THE COMPARISON OF RANKINGS CREATED
FOR OPEN-END EQUITY MUTUAL FUNDS WITH APPLICATION
OF DIFFERENT EFFECTIVENESS MEASURES

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Abstract: The presented work tries to carry out the comparison analysis of eight measures which are used to judge the open-end mutual fund's management. These are: coefficient of Burke, Sterling, Calmar, Omega, Sortino, Sharpe – Izraelsen, Information Ratio and potential of excess rate of return. The above measures were applied to equity mutual funds operating on polish capital market in 2003-2012 years. The investigations were carried out for three periods: 2003-2012 and for two five years sub-periods. Within which of them the ranking of funds were created to classify them from the most effective to the smallest. In order to answer the question about the influence of singled out effectiveness measures on judgment of portfolio management the Spearman rang coefficients were calculated between rankings created with application of different measures. In this way the detailed information was obtained not only about "the best" and "the worst" mutual funds in different periods but also this information was made dependent on market condition. It is because the division of investigation period on two sub-periods harmonizes with bullish and bearish market on polish stock exchange. From one point this work is some recapitulation of the results obtained by authors in previous investigations but from another point it is some kind of its extension and generalization.

Keywords: open-end mutual funds, measures of investment effectiveness, Spearman rang coefficient

INTRODUCTION

Entrusting own savings by the investor to collective investment institutions involves both the choice of the fund as well as the length of time horizon. The

investor makes a decision usually on the basis of publicly available rates of return. This may give the wrong picture of profitability of investments, mainly by ignoring the risk taken. The measure that the risk takes into account is Sharpe ratio, constituting the relation of expected premium to an investment risk [Sharpe, 1966]. Its use is conditioned by the assumption of normal distribution of rates of return, not often met in practice[1]. Therefore, in literature, other measures of efficiency of investments can be found, such as Calmar, Sortino, Omega and many generalisations of the Sharpe's ratio. The multiplicity of measures, however, makes it difficult to decide which of them to choose. In foreign literature, one can find the comparison between the rankings of funds based on the Sharpe ratio with the rankings formed on the basis of other measures of performance as well as the latter ones among one another. The research of, among others, Eling and Schumacher [Eling, Schuhmacher 2007] show that, with respect to hedge funds, the choice of measure is not critical. They all lead to similar rankings. Analogous results were obtained by Eling [Eling 2008] for five other groups of funds, including, among others, those investing in shares or bonds.

This paper aims to answer the question: Is the choice of measure on the Polish market important when making a decision on the choice of equity funds. In addition, at work, the issue of stability of rankings is considered by testing the correlation between the two sub-periods, used for dividing the whole study period. The work of Nguyen-Thi-Thanh [Nguyen-Thi-Thanh 2007] is devoted to such an issue. However, it concerns hedge funds, and the studies have indicated less and more stable measures of efficiency. The applied methodology can be easily adapted to open-ended mutual funds.

DATA AND METHODOLOGY

The studies concern the share funds existing in the whole period i.e.in the years of 2003-2012. Sixteen such funds were selected: Arka BZWBK Akcji, BPH Akcji Dynamicznych Spółek, BPH Akcji, AvivaPolskich Akcji (formerly known as CUAkcji Polskich), Investor Akcji (formerly known as DWS Akcji), Investor Akcji Pluo(formerly known as DWS Akcji Plus), Investor Top 25 (formerly known asDWS Top 25), ING Akcji, Legg Mason Akcji, Millenium Akcji, Pioneer Akcji Polskich, PKO/CS Akcji, PZU Akcji Krakowiak, SEB 3, Skarbiec Akcja and Unikorona Akcje. In addition, Investor Top 25 small companies' fund is included in the above group of companies because the authors want to examine whether this type of fund, as compared to those investing in large companies, will be 'standing out' in the generated rankings. As presented below, the applied measures

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[1] The studies of the authors conducted for share funds in the period of 1 February 2007-31 August 2011 [Karpio Żebrowska-Suchodolska 2011] also point to the lack of normal distribution of monthly rates of return for 6 out of the 16 studied funds and lack of normal distribution of weekly rates of returns for all (16) funds.

of effectiveness practically do not take into account the fact whether the fund invests in large or small companies. It is important that they are equity funds.

