bloomberg.com). Europe is considered the leading region for ESG investments, with more than 80% of ESG assets concentrated there (Papathanasiou and Koutsokostas, 2024). PwC research also shows a significant growth in ESG investment funds, with estimates that they will account for more than 50% of all European funds' assets by 2025, up from 37% at the end of 2021 (Funds Europe, 2022).

The rise in popularity of socially responsible funds has attracted the attention of researchers and practitioners. The vast majority of the literature focuses on comparing funds that apply ESG criteria with their traditional counterparts, but the research results are not clear. Some studies support the idea that ESG funds with higher ratings tend to outperform and that this effect is more pronounced during economic recessions and the COVID-19 epidemic (Reddy et al, 2017; Pasztor and Vorsatz, 2020; Abate et al., 2021; Omura et al., 2021; Fang and Parida, 2022; Dunbar et al., 2023). Other research highlights that funds with lower ESG ratings perform better than their counterparts with higher ESG rankings (Lesser et al, 2016; Pavlova and de Boyrie, 2022; El Ghouli et al., 2023). Furthermore, there is a third camp who argue that ESG-rated funds perform similarly to their conventional counterparts, so that ESG investments do not provide higher returns for investment funds (Matallín, 2019; Hartzmark and Sussman, 2019).

The question arises, therefore, which category of ESG investment funds available in Hungary can be classified? With this in mind, the focus of our research is on investment funds that are also very popular in Hungary. Their assets have grown significantly in the last 5 years. While in 2019 their net asset value was around 6500 billion HUF, by 2023 it had reached 14000 billion HUF (Association of Hungarian Investment Fund and Asset Management Companies), despite the economic difficulties caused by the Covid19 and Russian-Ukrainian conflict and the extraordinary increase in inflation.

The Association of Hungarian Investment Fund and Asset Management Companies in Hungary has introduced the „ESG certified” classification for

the categorisation of investment funds from 2020, so that it is now required to be included in product descriptions. These changes provide an opportunity to examine how competitive domestic ESG-qualified investment funds are in terms of returns and cost structure compared to their traditional counterparts. Indeed, as government bond yields fall, they could once again offer a good alternative for retail investors. And ESG certification allows them to target a segment of society for whom sustainability is an important consideration, in addition to financial awareness. In Hungary, there is also a growing trend of interest in sustainability among the general public. According to research by the European Commission (2020), Hungarian consumers are increasingly taking environmental and social factors into account in their purchasing and investment decisions (European Commission, 2020).

In our research, we investigate the factors that influence the returns and costs of investment funds operating in Hungary. Thus, the various return and risk indicators such as cost structure, age of funds, portfolio size (net asset value), ESG rating, extreme inflationary environment and the recent COVID-19 and Russian-Ukrainian conflict play an important role. In our opinion, ESG-rated funds are more expensive than their traditional counterparts due to the more complex portfolio construction and management process. In terms of performance, the presence of ESG factors results in lower returns.

## Literature review

In our literature review, we found that there is a wide divergence of opinion across the studies. Three main directions are represented. The first suggests that there is a positive relationship between ESG assessment and investment fund performance. The second group considers this relationship to be neutral, while the third approach assumes that ESG valuation has a negative impact on returns.

The literature in the first category is discussed in the next section. Abate and colleagues (2021) examined European equity funds. Their results are consistent with the strand of literature that supports the existence of a positive relationship between ESG performance and financial performance. Their findings suggest that investors who allocate to European equity funds of wealth managers that favour ESG criteria can achieve better financial performance than those who choose funds with less sustainable investment policies. Therefore, investment decisions based on ESG criteria seem to have a competitive advantage due to the inclusion of non-financial data. It is also found that funds with a high ESG rating are associated with lower unit costs despite more complex screening criteria and associated operating costs. In their study, Fang and Parida (2022) investigated the performance and capital inflows of sustainable equity funds during the pandemic period. They find that funds with high ESG ratings perform better than their lower rated counterparts. This superior performance increases significantly during the market crash caused by COVID-19 and in the post-pandemic period. Their analysis also shows that funds with higher ESG ratings attract significantly more investment or suffer fewer outflows than

lower rated funds. These differences in capital flows increase significantly during market crashes. The study by Meyers et al. (2024) aimed to investigate the ESG performance and sustainability risk of funds through a multi-regional perspective analysis. The results show that higher ESG performance is associated with better risk indicators. The analysis also shows that ESG performance varies depending on the geographical area of investment. Funds with a European investment focus show higher ESG performance than North American funds. It was also observed that investments allocated to emerging markets and Asia have lower performance and higher risk ratios than their North American counterparts. Pisani and Russo (2021) investigated the returns, volatility and risk of European mutual funds over the period of the financial crisis caused by the pandemic COVID-19. Both GARCH models and event analysis showed that funds with higher ESG ratings were able to outperform other funds during COVID-19. These funds had higher resilience, which is reflected to a lower levels of the various risk metrics.

The second category, on the other hand, focuses on studies that show lower ESG-rating mutual funds perform better. In their study, Lesser and colleagues (2016) examined international equity funds. Their results show that funds with a sustainable investment strategy tend to underperform their peers in non-crisis periods. These performance differences are attributed to the screening activity of the funds, as within each sustainable strategy there are both performance drivers and reducers. El Ghouli and colleagues (2023) analysed 2255 ESG rated and conventional mutual funds. They found that sustainable funds had lower raw returns, risk-adjusted returns and Sharpe ratios than others. They also found that underperformance is relatively small. Their results are consistent with the view that ESG has a limited negative impact on the performance of investment funds, but also offers some diversification benefits. Papathanasiou and Koutsokostas (2024) investigated how ESG ratings affect the performance and performance persistence of European equity mutual funds. The results suggest that funds with low ESG ratings show better performance and stronger positive performance persistence. Nevertheless, during the COVID-19 epidemic, it was observed that investors became risk averse and withdrew from lower ESG rated funds despite their previous better performance. In contrast, the interest in funds with a high proportion of sustainable assets indicates that investors see sustainability as a necessity when making investment decisions. In their study, Baily and Gnabo (2022) used a panel database of US equity mutual funds to investigate whether ESG-rated funds are indeed different from their conventional counterparts in terms of investment strategies and returns. The empirical results showed that the portfolio composition of highly rated ESG funds differed from their conventional peers and, more surprisingly, from each other. They also found that high ESG rated funds underperform their traditional counterparts on average, while showing much higher resilience to climate risks.

