

EVALUATION OF EQUITY FUNDS' EFFICIENCY USING MARKET TIMING MODELS

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Summary

Investment funds in Poland

Investment funds are the popular way of investment. Being professionally managed collective investment scheme that pools money from many investors to purchase securities the fund enables the individuals to invest even relatively small amount of money. The question however arises whether a given investment fund is efficiently managed in comparison to others. The purpose of the research is to answer the question whether the equity funds in Poland in the years 2008-2013 were well managed. In this research market timing models were used to check whether managers have selectivity and market timing ability. Selectivity is responsible for proper choice of the securities for portfolio and market timing allows to predict the whole market in future and to use the results of prediction to proper risk management of the funds. The sample was consisted of nine equity funds operating in Poland in 2008, Jan – 2013, Dec.

Keywords: equity fund, market timing, T-M model, H-M model, three factor model, GARCH

Introduction

The investment funds are the popular alternative for investors who do not want to waste time for learning the rules that govern capital markets, particularly stock exchange markets. Being professionally managed collective investment scheme that pools money from many investors to purchase securities the fund enable the individuals to invest even relatively small amount of money. The question however arises whether a given investment fund is efficiently managed in comparison to others. The investment strategy and changes in the portfolio are then most important issues. The investment strategy realized by the fund should be considered within longer horizon of time but it must be flexible enough to adjust to the market conditions. Thus managers have to change the portfolio by buying and/or selling assets in the right moment to avoid losses or to increase the return. The problem of market timing and selectivity of the investment funds' managers was the subject of analysis in numerous literature (Lee and Rahman, 1990; Hendricks et al., 1993; Prather and Middleton 2006; Olbryś, 2008, 2010a,b,c; Zamojska, 2009a,b, 2012).

The purpose of the research is to answer the question whether the equity funds in Poland in the years 2008-2013 were well managed. The paper is organized as follows. In the first part of the paper the main types of investment funds and their advantages and disadvantages are considered. The measures and models of investment funds' efficiency are the subject of the second part, while in the third part empirical results will be shown and discussed. Conclusions sum up the results of the research.

Investment funds belong to basic institutions of financial market. In Poland they are present since early 90s of XX century. Their legal forms evaluated due to changes of legal acts within the period of 1991-2013 which constituted access to the market as well as more and more advanced constructions of the funds. The common characteristic of investment funds is that they collect money and securities that belong to individual and institutional investors and locate them – in return of remuneration – in financial market to obtain maximum rate of return (Perez, 2012). When more intense volatility is observed in financial markets the managers often change the investment strategy by introducing changes in the structure of the portfolio. It enables to secure the funds of investors and to achieve the investment goal. The investment goals may differ between the funds so it is important to define investor's preferences to maximize its gain. It should be mentioned that aggressive or conservative investment policy is directly related with the magnitude of accompanying risk. Risk is usually diversified by the fund by investments in different securities. Nevertheless it is common that investment funds has more advantages in the long term than in the short one. It is due to the risk of economic and political situation in the country that affects the results gained by the funds.

The investment funds are often classified from the point of view of legal and economic criteria. Taking into account construction the most popular are open-end and closed-end funds, both types can be also constructed as specialized funds. The mixed fund joins characteristics of open-end and closed-end funds. Taking into account type of investors the funds can be divided into special, private and public.

From the perspective of type of investments the funds are usually classified as equity fund, mixed (or hybrid) fund, bond fund and money market fund (Dawidowicz, 2011). The main characteristic of the mentioned funds is their attitude to the risk, where equity funds are considered to be most risky. Equity funds can also be divided according to the categories defining the geographical specialization. There are domestic market funds, European, American, Asia-Pacific and other funds, and global funds and emerging markets funds. Regardless of the classification the equity funds are also distinguished by index funds, small and medium-sized companies as well as sector funds. The second group, we can meet on the Polish market of investment funds are mixed funds, otherwise known as hybrid. They invest in shares and debt securities, where the shares are responsible for growth of investments, and in turn, other securities act for stabilizing and are the part of a

passive investment. Mixed funds have a lower risk, but also lower the expected rate of return than is the case for equity funds. Among the mixed funds stand out capital protection funds, whose main purpose is to protect against a decline in investment, balanced funds, whose share of stocks in the portfolio varies between 40% and 60%, and stable growth funds, having a maximum of 30% share of stocks in the portfolio. Another type of funds is bond funds, also called debt funds. These are funds that accumulated capital invests mainly in fixed income securities, mainly bonds. Treasury bonds and Treasury bills must be at least 90% of the portfolio of the fund by issuing bonds. This ensures that these funds have a much lower risk than mixed funds. The last group of investment funds listed according to the type of investments made are money market funds and money market funds. MMFs can be formed as an open investment fund and its assets may invest exclusively in money market instruments and deposits with a high degree of security and maturity no longer than one year. Money market funds among all these are of the highest liquidity of capital and because of the nature of the investments made and the lowest investment risk.