The monthly rates of return of participation units and eight measures have been determined for each fund. The last ones include the following indicators: Burke, Sterling, Calmar, Omega, Sortino, Sharpe-Izraelsen, Information Ratio and the potential for excess rate of returns. They were calculated using the formulas:

Burke ratio:
$$Burke_T = \frac{R}{\sqrt{\sum_{t=1}^{n}\left(MDD_{t,T}\right)^2}} \tag{1}$$

Sterling ratio:
$$Sterling_T = \frac{R}{\frac{1}{n}\sum_{t=1}^{n}\left|MDD_{t,T}\right|+10\%} \tag{2}$$

Calmar ratio:
$$Calmar_T = \frac{R}{\left|MDD_{t,T}\right|} \tag{3}$$

Omega ratio:
$$Omega = \frac{\frac{1}{T-1}\sum_{t=1}^{T}\max\left(R_t - m,0\right)}{\frac{1}{T-1}\sum_{t=1}^{T}\max\left(m - R_t,0\right)} \tag{4}$$

Sortino ratio:
$$Sortino = \frac{\overline{R_x} - m}{\theta(m)} \tag{5}$$

Information Ratio:
$$IR_x = \frac{\overline{R_x} - \overline{R_b}}{TR_x} \tag{6}$$

Sharpe-Israelsen ratio:
$$IR^{SI} = \frac{\overline{R_x} - \overline{R_b}}{\sigma_{R_x-R_b}\frac{\overline{R_x-\overline{R_b}}}{\left|R_x-\overline{R_b}\right|}} \tag{7}$$

potential indicator of excess rate of return:
$$UPR_t = \frac{\frac{1}{T-1}\sum_{t=1,R_t>m}^{T}\left(R_t - m\right)}{\sqrt{\frac{1}{T-1}\sum_{t=1,R_t<m}^{T}\left(R_t - m\right)^2}} \tag{8}$$

where:

$\overline{R_b}$ - average rate of return from the selected benchmark,

$\overline{R_x}$ - average rate of return from the x fund's portfolio,

$$TR_x = \sqrt{\tfrac{1}{T-1}\left(R_{x,t} - R_{b,t} - \left(\overline{R_x} - \overline{R_b}\right)\right)^2} \; ,$$

$\sigma_{R_x - R_b} = TR,$

$$\theta(m) = \sqrt{\tfrac{1}{T-1}\sum_{T=1}^{T}\left((R_t - m)^-\right)^2} \; , \quad \text{where} \left(R_t - m\right)^- = R_t - m \text{ when } R_t - m \le 0 \quad \text{and}$$

$\left(R_t - m\right)^- = 0$ when $R_t - m > 0$,

m − break-even point, which can assume different values depending on what is the minimal acceptable rate of return for the investor,

R - annual rate of return,

MDD_T - maximum decrease of the rate of return in T period.

A detailed description of the above models and their interpretation can be found, among others, in the works of [Karpio, Żebrowska-Suchodolska 2012, 2013]. As benchmarks for Information Ratio and Sharpe − Izraelsen ratio, the following indices were used: WIG and WIG 20. Although WIG20 is not the best benchmark for the fund of Investor Top 25 small companies, it is just one of the many measures considered. Moreover, these indices are used as benchmarks. Therefore, in the case of small and speculative companies, WIG and WIG 20 can simply be treated as 'cautious' benchmarks. To make the calculations for the same threshold of profitability, it is assumed that it has the value of $m = 0$ both in the entire period and the two sub-periods. This means that profitable funds are those that can earn anything.