The third point of view is that there is no difference between the performance of ESG and conventional funds, so there is no over- or under-performance in the studies. Hartzmark and Sussman (2019) studied the US mutual fund market. They found evidence that investors across the market value sustainability, with low

sustainability ratings resulting in significant capital outflows and high sustainability ratings resulting in large capital inflows. The results of their research suggest that investor groups perceive sustainability as a positive predictor of future performance, but found no evidence that high sustainability funds outperform their lower rated counterparts. Matallín and co-authors (2019) examined 202 different ESG-rated US equity funds between 3 January 2000 and 30 June 2017, which were compared with traditional funds. Their results show that, overall abnormal performance of ESG funds is negative and significant in growth periods, but they did not find significant differences in recession periods. Their final conclusion was that there are no significant differences between the performance of ESG and traditional mutual funds when comparing within the same type categories. Plagge and Grim (2020) in their study examined the performance characteristics of US ESG equity funds over the period 2004 to 2018. The results suggest that the majority of funds do not show statistically significant differences in returns across any of the ESG categories studied. Overall, the differences in returns and risks of ESG funds may be significant, but they appear to be driven primarily by fund-specific criteria rather than by a homogeneous ESG factor. Steen et al. (2020) compared the performance of ESG rated and conventional mutual funds established in Norway. They found no relationship between ESG rating levels and abnormal risk-adjusted returns. However, it is important to note that the European comparison concluded that geographical bias is a recurring phenomenon in the distribution of sustainability ratings. Naffa and Fain (2022) examined the relationship between equities investments and ESG ratings and concluded that ESG portfolios constructed from the data used did not generate significant alpha, which also reinforces the neutrality of the factors relative to each other. The study by Vancsura and Bareith (2024) also focuses on the analysis of global equities in the period 2022-2023. The results show that the real returns on equities have no impact on ESG scores, nor do ESG ratings affect stock market performance.

In summary, the literature is fragmented on the relationship between ESG assessment and investment fund performance. While many studies support a positive relationship, especially during economic crises, other studies have found a neutral or negative relationship. This suggests that the impact of ESG ratings on mutual fund performance is complex and depends on multiple factors, and further research is needed to gain a deeper understanding of the issue.

## Materials and methods

In our study, we examined publicly managed, open-ended equity funds operated by fund managers in Hungary between 2021 and 2023. Since we had annual data available, the panel regression approach was not an option due to the shortness of the interval, so we decided to use cross-sectional analysis, including OLS and quantile regression. The data were downloaded from the publicly available databases of the National Bank of Hungary and the Association of Hungarian Investment Fund and Asset Management Companies. When selecting funds, we considered the analysis

of total expenses ratio published annually by the MNB to be authoritative, in order to be able to work with as much data as possible during income- and expense-based analyses. The following variables were used in the modelling:

- ▶ Annual\_yield\_percent: the annual return of the mutual fund as a percentage.
- ▶ Yield\_from\_start\_percent: the accumulated return generated by the mutual fund from its inception to the end of the current year under review, expressed as a percentage.
- ▶ Previous\_yield\_percent: the percentage of return achieved in the previous year.
- ▶ Annual\_std\_percent: the standard deviation of the returns in the current year.
- ▶ NAV\_in\_mrdFt\_actual\_year: net asset value calculated on the last day of the year in billion HUF.
- ▶ Age\_in\_months: age of the fund from the start.
- ▶ TER\_percent: the indicator representing the total costs of the mutual fund for the year under review.
- ▶ ESG\_rating\_dummy: dummy variable representing the ESG rating.
- ▶ Emerging\_market\_dummy: the geographic location of the stocks in the fund is emerging markets.
- ▶ Developed\_markets\_dummy: the geographic location of the stocks in the fund is developed markets.

In the first model version, the focus was on the variables affecting the Annual\_yield\_percent, while in the second version, the focus was on the factors affecting the Total Expense Ratio (TER). In both cases, OLS and quantile models are used to compare the results. There are several studies in the literature that highlight the importance of the benefits of quantile regression in the analysis of mutual fund performance (Abdelsalam et al., 2014; Matallín-Sáez et al., 2019; Duong and Meschke, 2020; Ahmed and Doukas, 2021; Agoraki et al., 2023; Paudel and Naka, 2023). Unlike conventional regression methods (OLS), quantile regression, introduced by Koenker and Bassett (1978), estimates effects at different quantiles of the distribution of the dependent variable, thus providing a more detailed picture of these relationships. This approach reveals how individual variables may affect equity fund returns differently across different return levels. From a risk management perspective, quantile regression offers insights that help investors adjust their portfolios and develop hedging strategies (Eissa et al. 2024). The quantile regression model assuming independent identical distributions can be described as follows (Bareith and Fertő, 2023):

$$f_t = x_t' \beta + u_t \tag{1}$$

$$E(f_t | x_t) = x_t' \beta \tag{2}$$

$$Q_{f_t}(\theta | x_t) = x_t' \beta_\theta \tag{3}$$

$$\beta_\theta = \beta + \gamma F^{-1}(\theta) \tag{4}$$

where  $F$  is the cumulative distribution function of the error term ( $u_t$ ),  $\gamma$  is the constant, and  $\theta$  denotes the quantile. In our study, we used the following quantiles split: 10., 20., 30., 40., 50., 60., 70., 80. and 90.  $Q_{\theta}(f_t | x_t)$  shows the conditional quantiles functions based on the inclusion of covariances. The quantiles considered have sufficient number of elements and degrees of freedom.  $\beta_{\theta}$  shows the parameters estimated in the different quantiles,  $x_t$  denotes the covariance matrix of the explanatory variables. The specificity of the method is that the error term ( $u_t$ ) can have any type of distribution. When estimating the parameters in the equations presented above, the following loss function is minimised:

$$\min_{\beta_{\theta} \in R^p} \sum_{t=1}^T \rho_{\theta}(f_t - x_t' \beta_{\theta}) \quad (5)$$

where  $p = \text{dimension}(\beta_{\theta})$ . The above function (5) can be written in simplified form as follows:  $\rho_{\theta}(u) = u(\theta - I(u < 0))$  The indicator function  $I$  takes the value 1 if  $(u < 0)$  and it is 0 in all other cases.

In the case of quantile regression, contrary to OLS, it does not minimize the sum of squares of the residuals, but the sum of the absolute value of the residuals corrected by the asymmetric penalties, where the focus is on the following minimization problem:

$$\min_{\beta_{\theta} \in R^p} \sum_{t=1}^T \theta |u_t| + \sum_{t=1}^T (1 - \theta) |u_t| \quad (6)$$

In formula (6), the penalty is  $\theta |u_t|$  in the case where  $u_t \geq 0$ . If  $u_t < 0$ , the penalty can be written as  $(1 - \theta) |u_t|$ .