Methods of evaluation of investment fund effectiveness

Classical measures of investment funds' evaluation show the ability of funds' managers to prepare micro-forecasts using public as well as private information about the market. They can be divided into two groups, i.e. absolute and relative. Some of them are simple and widely used in practice, the other are more advanced and not so popular. Taking into account absolute measures Jensen's alpha and its modifications are usually considered (Perez, 2012a). The group of relative measures of evaluation investment funds is much more diversified, wider and, what is particularly important, developing. It includes: classical relative measures based on CAPM, such as Treynor ratio, Sharpe ratio, appraisal ratio, measures based on lower partial moments such as semi variance, Sortino ratio, U-P, Omega, Sharpe-Omega, Kappa and Farinelli-Tibiletti indicators, measures based on value at risk and mmeasure taking into account the maximum loss on equity, such as Calmar, Sterling and Burke indicators (Perez, 2012a; Zamojska, 2012). The more advanced measures concentrate on macro-forecasting ability of funds' managers. Macro-forecasting ability is called market timing and concerns future situation in the market as a whole, represented by return on market portfolio. The first market-timing model was proposed by Treynor and Mazuy in 1966 (T-M). In the model classic linear CAPM model was replaced by quadratic function. The T-M model has the following form:

$$R_{pt} - R_{ft} = \alpha_p + \theta_p(R_{Mt} - R_{ft}) + \gamma_{pMT}(R_{Mt} - R_{ft})^2 + u_{pt}$$

where: 1, 2, ..., T.

If the fund manager correctly can forecast the market and increase systematic risk the periods of bull market and

decrease it in the period of bear market then return excess of the portfolio is a quadratic function of return excess of market portfolio. As a result the parameter γ_{pMT} takes positive values. Thus negative values will then correspond with negative impact of market timing technique on the results gained by the fund. Based on the model of Treynor and Mazuy we can also evaluate a manager's ability to predict the selectivity of assets. If parameter $\alpha_p > 0$ and additionally it is statistically significant then managers predict well and choose right assets.

Another market timing model was proposed by Henriksson and Merton (H-M) in 1981. They assumed that the only question to be answered by the managers is whether future excess return will be positive or negative. The H-M model takes the following form:

$$R_{pt} - R_{ft} = \alpha_p + \theta_p(R_{Mt} - R_{ft}) + \gamma_{pMT}I(R_{Mt} - R_{ft}) + u_{pt}$$

where I denotes situation in the market in future and takes one of two possible values:

$$I = \begin{cases} 1, & R_{Mt} > R_{ft} \\ 0, & R_{Mt} \leq R_{ft} \end{cases}$$

The interpretation of the parameters is similar to that

of Treynor and Mazuy model. Additionally if $\gamma_{pMT} = 0$ then the manager cannot predict short term market trends or does not use them.

In 1994 Grinblatt and Titman showed that the results of investment funds are very sensitive for the benchmark choice. Olbryś (2010c) extended Treynor and Mazuy as well as Henriksson and Merton model by introducing two additional variables i.e. SMB and HML that come from Fama and French model. The three-factor Treynor and Mazuy model (T-M-FF) takes the following form:

$$r_{p,t} = \alpha_p + \beta_p \cdot r_{M,t} + \delta_{1P} \cdot r_{SMB,t} + \delta_{2P} \cdot r_{HML,t} + \gamma_P \cdot (r_{M,t})^2 + u_{pt} \quad (2.2.)$$

where: $r_{P,t}$ excess return of portfolio P, α_P measure of selectivity of assets, β_P market risk of portfolio P, $r_{M,t}$ excess return of market portfolio, δ_{1P} sensitivity of return on portfolio P to changes of return of SMB portfolio, δ_{2P} sensitivity of return on portfolio P to changes of return of HML portfolio, $r_{-(HML,t)}$ excess return of HML i.e. market timing measure.

Three-factor modification of H-M-FF model is as follows:

$$r_{p,t} = \alpha_p + \beta_p \cdot r_{M,t} + \delta_{1P} \cdot r_{SMB,t} + \delta_{2P} \cdot r_{HML,t} + \gamma_P \cdot y_{M,t} + u_{pt}$$

$$y_{M,t} = \max\{0, R_{ft} - R_{Mt}\}.$$

where:

In both models parameter interpretation is analogous.

Additionally, if then SMB has significant impact on changes of return of portfolio P. Parameter is similar although it measures the impact of HML factor on changes of return of portfolio P.