In the next step, for each measure separately, the ranking of funds was made from the highest to the lowest value of calculated measures. This allowed to create rankings of funds according to their investment efficiency. They have become the starting point to determine the Spearman's rank correlation coefficient [Luszniewicz, Słaby 2003]:

$$r_s = 1 - \frac{6\sum_{i=1}^{T} d_i^2}{T(T^2 - 1)} \tag{9}$$

where:

d_i − difference between the ranks conferred to both characteristics for the i-observation,

T − sample size.

The study of significance of the Spearman's rank correlation coefficient was carried out with the application of null hypothesis: $r_s = 0$, as compared to the alternative hypothesis $r_s \neq 0$. Test statistics

$$t = \frac{r_s}{\sqrt{1 - r_s^2}} \sqrt{T - 2} \qquad (10)$$

has the schedule of t-Student with $T - 2$ degrees of freedom.

Analogous calculations were performed for the two sub-periods (2003-2007 and 2008-2013), used for dividing the whole study period. The division is dictated by the moment of the outbreak of financial crisis. In addition, for each measure, the Spearman's rank coefficient was established between the two sub-periods.

RESULTS

Most of the received rankings of equity funds designated on the basis of 8 measures for the entire study period yield similar results, and some are even exactly the same (Fig. 1). Although the drawing in black and white colour blurs the results obtained for specific measures, the intention of the authors was to show the overall picture of the results. In the case of Investor Top 25 fund, the results obtained with the support of Sharpe-Izraelsen ratio proved to be close to the results obtained, among others, through profit and loss indicators (Burke, Sterling and Calmar), Omega and Sortino. Larger differences in the ranking of Top 25 Investor were shown only by the results obtained with the support of IR.

Figure 1a. The rankings of equity funds for the entire study period obtained on the basis of 8 measures
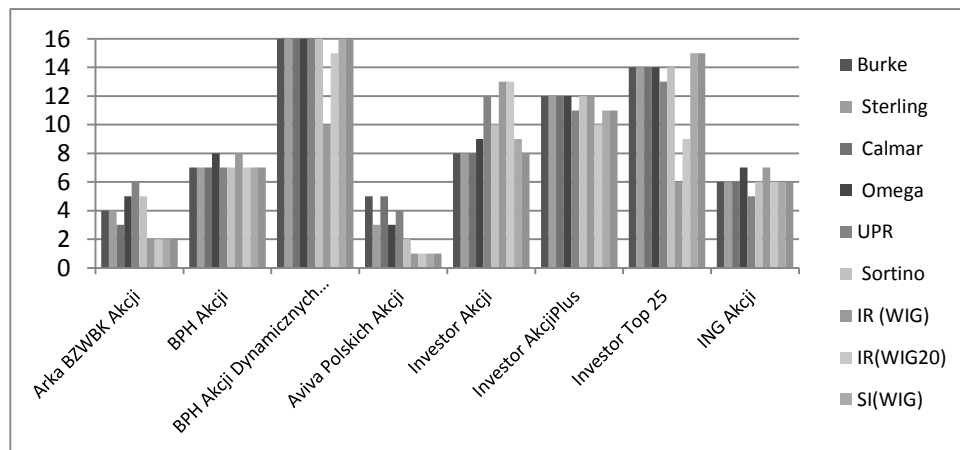
Source: own study