It is important to mention that in order to test heteroskedasticity in the OLS models, we also used the Breusch-Pagan and White tests for each cross-sectional data set. For a significant proportion of the models, the tests led us to conclude that heteroskedasticity was found and we had to use a robust estimation method. We also tested for multicollinearity (VIF test), but this was not found for any of the models, so we did not need to change the composition of the combinations of dependent and independent variables we originally formulated. The OLS and quantile regression, and all the necessary tests, were executed in Stata version 17.

The rating of ESG mutual funds operating in Hungary is not yet as sophisticated as in the United States or Western European countries. Therefore, we considered the information published by BAMOSZ and used binary variables to indicate ESG ratings in our analysis. Our database therefore contains a mix of ESG-rated and non-ESG-rated funds.

The descriptive statistics of the variables are presented in Tables 1, 2, and 3. The difference in the number of observations can be explained by the fact that during the preliminary data analysis and data cleaning, we removed the outliers from the explanatory and dependent variables in order to avoid bias. This database reduction was based on the 1st and 99th percentiles, i.e., the lower and upper 1% of the data

were automatically excluded. This step is a commonly used procedure in practical statistical analyses for handling small numbers of outliers that cause bias.

**Table 1: Descriptive statistics for equity mutual funds in the database for the year 2021**

Variable	Obs	Mean	Std. dev.	Min	Max
Annual_yield_percent	161	17,44	11,58	-23,26	38,55
Yield_from_start_percent	161	9,50	9,10	-10,23	41,92
Previous_yield_percent	161	6,22	15,42	-29,63	70,74
Annual_std_percent	161	11,97	3,09	1,03	22,67
NAV_in_mrdFt_actual_year	161	4,29	6,27	0,00	38,64
Age_in_months	161	117,28	86,59	12,00	336,00
TER_percent	161	1,75	0,59	0,19	2,68
ESG_rating_dummy	31	0,19	0,40	0,00	1,00
Emerging_market_dummy	110	0,54	0,50	0,00	1,00
Developed_markets_dummy	51	0,17	0,38	0,00	1,00

Source: own editing based on STATA17 output

**Table 2: Descriptive statistics for equity mutual funds in the database for the year 2022**

Variable	Obs	Mean	Std. dev.	Min	Max
Annual_yield_percent	154	-8,28	20,23	-26,74	127,47
Yield_from_start_percent	154	4,76	4,28	-4,96	18,64
Previous_yield_percent	154	17,21	11,52	-23,26	38,55
Annual_std_percent	154	12,12	2,76	7,82	22,67
NAV_in_mrdFt_actual_year	154	3,61	5,04	0,00	30,38
Age_in_months	154	129,04	87,09	24,00	348,00
TER_percent	154	1,80	0,57	0,19	2,70
ESG_rating_dummy	31	0,20	0,40	0,00	1,00
Emerging_market_dummy	104	0,53	0,50	0,00	1,00
Developed_markets_dummy	50	0,18	0,39	0,00	1,00

Source: own editing based on STATA17 output

**Table 3: Descriptive statistics for equity mutual funds in the database for the year 2023**

Variable	Obs	Mean	Std. dev.	Min	Max
Annual_yield_percent	157	17,11	13,26	-9,97	44,72
Yield_from_start_percent	157	6,11	4,23	-2,00	19,23
Previous_yield_percent	157	-8,73	20,30	-34,47	127,47
Annual_std_percent	157	12,17	2,80	7,82	22,67
NAV_in_mrdFt_actual_year	157	4,14	5,77	0,00	33,04
Age_in_months	157	140,05	86,97	36,00	360,00
TER_percent	157	1,80	0,63	0,19	3,92
ESG_rating_dummy	31	0,20	0,40	0,00	1,00
Emerging_market_dummy	106	0,53	0,50	0,00	1,00
Developed_markets_dummy	51	0,18	0,38	0,00	1,00

Source: own editing based on STATA17 output

## Results

### Results for annual returns in 2021

In our study, we examined the returns of mutual funds and their total cost ratios. First, we analyzed the data for the year 2021 using OLS and quantile regression, the results of which are presented in Table 4. The results of OLS show that only the total cost ratio (TER\_percent) and the developed market dummy variables (Developed\_markets\_dummy) are not significant in terms of their effects on annual returns. It is important to highlight that in this model, ESG rating has a negative impact on fund returns and this leads to a reduction in performance of almost 3%. If we look at the results of the quantile regression, we obtain a much more nuanced picture, as we only see significant values for the ESG dummy variables for quantile 50th and 60th. However, here we find negative effects of 5.2% and 4.6% respectively. In the case of the return from the start, only the 90th quantile is not significant, while in all other cases a positive relationship is observed. On the other hand, the evolution of the previous year's returns has a negative effect on the performance in 2021, with P-values below the 10% significance level for all quantiles. With respect to the annual variance, a shift occurs at quantile 80th and 90th (these two levels are not significant), until then it can be said that an increase in risk leads to a deterioration in performance for the funds. The evolution of the current annual value of net asset value has no impact on returns. The TER indicator also only shows a significant negative effect at level 40th. The fund age is significant and positive up to the 50th quantile. It is also clear that the impact of Covid19 is already felt in 2021, as emerging

markets are more sensitive to this shock. The results show that, without exception, we obtain negative coefficient values everywhere and that these values are only non-significant from the 70th quantile onwards. In the case of funds holding developed market equities, only the 90th quantile can be taken into account, in which case there is a significant positive impact on annual returns.

**Table 4: OLS and quantile regression results for the annual return for 2021 (Annual\_yield\_percent)**

VARIABLES	OLS	q10	q20	q30	q40
Yield_from_start_percent	0,381*** (0,128)	0,595** (0,236)	0,584*** (0,198)	0,568*** (0,177)	0,407** (0,162)
Previous_yield_percent	-0,287*** (0,060)	-0,233** (0,091)	-0,257*** (0,083)	-0,289*** (0,088)	-0,295*** (0,099)
Annual_std_percent	-1,491*** (0,382)	-2,285*** (0,358)	-2,229*** (0,372)	-2,361*** (0,462)	-2,228*** (0,524)
NAV_in_mrdFt_actual_year	0,229* (0,122)	0,193 (0,131)	0,113 (0,148)	0,186 (0,168)	0,154 (0,185)
Age_in_months	0,020* (0,011)	0,038* (0,020)	0,045*** (0,017)	0,033** (0,015)	0,023* (0,013)
TER_percent	-1,780 (1,254)	-2,343 (1,881)	-1,768 (1,538)	-1,128 (1,622)	-2,642* (1,558)
ESG_rating_dummy	-2,943** (1,400)	1,717 (2,141)	1,589 (1,515)	-0,253 (1,867)	-2,348 (2,531)
Emerging_market_dummy	-6,120*** (1,761)	-7,130** (3,560)	-9,584*** (2,687)	-8,932*** (2,301)	-8,076*** (2,141)
Developed_markets_dummy	2,177 (1,938)	1,002 (3,365)	-1,503 (3,126)	-0,840 (3,300)	-0,028 (3,086)
Constant	36,795*** (5,694)	33,761*** (10,479)	35,833*** (8,902)	39,332*** (8,357)	45,979*** (7,520)
R-squared	0,481	0,4687	0,4471	0,4057	0,3531
Observations	161	161	161	161	161
VARIABLES	q50	q60	q70	q80	q90
Yield_from_start_percent	0,293** (0,142)	0,287** (0,130)	0,224* (0,133)	0,234* (0,135)	0,178 (0,151)
Previous_yield_percent	-0,165* (0,098)	-0,163* (0,097)	-0,191* (0,113)	-0,249** (0,119)	-0,332** (0,129)