The above models can be estimated using both monthly and daily data. Using daily data can influence the results in that sense that the fund managers take their decisions concerning market timing more often than once a month.

Empirical analysis

It was already mentioned that investment funds in Poland have been developing for over last 20 years. Several times they were subject of professional investigation of theoretical and empirical nature (Jamróz, 2011; Olbryś 2010a,b,c; Zamojska 2009a,b, 2012).

In the present paper only equity funds are subject of the analysis. They were divided into two groups: universal ones and small and medium-size companies' equity funds. The data were taken from the internet portal www.bossa.pl. The following universal funds were subject of analysis: Allianz, Aviva, BPH, Investor, Legg Mason, Noble Fund and UniKorona. Among small and medium-size companies equity funds three were taken into account: KBC, PZU and Skarbiec. The chosen time period is very recent and covers daily observations from January 2008 to December 2013. The following practical assumptions for all models were taken: daily average rate of return of 52-week treasury bonds in Poland stands for risk-free return, for universal funds the WIG index plays the role of market portfolio while for small and medium-size companies' equity funds the market portfolio was represented by mWIG40.

In figures 1 and 2 the values of units of the funds are presented in comparison with the market portfolio indices.

Fig1. Values of the units of universal funds and WIG index in 2008, Jan – 2013, Dec.

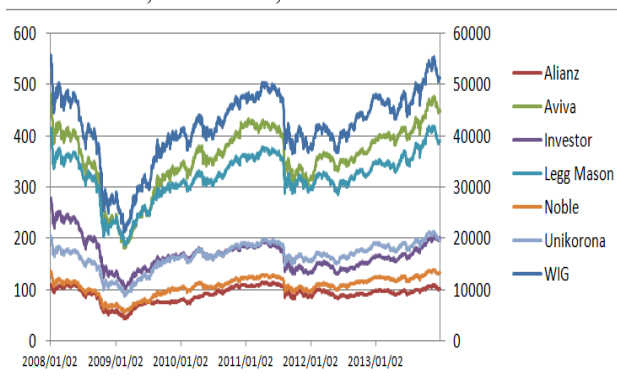
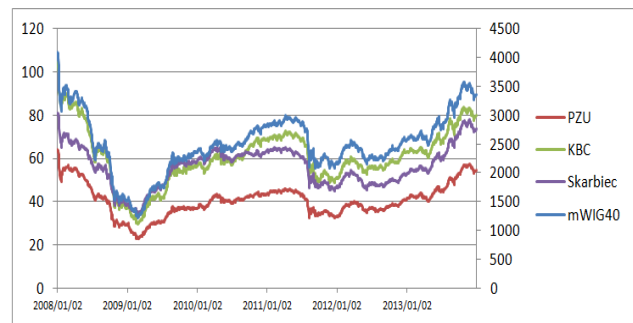


Fig 2. Values of the units of small and medium-size companies equity funds and mWIG40 index in 2008, Jan – 2013, Dec.



In the models daily returns were analyzed. Summary statistics for daily returns are presented in table 1.

Table1. Summary statistics for daily returns of the funds

Fund name	Mean	Minimum	Maximum	Std. Dev.	Skewness	Kurtosis
Allianz	-0,000049	-0,1039	0,0774	0,0142	-0,8133	8,2868
Aviva	-0,000043	-0,0880	0,0605	0,0129	-0,5802	4,6144
Investor	-0,000216	-0,0760	0,0494	0,0128	-0,7652	4,2272
KBC	-0,000177	-0,0884	0,0552	0,0123	-0,8563	4,9356
Legg Mason	-0,000041	-0,0659	0,0640	0,0118	-0,4094	4,0579
Noble	-0,000010	-0,0711	0,0595	0,0127	-0,4455	3,5478
PZU	-0,000110	-0,0877	0,0471	0,0099	-1,1178	7,4627
Skarbiec	-0,000063	-0,0547	0,0335	0,0097	-0,9037	3,7698
Unikورونا	-0,000024	-0,0757	0,0714	0,0131	-0,5307	3,9220

Source: Author's calculations

Since the return series have similar characteristics is similar as returns on single equities time series (fat tails, leptokurtosis) GARCH~t models were estimated to describe daily volatility processes (Osińska, 2006). In the research both models T-M and H-M were estimated using ML method in two versions: i.e. T-M and H-M models with GARCH~t error distribution and three factor T-M-FF and H-M-FF models with GARCH~t error distribution. Then the general model has the following form:

$$r_t = TM(or HM) + \varepsilon_t$$

$$\varepsilon_t | \psi_{t-1} \sim t(0, h_t)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1}$$

The results obtained for three factor model do not outperform the results of estimation of the original models that is why only these models will be discussed below. The results are presented in tables 2 and 3. The vast majority of structural parameters are statistically significant with 5% significance level, so it is possible to evaluate the ability of selection (parameter γ) and market timing (parameter β) of the managers managing studied funds. Based on the Akaike information criterion, it can be seen that for the majority of funds the T-M model proved to be slightly better. In both models T-M and H-M alpha parameter values fluctuated

around zero, and all were negative, thus in the analyzed period managers have not demonstrated the ability to select securities.