Figure 1b. The rankings of equity funds for the entire study period obtained on the basis of 8 measures.
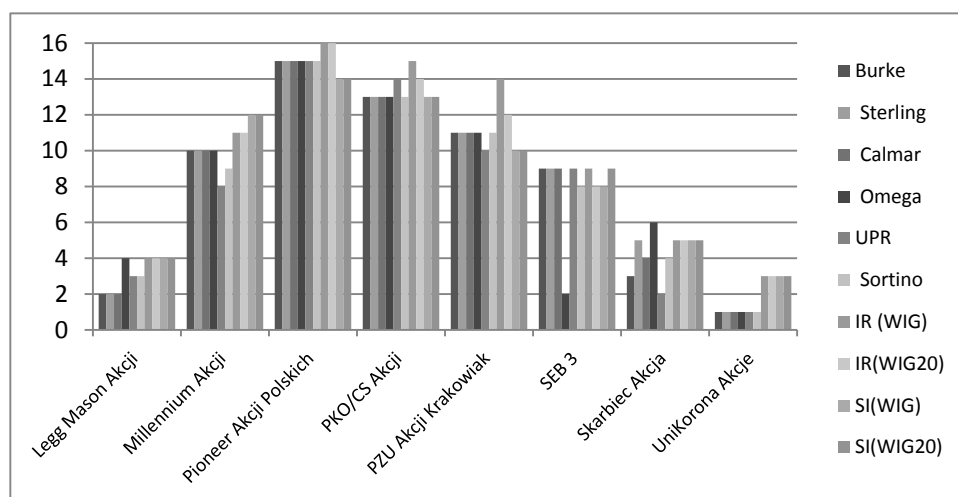
Source: own study

The rankings obtained for each sub-period (Tables 1-2) were also analysed. Similar rankings were obtained for each of them. It was especially apparent with the index of profits and losses as well as IR and SI indicators. The reason probably is similar structure of these measures. For the two considered sub-periods, however, the established rankings vary considerably. The differences range from a few to several positions.

Table1.The rankings of equity funds in the first sub-period (the years of 2003-2007)

	Burke	*Sterling*	*Calmar*	*Omega*	*UPR*	*Sortino*	*IR (WIG)*	*IR(WIG20)*	*SI(WIG)*	*SI(WIG20)*
Arka BZWBK Akcji	1	1	1	2	1	1	1	1	1	1
BPH Akcji	9	9	10	10	8	9	8	9	10	9
BPH Akcji Dynamicznych Spółek	16	16	16	16	16	16	11	16	16	16
Aviva Polskich Akcich	6	2	7	3	3	2	2	2	2	2
Investor Akcji	7	10	3	13	13	13	16	15	14	14
Investor AkcjiPlus	10	8	8	9	6	6	7	8	9	8
Investor Top 25	14	13	14	6	11	8	3	5	3	5
ING Akcji	8	7	9	12	9	11	9	7	7	7
Legg Mason Akcji	3	4	5	8	5	5	4	4	5	4

	Burke	Sterling	Calmar	Omega	UPR	Sortino	IR (WIG)	IR(WIG20)	SI(WIG)	SI(WIG20)
Millennium Akcji	15	15	15	15	15	15	14	14	15	15
Pioneer Akcji Polskich	12	12	12	14	14	14	15	11	8	11
PKO/CS Akcji	4	6	4	7	7	7	10	10	11	10
PZU Akcji Krakowiak	13	14	13	1	12	12	13	13	13	13
SEB 3	11	11	11	11	10	10	12	12	12	12
Skarbiec Akcja	2	3	2	4	2	3	6	6	6	6
UniKorona Akcje	5	5	6	5	4	4	5	3	4	3

Sources: own study

Table 2. The rankings of equity funds in the second sub-period (the years of 2008-2013)

	Burke	Sterling	Calmar	Omega	UPR	Sortino	IR (WIG)	IR(WIG20)	SI(WIG)	SI(WIG20)
Arka BZWBK Akcji	11	11	11	9	3	10	6	8	10	10
BPH Akcji	8	8	8	7	9	8	10	9	7	7
BPH Akcji Dynamicznych Spółek	14	14	14	12	14	14	13	12	13	13
Aviva Polskich Akcji	3	3	3	16	10	2	2	2	2	2
Investor Akcji	5	5	5	4	4	5	5	5	3	4
Investor AkcjiPlus	12	12	12	11	12	12	15	13	11	11
Investor Top 25	15	15	15	15	13	16	12	15	15	15
ING Akcji	6	6	6	5	6	6	7	6	6	6
Legg Mason Akcji	2	2	2	2	8	3	3	3	16	3
Millennium Akcji	7	7	7	6	11	7	9	7	5	5
Pioneer Akcji Polskich	16	16	16	14	16	15	16	16	14	14
PKO/CS Akcji	13	13	13	13	15	13	14	14	12	12
PZU Akcji Krakowiak	9	9	9	10	5	11	11	11	8	8
SEB 3	10	10	10	8	7	9	8	10	9	9
Skarbiec Akcja	4	4	4	3	2	4	4	4	4	16
UniKorona Akcje	1	1	1	1	1	1	1	1	1	1