VARIABLES	q50	q60	q70	q80	q90
Annual_std_percent	-1,831*** (0,467)	-1,836*** (0,489)	-1,034* (0,560)	-0,691 (0,434)	-0,460 (0,293)
NAV_in_mrdFt_ actual_year	0,121 (0,186)	0,187 (0,197)	0,047 (0,232)	0,237 (0,261)	0,379 (0,261)
Age_in_months	0,022* (0,012)	0,017 (0,012)	0,014 (0,014)	0,010 (0,015)	-0,002 (0,015)
TER_percent	-2,237 (1,401)	-2,199 (1,501)	-1,830 (1,508)	-1,088 (1,493)	-0,803 (1,560)
ESG_rating_dummy	-5,225** (2,597)	-4,644* (2,676)	-3,683 (2,980)	-1,223 (2,694)	-3,090 (1,978)
Emerging_market_ dummy	-7,367*** (2,216)	-5,457** (2,608)	-3,785 (2,750)	-2,812 (3,072)	-1,819 (2,909)
Developed_markets_ dummy	0,307 (2,419)	0,625 (2,030)	0,584 (2,742)	2,057 (3,730)	6,835** (3,411)
Constant	43,334*** (6,553)	44,034*** (6,306)	37,070*** (6,241)	33,150*** (5,402)	34,548*** (4,950)
R-squared	0,3075	0,2451	0,1889	0,1609	0,2029
Observations	161	161	161	161	161

In parentheses, there are the robust standard errors for OLS and the robust standard errors of heteroskedasticity for the quantile regressions.

\*\*\*p < 0,01; \*\*p < 0,05; \*p < 0,1.

Source: own editing.

## Results for total expense ratio (TER) in 2021

When estimating the TER with OLS (Table 5), the net asset value (NAV\_in\_mrdFt\_actual\_year), the age of the fund (Age\_in\_months), and holding emerging market (Emerging\_market\_dummy) or developed market (Developed\_markets\_dummy) equities were significant. Apart from the age of the fund, all factors have a negative impact on costs, which assumes the principle of economies of scale in terms of net asset value, and in terms of equity market capital allocation, each factor has a reducing effect on the total cost indicator. In the case of quantile regression, we also see differences here, as there are far fewer significant values. Based on the results, we can only identify a relationship in the case of the following variables: annual return 10th; net asset value 40th; fund age 10th-50th; in emerging markets 10th, 20th, 90th; and in developed markets 20th and 70th-90th quantiles. Of the above, only the age of the fund can be considered a cost-increasing factor, while all the others can reduce the total cost indicator value to some extent.

**Table 5: OLS and quantile regression results for the total expense ratio for 2021 (TER\_percent)**

VARIABLES	OLS	q10	q20	q30	q40
Annual_yield_percent	-0,007	-0,016*	-0,007	-0,009	-0,012
	(0,005)	(0,009)	(0,009)	(0,010)	(0,010)
Yield_from_start_percent	-0,004	-0,014	-0,010	-0,011	0,003
	(0,007)	(0,011)	(0,013)	(0,015)	(0,015)
Previous_yield_percent	-0,001	0,005	0,004	0,005	-0,001
	(0,004)	(0,007)	(0,006)	(0,007)	(0,007)
Annual_std_percent	-0,008	-0,032	0,000	-0,029	-0,018
	(0,019)	(0,026)	(0,032)	(0,039)	(0,037)
NAV_in_mrdFt_actual_year	-0,013*	-0,012	-0,014	-0,018	-0,026**
	(0,008)	(0,011)	(0,010)	(0,011)	(0,012)
Age_in_months	0,003***	0,004***	0,005***	0,004***	0,004***
	(0,001)	(0,001)	(0,001)	(0,001)	(0,001)
ESG_rating_dummy	0,101	0,134	0,079	0,019	0,169
	(0,104)	(0,150)	(0,152)	(0,191)	(0,184)
Emerging_market_dummy	-0,293**	-0,303*	-0,441**	-0,358	-0,394
	(0,126)	(0,171)	(0,179)	(0,222)	(0,252)
Developed_markets_dummy	-0,239*	-0,137	-0,418*	-0,336	-0,267
	(0,139)	(0,217)	(0,218)	(0,238)	(0,230)
Constant	1,924***	1,503***	1,210**	1,809***	2,014***
	(0,327)	(0,473)	(0,597)	(0,693)	(0,613)
R-squared	0,180	0,2030	0,2101	0,1854	0,1090
Observations	161	161	161	161	161

  

VARIABLES	q50	q60	q70	q80	q90
Annual_yield_percent	-0,005	-0,003	-0,000	0,002	0,003
	(0,009)	(0,007)	(0,005)	(0,004)	(0,006)
Yield_from_start_percent	-0,001	-0,005	-0,007	-0,008	-0,010
	(0,013)	(0,010)	(0,008)	(0,007)	(0,007)
Previous_yield_percent	-0,002	-0,001	-0,000	0,001	0,003
	(0,006)	(0,004)	(0,004)	(0,004)	(0,004)
Annual_std_percent	0,013	0,009	-0,003	-0,009	-0,007
	(0,031)	(0,027)	(0,022)	(0,016)	(0,016)

VARIABLES	q50	q60	q70	q80	q90
NAV_in_mrdFt_ actual_year	-0,009 (0,013)	-0,005 (0,012)	-0,007 (0,011)	-0,002 (0,009)	-0,005 (0,010)
Age_in_months	0,002* (0,001)	0,001 (0,001)	0,001 (0,001)	0,001 (0,000)	0,001 (0,001)
ESG_rating_dummy	0,125 (0,135)	0,111 (0,094)	0,096 (0,084)	0,073 (0,083)	-0,015 (0,114)
Emerging_market_ dummy	-0,188 (0,247)	-0,103 (0,188)	-0,165 (0,138)	-0,157 (0,108)	-0,205** (0,097)
Developed_markets_ dummy	-0,204 (0,207)	-0,247 (0,177)	-0,339** (0,146)	-0,337** (0,129)	-0,458** (0,194)
Constant	1,779*** (0,498)	1,952*** (0,421)	2,302*** (0,342)	2,385*** (0,262)	2,503*** (0,235)
R-squared	0,0652	0,0572	0,0535	0,0809	0,1235
Observations	161	161	161	161	161

In parentheses, there are the robust standard errors for OLS and the robust standard errors of heteroskedasticity for the quantile regressions.