Table 2. The results of estimation of the T-M model

Fund name	Model T-M			GARCH Student's t					AIC
							De-grees of free-dom		
Alianz	-0,002*	0,83*	-0,82	1,6e-07	0,14*	0,87*	4,49		-12123
Aviva	-0,002*	0,88*	-0,99*	2,9e-08	0,08*	0,92*	6,78		-13111
Investor	-0,002*	0,81*	-0,91*	9,4e-08*	0,13*	0,87*	10,11		-12577
KBC	-0,001*	0,97*	0,08	1,0e-06*	0,10*	0,79*	6,65		-13350
Legg Mason	-0,002*	0,79*	-0,56*	4,4e-08	0,05*	0,95*	10,63		-13811
Noble	-0,001*	0,88*	-0,27	5,9e-07*	0,07*	0,83*	11,65		-13836
PZU	-0,004*	0,68*	-1,50*	1,0e-07	0,03*	0,97*	8,87		-12368
Skarbiec	-0,003*	0,71*	-1,23*	2,1e-07*	0,09*	0,91*	8,53		-12037
Unikona	-0,005*	0,57*	-2,63*	2,6e-05*	0,46*	0,31*	8,55		-9982

* Significant at $\alpha = 0,05$.

Source: Author's calculations

Table 3. The results of estimation of the H-M model

Fund name	Model H-M			GARCH Student's t					AIC
							De-grees of free-dom		
Alianz	-0,002*	0,86*	-0,03	1,6e-07*	0,14*	0,87*	4,42		-12220
Aviva	-0,001*	0,92*	-0,06*	2,0e-08	0,08*	0,92*	6,73		-13073
Investor	-0,002*	0,85*	-0,09*	9,4e-08*	0,13*	0,87*	10,12		-12579
KBC	-0,0004*	0,97*	-0,07*	8,5e-07*	0,09*	0,81*	6,62		-13355
Legg Mason	-0,002*	0,82*	-0,06	4,8e-08	0,05*	0,94*	10,53		-13809
Noble	-0,001*	0,89*	-0,03	5,8e-07*	0,07*	0,83*	11,92		-13836
PZU	-0,003*	0,74*	-0,13*	1,1e-07	0,03*	0,97*	7,96		-12362
Skarbiec	-0,003*	0,75*	-0,06	2,0e-07*	0,09*	0,91*	8,65		-12031
Unikona	-0,004*	0,67*	-0,19*	2,3e-05*	0,40*	0,39*	7,46		-9971

* Significant at $\alpha = 0,05$.

Source: Author's calculations

A similar situation occurs in the case of the gamma, which in the T-M model for six funds is statistically significant but its values are negative that suggests a negative impact of market timing on the results of funds. Other gamma parameters of the T-M model are not statistically significant, three of which are negative and one positive. Positive

but insignificant parameter does not necessarily imply the ability of the fund manager. In turn, in the H-M model all funds have negative gamma, and five of them are statistically significant values, which may mean a negative impact of use of market timing technique on returns the funds.

Analyzing the systematic risk of the funds it should be noted that the parameter theta is statistically significant for all tested funds and has rather high values. The two explanations can be given. First, that due to managers activity the fund investors could not get extra return because they did not beat the market which in the analyzed period was in bad state after the recession in 2007-2009. Second explanation is of psychological nature. The managers have learned from the recession and are very careful in taking risky decisions that is why all the funds results are more or less the same as those on the whole market.

Conclusions

Effectiveness of investment funds may be examined with different methods. In this research market timing models were used to check whether managers have selectivity and market timing ability. Selectivity is responsible for proper choice of the securities for portfolio and market timing allows to predict the whole market in future and to use the results of prediction to proper risk management of the funds. The sample was consisted of nine equity funds operating in Poland in 2008, Jan – 2013, Dec. In most cases the managers did not make use of selectivity and/or market timing. In some cases managers had negative impact for returns gained by the funds. Only in single cases parameter estimates for selectivity and market timing were positive but often non-significant.

On the basis of the tests performed and the analysis of their results, it can be concluded that in the years 2008 - 2013 a tested group of nine funds did not generate superior returns in comparison to the market. These results are not isolated. Multiple studies of Polish, but also foreign investment funds market by market timing models in most cases pointed to a lack of market timing offund managers.

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