Sources: own study

Spearman's rank correlation coefficients, obtained for the entire study period, indicate a high similarity between the rankings created on the basis of various measures (Table 3). All were found to be statistically significant at the significance level of 0.05. The smallest value (0.74) related to Burke indicators and Information Ratio (WIG). Nevertheless, it points to the similarity of rankings based on these measures.

Table 3. Spearman's correlation coefficients for the rankings of equity funds during the entire study period

	Burke	Sterling	Calmar	Omega	UPR	Sortino	IR (WIG)	IR(WIG20)	SI-(WIG)	SI-WIG20)
Burke	1,00	0,998	0,997	0,897	0,953	0,974	0,744	0,865	0,938	0,941
Sterling		1,000	0,991	0,915	0,941	0,985	0,768	0,888	0,962	0,965
Calmar			1,000	0,900	0,941	0,971	0,753	0,874	0,947	0,950
Omega				1,000	0,868	0,932	0,709	0,844	0,906	0,885
UPR					1,000	0,971	0,768	0,891	0,894	0,885
Sortino						1,000	0,785	0,909	0,956	0,950
IR (WIG)							1,000	0,932	0,762	0,750
IR(WIG20)								1,000	0,906	0,891
S-I(WIG)									1,000	0,997
SI-(WIG20)										1,000

Sources: own study

In the event of correlation between the two sub-periods, most measures suggest that there is no rank stability, as evidenced by statistically insignificant coefficients, shown in bold in Table 4.

Table 4. Spearman's coefficient between the two sub-periods

	Burke	*Sterling*	*Calmar*	*Omega*	*UPR*	*Sortino*	*IR (WIG)*	*IR(WIG20)*	*SI-(WIG)*	*SI-WIG20)*
Spearman's coefficient	0,521	0,518	**0,456**	**-0,056**	**0,488**	**0,424**	**0,432**	**0,415**	**0,009**	**0,182**

Sources: own study

As a result, the funds that do well during good investment times do badly when there is a bear market and vice versa. This indicates a minimal adjustment of fund management investment policy to market conditions.

SUMMARY

The analysis shows that all measures of efficiency of investment in long-term studies (10 years) and over shorter periods, but with 'homogeneous' economic situation, lead to the rankings that are very close to each other. Therefore, we are faced with an almost identical assessment of the efficiency of investment. It would seem that the measure is not critical when choosing a fund. Similar results were obtained in the studies conducted in foreign markets [Eling 2008, Ornelas et al. 2011]. However, this interpretation ends in failure when taking into account the periods differing in terms of economic prosperity. Most of the Spearman's coefficients between the two sub-periods are not statistically significant. Only the results based on Burke and Sterling indicators proved to be stable over time. Equity funds on the Polish market are therefore not able to yield good results in the periods of variable market conditions.

Therefore, the burden to adapt to market situation, for example, by changing the fund, falls on the customers. Yet, the managers charge fees for their activities. Therefore, they should strive to achieve good results in the condition of changing economic situation. It seems that five years is too long period to trust in the abilities of those managing the portfolios of funds, despite the fact that investing in funds is still the long-term process. Considerations related to the length of period guaranteeing the stability of the rankings of funds become interesting here. This will be the subject of future works of the authors. It is worth noting that the fund of small companies does not stand out from the rest. Therefore, the methodology used does not appear to be sensitive to that whether it is used for funds investing in large fundamental or in small speculative companies. Certainly, this question should be the subject of a more detailed analysis. In this place where, the inclusion of DWS Top 25 to the studies was merely of 'exploratory' nature.

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