\*\*\*p < 0,01; \*\*p < 0,05; \*p < 0,1.

Source: own editing.

## Results for annual returns in 2022

Table 6 shows the results of the OLS and quantile regression run using data for the year 2022. There is a significant effect of the starting yield on the 10th-70th. and 90th quantile, as well as on the OLS. At the 10th-70th levels, the effect ranges from 0.53 to 0.74 percent, but there is a significant jump at the highest quantile (1.539). This may suggest that the effect of the return since inception is more pronounced at the upper quantile with less significance at the lower and middle levels. The yield in the previous year is significant in the lower quantiles (10th and 20th) and in the OLS model. However, the effect disappears in the higher quantiles, which may suggest that prior year returns have an influence at the lower levels, but are not significant for portfolios with higher returns. Annual variance has a significant negative effect for quantiles 20th and 30th. OLS also yields a value below the 10% significance level, but here with a coefficient with a positive sign. This suggests that the increase in volatility is more likely to negatively affect small and medium return portfolios. At the 90th quantile, the value of the variable was also significant, but the sign was reversed. This supports the general correlation that higher risk (dispersion) can be associated with higher returns. The results also show that neither the age of the fund nor the net asset value has an effect on the evolution of the dependent variable in

any of the models. The total expense ratio (TER) shows a significant negative effect (-2.518) only in the 10th quantile, while no correlation is found in the OLS and the other quantile. This may suggest that the impact of costs is mostly negative for lower yielding portfolios. The ESG rating shows a changing trend. In the OLS model, it is negative and significant (-6.484). In the quantile regression, it has a significant positive effect in the lower quantiles (10th, 20th), with no relationship visible at the other levels. The effect of the emerging market variable is significant and positive only at quantile 90th (10.195). This may suggest that investing in emerging markets is riskier, but may be the determinant for achieving the highest returns. The developed markets dummy variable also shows an interesting picture. In the OLS model, it has a significant positive effect (9.028), suggesting that developed markets tend to generate higher returns. However, it has a negative effect in the 10th quantile (-5.726), and then the effect is not significant at other levels. Thus, the presence of developed markets may result in lower returns at lower quantiles, while there is no significant difference at higher quantiles.

**Table 6: OLS and quantile regression results for the annual return for 2022 (Annual\_yield\_percent)**

VARIABLES	OLS	q10	q20	q30	q40
Yield_from_start_percent	0,940* (0,487)	0,638*** (0,162)	0,532*** (0,158)	0,616*** (0,173)	0,579*** (0,191)
Previous_yield_percent	-0,577* (0,301)	0,174** (0,072)	0,182** (0,076)	0,142 (0,099)	0,111 (0,116)
Annual_std_percent	2,408* (1,219)	-0,758 (0,537)	-0,946* (0,498)	-0,812* (0,475)	-0,609 (0,475)
NAV_in_mrdFt_actual_year	-0,051 (0,302)	0,174 (0,137)	0,111 (0,139)	0,014 (0,150)	-0,032 (0,171)
Age_in_months	0,030 (0,019)	0,012 (0,010)	0,005 (0,010)	-0,002 (0,010)	0,001 (0,011)
TER_percent	-4,001 (2,838)	-2,518* (1,382)	-1,852 (1,323)	-0,627 (1,386)	0,089 (1,522)
ESG_rating_dummy	-6,484* (3,290)	4,909*** (1,555)	2,817* (1,465)	2,308 (1,677)	1,931 (1,790)
Emerging_market_dummy	2,642 (3,129)	-1,013 (1,486)	-0,998 (1,719)	0,941 (1,823)	0,583 (1,988)
Developed_markets_dummy	9,028** (3,960)	-5,726* (2,991)	-1,522 (3,243)	2,670 (2,830)	2,379 (2,567)
Constant	-30,245** (13,901)	-13,268 (8,960)	-8,966 (7,946)	-10,887 (7,690)	-12,207 (7,926)

VARIABLES	OLS	q10	q20	q30	q40
R-squared	0,269	0,1976	0,1479	0,1287	0,1208
Observations	154	154	154	154	154
VARIABLES	q50	q60	q70	q80	q90
Yield_from_start_percent	0,606*** (0,222)	0,610** (0,267)	0,744** (0,332)	0,851 (0,575)	1,539* (0,899)
Previous_yield_percent	0,007 (0,124)	-0,074 (0,137)	-0,129 (0,214)	-0,208 (0,473)	-0,944 (0,700)
Annual_std_percent	-0,551 (0,485)	-0,621 (0,499)	-0,479 (0,728)	-0,310 (1,648)	4,806* (2,803)
NAV_in_mrdFt_actual_year	-0,062 (0,171)	0,066 (0,169)	-0,001 (0,202)	0,212 (0,356)	0,247 (0,583)
Age_in_months	0,010 (0,012)	0,011 (0,012)	0,002 (0,013)	0,000 (0,018)	0,002 (0,027)
TER_percent	-0,182 (1,673)	-1,011 (1,761)	-1,519 (2,115)	-1,155 (3,278)	-3,626 (4,499)
ESG_rating_dummy	-0,708 (1,949)	-2,409 (2,185)	-1,735 (2,615)	-2,765 (4,027)	-8,087 (5,687)
Emerging_market_dummy	-0,060 (2,247)	-2,004 (2,417)	1,013 (2,661)	1,876 (4,050)	10,195* (5,870)
Developed_markets_dummy	2,307 (2,624)	1,500 (2,763)	4,315 (3,023)	3,804 (4,110)	7,975 (5,194)
Constant	-9,062 (7,869)	-2,370 (7,086)	-1,387 (8,694)	-2,022 (17,542)	-32,655 (32,811)
R-squared	0,1022	0,0838	0,0727	0,0586	0,1925
Observations	154	154	154	154	154

In parentheses, there are the robust standard errors for OLS and the robust standard errors of heteroskedasticity for the quantile regressions.

\*\*\*p < 0,01; \*\*p < 0,05; \*p < 0,1.

Source: own editing.

## Results for total expense ratio (TER) in 2022

The results of the TER 2022 modelling are presented in Table 7. The annual return variable shows a significantly negative relationship in quantile 50th and quantile 60th, suggesting that an increase in annual return may slightly reduce the total cost indicator in the mid-quantile. The return to start has a significant negative effect in

the conventional regression and in the 20th quantile. This implies that an increase in the initial return can reduce the total cost in the lower quantiles (i.e. for the lower cost funds). The prior year return shows a significant negative effect only in the 10th quartile, so that only in the lowest cost segment is there a change in the return. The current year net asset value shows a significant negative relationship in the OLS and q40 models, suggesting that costs may be more economically favourable for larger funds. NAV change relative to the previous year shows only a minimal significantly negative effect in the OLS model, while in the quantile models we see examples of a relationship with costs at levels 40th. and 50th The age of the fund shows a significantly positive relationship in several quantile (10th-70th) and in the OLS. Suggesting that older funds typically have higher costs. Emerging market-focused funds show significantly lower costs in the OLS model and in quantile 10th-40th and quantile 90th. This suggests that a full cost-reducing effect is observed for funds with the lowest and highest costs by allocating capital to emerging markets. Annual variance, ESG rating and developed markets variables do not show a significant relationship in any of the models. This suggests that the annual return dispersion, i.e. the variation in returns, is not directly related to the change in costs, that ESG rating does not affect the evolution of fund costs, and that capital allocation to developed markets does not lead to a change in the overall cost structure of the fund.

**Table 7: OLS and quantile regression results for the total expense ratio for 2022 (TER\_percent)**

VARIABLES	OLS	q10	q20	q30	q40
Annual_yield_percent	-0,003 (0,002)	-0,002 (0,004)	-0,003 (0,004)	-0,006 (0,005)	-0,005 (0,005)
Yield_from_start_percent	-0,022* (0,013)	-0,038 (0,024)	-0,053* (0,027)	-0,028 (0,029)	-0,028 (0,027)
Previous_yield_percent	-0,005 (0,005)	-0,018** (0,009)	-0,011 (0,009)	-0,010 (0,010)	-0,005 (0,009)
Annual_std_percent	0,000 (0,021)	-0,039 (0,036)	-0,027 (0,049)	0,016 (0,046)	0,014 (0,038)
NAV_in_mrdFt_actual_year	-0,021*** (0,008)	-0,007 (0,011)	-0,013 (0,012)	-0,022 (0,014)	-0,031** (0,015)
Age_in_months	0,002*** (0,001)	0,003*** (0,001)	0,003** (0,001)	0,004*** (0,001)	0,003*** (0,001)
ESG_rating_dummy	0,046 (0,102)	0,062 (0,150)	-0,062 (0,178)	0,018 (0,213)	0,062 (0,212)
Emerging_market_dummy	-0,301*** (0,113)	-0,334** (0,161)	-0,313* (0,188)	-0,397* (0,222)	-0,357* (0,211)

VARIABLES	OLS	q10	q20	q30	q40
Developed_markets_dummy	-0,094 (0,141)	0,062 (0,224)	0,016 (0,239)	-0,170 (0,271)	-0,097 (0,258)
Constant	1,898*** (0,315)	1,781*** (0,557)	1,837** (0,757)	1,394* (0,724)	1,688*** (0,583)
R-squared	0,194	0,2004	0,1969	0,1841	0,1160
Observations	154	154	154	154	154

VARIABLES	q50	q60	q70	q80	q90
Annual_yield_percent	-0,006* (0,004)	-0,005* (0,003)	-0,004 (0,003)	-0,003 (0,003)	-0,002 (0,004)
Yield_from_start_percent	-0,023 (0,020)	-0,013 (0,013)	-0,006 (0,010)	-0,006 (0,010)	-0,008 (0,011)
Previous_yield_percent	-0,005 (0,007)	-0,004 (0,005)	-0,000 (0,004)	0,001 (0,004)	0,003 (0,006)
Annual_std_percent	0,015 (0,029)	0,009 (0,022)	0,011 (0,018)	-0,008 (0,015)	-0,025 (0,016)
NAV_in_mrdFt_actual_year	-0,033** (0,016)	-0,011 (0,016)	-0,010 (0,014)	-0,006 (0,012)	-0,006 (0,011)
Age_in_months	0,002** (0,001)	0,002** (0,001)	0,001* (0,001)	0,001 (0,001)	0,000 (0,001)
ESG_rating_dummy	0,095 (0,155)	0,063 (0,103)	0,030 (0,085)	-0,020 (0,086)	-0,068 (0,102)
Emerging_market_dummy	-0,268 (0,200)	-0,199 (0,173)	-0,126 (0,142)	-0,149 (0,113)	-0,220** (0,108)
Developed_markets_dummy	-0,122 (0,209)	-0,143 (0,165)	-0,128 (0,164)	-0,047 (0,160)	-0,163 (0,154)
Constant	1,840*** (0,423)	1,956*** (0,302)	1,935*** (0,252)	2,324*** (0,243)	2,754*** (0,287)
R-squared	0,0705	0,0576	0,0464	0,0648	0,0854
Observations	154	154	154	154	154

In parentheses, there are the robust standard errors for OLS and the robust standard errors of heteroskedasticity for the quantile regressions.

\*\*\*p < 0,01; \*\*p < 0,05; \*p < 0,1.

Source: own editing.

## Results for annual returns in 2023

Table 8 shows the results of the OLS and quantile regression run using the 2023 data. Neither the current year net asset value (NAV) nor the total cost indicator show significant effects on returns in the models. A significant positive relationship is observed for the return from inception in all quantile (10th-90th) and OLS models. This suggests that funds with higher initial returns typically achieve higher annual returns, regardless of the quantile. The size of the effect varies across quantiles, but peaks at level 40th. In general, the previous year's return has a negative impact on the current year's return. For OLS and quantile regression, a significant effect is observed between levels 50th and 80th. This could even indicate a reversion to the mean, where high past returns are associated with lower future returns. The annual standard deviation (volatility) is mostly non-significant across quantiles, except for the 60th and 70th, where it takes on a positive value. This indicates that higher volatility can only increase returns at certain levels (60th, 70th). Fund age shows a positive and significant effect only in OLS and at quantile 50th (median). Which may indicate that older funds are slightly more likely to achieve positive returns, but the effect is moderate and significant only around the median. ESG rating has a significant negative effect on returns in the OLS model and in several quantile (40th-90th). This suggests that ESG rated funds tend to provide lower returns. The highest quantile leads to a significant (-10.357) negative effect. Being classified as an emerging market fund is associated with significantly higher returns, especially in the top quantiles (40th-90th) and is also significant in the OLS model. The positive effect is particularly strong in quantile 70th and 80th, indicating that emerging market funds are more likely to provide high returns in the upper part of the return distribution. The developed market categorization shows a significant positive effect in quantiles 50th, 80th and 90th, suggesting that developed market funds only perform better around the median and in the highest quantiles.

**Table 8: OLS and quantile regression results for the annual return for 2023 (Annual\_yield\_percent)**

VARIABLES	OLS	q10	q20	q30	q40
Yield_from_start_percent	1,291*** (0,295)	0,735*** (0,255)	0,855* (0,450)	1,216** (0,540)	1,606*** (0,469)
Previous_yield_percent	-0,201*** (0,035)	-0,157 (0,164)	-0,146 (0,180)	-0,117 (0,171)	-0,211 (0,128)
Annual_std_percent	0,536 (0,393)	-0,707 (0,581)	-0,430 (0,874)	0,604 (1,001)	0,801 (0,750)
NAV_in_mrdFt_actual_year	0,045 (0,148)	0,157 (0,112)	0,072 (0,171)	-0,162 (0,238)	-0,084 (0,254)

VARIABLES	OLS	q10	q20	q30	q40
Age_in_months	0,024** (0,011)	0,005 (0,015)	0,008 (0,020)	0,010 (0,023)	0,027 (0,018)
TER_percent	-2,259 (1,609)	-0,982 (1,351)	-0,480 (2,198)	0,014 (3,095)	-1,879 (2,999)
ESG_rating_dummy	-5,947*** (1,739)	0,578 (1,532)	0,107 (2,170)	-3,968 (2,995)	-6,936** (2,998)
Emerging_market_dummy	7,278*** (2,045)	-2,936 (1,872)	-0,256 (3,029)	1,027 (4,522)	9,152** (3,902)
Developed_markets_dummy	3,269 (2,348)	1,345 (3,182)	3,602 (4,713)	6,285 (5,136)	5,923 (4,134)
Constant	-1,753 (7,851)	6,819 (7,849)	2,478 (13,657)	-7,953 (16,476)	-10,237 (12,866)
R-squared	0,3320	0,2406	0,1695	0,1276	0,1837
Observations	157	157	157	157	157

VARIABLES	q50	q60	q70	q80	q90
Yield_from_start_percent	1,407*** (0,435)	1,397*** (0,411)	0,963*** (0,356)	0,907*** (0,299)	0,917*** (0,308)
Previous_yield_percent	-0,237*** (0,083)	-0,253*** (0,070)	-0,268*** (0,065)	-0,269*** (0,073)	-0,127 (0,097)
Annual_std_percent	0,859 (0,525)	0,738* (0,442)	0,654* (0,384)	0,534 (0,407)	0,564 (0,466)
NAV_in_mrdFt_actual_year	-0,271 (0,267)	-0,157 (0,279)	0,073 (0,263)	0,117 (0,262)	0,029 (0,286)
Age_in_months	0,034** (0,015)	0,023 (0,015)	0,013 (0,015)	0,008 (0,016)	0,014 (0,020)
TER_percent	-3,327 (2,550)	-1,378 (2,224)	-0,800 (2,036)	-1,350 (1,909)	-0,550 (2,093)
ESG_rating_dummy	-4,727* (2,855)	-6,401** (2,866)	-6,006** (2,829)	-6,615** (2,990)	-10,375*** (3,050)
Emerging_market_dummy	11,359*** (3,539)	12,892*** (3,657)	15,279*** (3,592)	13,446*** (3,482)	11,935*** (3,466)
Developed_markets_dummy	5,909* (3,444)	4,698 (3,326)	4,633 (3,501)	6,933** (3,405)	6,266* (3,233)

VARIABLES	q50	q60	q70	q80	q90
Constant	-6,375	-5,030	-0,448	5,676	9,792
	(9,592)	(8,242)	(7,754)	(8,589)	(9,511)
R-squared	0,2464	0,2899	0,3031	0,3140	0,3059
Observations	157	157	157	157	157

In parentheses, there are the robust standard errors for OLS and the robust standard errors of heteroskedasticity for the quantile regressions.

\*\*\*p < 0,01; \*\*p < 0,05; \*p < 0,1.

Source: own editing.

### Results for total expense ratio (TER) in 2023

The results of the modelling for the total cost indicator in 2023 are summarised in Table 9. They show that none of the previous year's return, the return from inception, the annual variance, the ESG valuation, and the emerging and developed market variables became significant. The annual return is significant only at the 90th quantile, where it has a slightly negative impact on the total cost. This suggests that the increase in the previous yield may have a slight cost-reducing effect in the top range. Annual net asset value shows a significant negative relationship in the OLS and at several quantiles (20th-60th). The results suggest that higher net asset value is associated with lower costs, resulting in a more optimal cost structure for the fund's operations. For the age of the fund, a significant positive relationship is observed except for the 90th quantile, and a similar relationship is observed for the OLS. This suggests that older funds are generally able to operate only at a less favourable cost structure.

**Table 9: OLS and quantile regression results for the total expense ratio for 2023 (TER\_percent)**

VARIABLES	OLS	q10	q20	q30	q40
Annual_yield_percent	-0,006 (0,004)	-0,010 (0,009)	-0,009 (0,009)	-0,006 (0,010)	-0,004 (0,008)
Yield_from_start_percent	-0,024 (0,015)	-0,039 (0,036)	-0,042 (0,031)	-0,026 (0,033)	-0,031 (0,029)
Previous_yield_percent	-0,002 (0,002)	-0,000 (0,005)	-0,002 (0,005)	-0,005 (0,005)	-0,005 (0,005)
Annual_std_percent	-0,012 (0,023)	-0,043 (0,042)	-0,040 (0,049)	0,004 (0,053)	-0,002 (0,044)

VARIABLES	OLS	q10	q20	q30	q40
NAV_in_mrdFt_ actual_year	-0,023*** (0,007)	-0,009 (0,010)	-0,018* (0,010)	-0,021* (0,011)	-0,026** (0,011)
Age_in_months	0,002*** (0,001)	0,003** (0,001)	0,004*** (0,001)	0,005*** (0,001)	0,003** (0,001)
ESG_rating_dummy	0,006 (0,110)	0,004 (0,173)	0,019 (0,184)	-0,134 (0,209)	0,005 (0,209)
Emerging_market_ dummy	-0,104 (0,127)	0,004 (0,265)	-0,131 (0,237)	-0,306 (0,245)	-0,271 (0,226)
Developed_markets_ dummy	0,014 (0,152)	0,085 (0,343)	-0,080 (0,292)	-0,229 (0,305)	-0,118 (0,258)
Constant	1,989*** (0,364)	1,569** (0,777)	1,727** (0,804)	1,296 (0,859)	1,886*** (0,673)
R-squared	0,216	0,2130	0,2115	0,2009	0,1335
Observations	157	157	157	157	157

VARIABLES	q50	q60	q70	q80	q90
Annual_yield_percent	-0,003 (0,005)	-0,001 (0,004)	-0,003 (0,003)	-0,003 (0,004)	-0,009* (0,004)
Yield_from_start_ percent	-0,022 (0,021)	-0,007 (0,014)	-0,006 (0,010)	0,001 (0,011)	-0,011 (0,013)
Previous_yield_ percent	-0,006 (0,004)	-0,004 (0,003)	-0,004 (0,003)	-0,004 (0,004)	-0,001 (0,007)
Annual_std_percent	0,011 (0,032)	0,003 (0,020)	-0,003 (0,015)	-0,001 (0,014)	-0,017 (0,021)
NAV_in_mrdFt_ actual_year	-0,031*** (0,012)	-0,031** (0,013)	-0,017 (0,013)	-0,008 (0,014)	-0,014 (0,013)
Age_in_months	0,002*** (0,001)	0,001** (0,001)	0,001* (0,001)	0,001** (0,001)	0,001 (0,001)
ESG_rating_dummy	0,027 (0,157)	0,039 (0,105)	0,044 (0,079)	0,019 (0,091)	-0,185 (0,135)
Emerging_market_ dummy	-0,181 (0,175)	-0,063 (0,128)	-0,027 (0,098)	-0,000 (0,097)	-0,126 (0,125)
Developed_markets_ dummy	-0,139 (0,186)	-0,008 (0,143)	0,039 (0,132)	0,078 (0,150)	-0,070 (0,188)

VARIABLES	q50	q60	q70	q80	q90
Constant	1,888***	2,027***	2,155***	2,094***	2,851***
	(0,458)	(0,283)	(0,204)	(0,242)	(0,350)
R-squared	0,0925	0,0761	0,0688	0,0746	0,1078
Observations	157	157	157	157	157

In parentheses, there are the robust standard errors for OLS and the robust standard errors of heteroskedasticity for the quantile regressions.

\*\*\*p < 0,01; \*\*p < 0,05; \*p < 0,1.

Source: own editing.

## Conclusions and recommendations

In our study, we examined the equity mutual funds available in Hungary between 2021 and 2023. We used both OLS and quantile regression for the analysis, as the advantages of the latter have been praised in several academic publications (Abdelsalam et al., 2014; Matallín-Sáez et al., 2019; Duong and Meschke, 2020; Ahmed and Doukas, 2021; Agoraki et al., 2023; Paudel and Naka, 2023). In our analysis of mutual fund returns and costs, we uncovered a number of interesting relationships between annual returns, total expense ratio (TER), and the effects of different fund-specific variables. The results suggest that, with few exceptions, ESG rating negatively affects fund performance, and this is particularly true for the OLS model. This finding is in line with a strand of literature that has identified a negative relationship between mutual fund returns and ESG rating (Lesser et al., 2016; Pavlova and de Boyrie, 2022; El Ghouli et al, 2023; Papathanasiou and Koutsokostas, 2024; Baily and Gnabo, 2022). It is also observed that this negative effect is much more pronounced in the ranges above the 50th level for quantile regressions, as the ESG aspect can lead to lower returns by 3-10% on average. This is an important factor for investors interested in sustainable funds. However, sustainability is not necessarily about a profit-driven approach, but about the application of social responsibility and the achievement of stated sustainability objectives. If investor attitudes tend to favour these, in some cases some profit may have to be foregone. On the institutional side, the introduction of an ESG rating should only be considered for funds for which lower returns do not significantly affect the achievement of investment objectives. In terms of the total cost indicator, however, we do not find a significant relationship between ESG rating and the evolution of the cost structure. This is certainly a positive result, as the inclusion of sustainability principles does not have a cost-increasing effect.

Our research shows that the effects of developed and emerging markets on returns are also different and that this is more pronounced across time periods. For developed markets, where we obtained significant results, they were essentially at higher return levels, i.e. the highest quantiles. In contrast, for funds focused on emerging markets, this phenomenon was rather mixed, as while in 2021 it tended to

occur in the lower and middle quantiles, in 2022 and 2023 it shifted towards the middle and upper quantiles. In light of this, it is certainly worth considering a diversified capital allocation, with both developed and emerging markets represented, in order to optimise the balance of return and risk in investment strategies.

Among the three years of results, we find robust results with similar behaviour and an impact that can be considered durable. The current year Net Asset Value (NAV) has a negative and significant impact on the Total Expense Ratio (TER) in all years (2021, 2022 and 2023), especially in the lower and middle quantiles. This suggests that larger funds achieve lower costs, probably due to economies of scale. This effect is 'offset' by the age of the fund, which shows a significant positive effect on TER in all years, especially in the lower and middle quantiles, suggesting that older funds typically operate with higher costs. The effect of annual variance on returns is consistently positive in the top quartiles, especially in the 60th and 70th quartiles, where volatility leads to higher returns. This relationship has been consistently observed over the years, especially in the higher yielding portfolios. The results suggest that larger or younger funds may be more favourable from a cost optimisation perspective.

We made another important observation that in several cases, the previous year's return had a negative impact on the current annual return. Based on quantile regressions, this can be seen in the middle and upper quantiles. This result seems to contradict the strong form of the efficient market hypothesis, but it can be interpreted as a phenomenon of mean reversion. In this sense, extreme past returns are often followed by weaker performance and vice versa. The Hungarian equity market and the domestic mutual fund market are typically less liquid and have fewer participants, so the weak-form efficient market model is more likely to prevail. In addition, a lack of transparency, information delays, and regulatory constraints (e.g., portfolio constraints, benchmark tracking) prevent the arbitrage opportunities arising from past returns. Therefore, the result does not necessarily contradict the efficient market theory, but rather can be interpreted as a sign of a specific, distorted operating environment.

The results of the research support our preliminary expectations that ESG assessment has a negative impact on fund performance. At the same time, we were unable to confirm the assumption that an ESG-focused investment policy has a cost-increasing effect.

A limitation of our study is that ESG investing is still in its infancy in Hungary, with uncertain regulation. This is partly the reason why sustainable mutual funds issued in Hungary differ significantly, especially in terms of the way ESG is assessed and the scalability of ESG. There is no standardised format either in the reports issued by the MNB or by the Association of Hungarian Investment Fund and Asset Management Companies. Research in this area is also hampered by the fact that ESG funds have only started to appear in mass in recent years, so that the data represent a relatively short time span.

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