PERFORMANCE MEASUREMENT OF UCITS INVESTMENT FUNDS IN CROATIA

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Abstract

UCITS investment funds represent an important investment opportunity for retail, as well for institutional investors in the European Union. The aim of this paper is to analyse the performance of the UCITS investment funds in Croatia and to detect relatively homogeneous groups among the UCITS funds based on its performance. The analysis includes 55 UCITS, in the period from the beginning of 2011 until the end of 2014, and it is conducted on daily data of share prices, available from Bloomberg terminal. Analysis is performed separately within the groups of different investment fund by investment strategy. The research methodology is based on the calculation of various indicators of absolute and relative risk-adjusted performance and riskiness of the funds. In general, based on analysis of performance measures, it can be concluded that funds with higher values of net assets were more successful compared to the funds with below-average asset values. Also, funds with below-average values of net assets were more volatile. At the same time, funds run by foreign own management companies were more successful by the absolute performance measures, compared to funds run by management companies with domestic ownership. On the other hand, those funds were more volatile, as well.

Keywords: absolute risk-adjusted performance, relative risk-adjusted performance, Sharpe ratio, Information ratio.

INTRODUCTION

Investment funds are indispensable financial intermediaries of every developed financial system with their special role of dominantly acquiring retirement savings or investments of the household sector. The importance of investment funds for financial systems, measured in the ratio of investment funds assets in the structure of assets of all financial institutions ranged at the end of 2014 from 21.8% in USA (Board of Governors of the Federal Reserve System 2015), 18.8% in Eurozone to only 2.7% in Croatia (EFAMA 2015). Although commercial banks have the largest share in the Eurozone's and Croatian

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financial system, the upward trend in the importance of institutional investors such as investment funds and a decline in the importance of traditional institutions such as commercial banks can be noticed. The financial crisis had significant impact on the investment funds, especially in Croatia, where its net assets have not yet recovered to pre-crisis values, unlike the EU countries.

In the United States and the Eurozone countries equity funds have the largest share among open-end funds (ICI 2015), while Croatian open-end investment funds structure is dominated by money market funds (CFSSA 2014). Low liquidity of the Zagreb Stock Exchange, a significate decline in stock prices and risk aversion led to a decline in the asset value of equity funds and now their share stands at only 14%, which is significantly lower comparing to the pre-crisis 2007 when their share was at all-time high of 51.8%. The share of bond funds remained at similar levels and at the end of 2014 it stood at 7.4%, while the share of bond funds both in the US and EU was higher than 15%. Besides the bond funds, balanced funds have a high share both in the US (22%) and in the EU (16%) (EFAMA 2015), while their share in Croatia stood only at 7%. Investment funds performance measurement is considered important for evaluation of investment strategy of individual investment fund and its comparison with similar funds. This paper uses absolute and relative risk-adjusted performance measures as well as descriptive statistics as research methodology in conducting performance analysis. The aim of this paper is to analyse the performance of the UCITS investment funds in Croatia and to detect relatively homogeneous groups among the UCITS funds based on its performance. The analysis includes 55 UCITS funds, in the period from the beginning of 2011 until the end of 2014, and it is conducted on daily data of share prices, available from Bloomberg terminal. The paper is organised as follows, after the introductory notes research methodology and data are presented, followed by presented results and discussion. At the end of paper mail findings of a paper are presented in a conclusion.

1. DATA AND METHODOLOGY

Research in this paper uses absolute and relative risk-adjusted performance measures and descriptive statistics methodology on the data obtained from Bloomberg. Analysis included all Croatian investment funds which unit prices are listed on Bloomberg Professional Service and were continuously running business between January 2012 and December 2014. That included 15 money market funds, 6 bond funds, 7 balanced funds and 27 equity funds. Risk-free rate is calculated as average yield of 3 month Croatian treasury bills, while benchmark is defined depending on fund type. EONIA, as an effective interbank overnight interest rate in the Eurozone is used as benchmark for the money market funds. Croatian bond index, CROBIStr, is used as benchmark for bond funds, while Zagreb Stock Exchange official share index, CROBEX, is used as benchmark for equity funds. Combination of CROBEX index (37%), CROBIStr index (39%) and EONIA (24%) is used as balanced funds benchmark, while weights are determined by average structure of assets in the portfolio of balanced funds at the end of 2014.

Absolute and relative performance measures which allow comparison between the same types of investment funds were used. Absolute performance measures are performance measures which do not use benchmark for calculating performance, while relative performance measures do use different types of benchmarks in calculation

process – such as market indexes, combination of different indexes or the peer group performance results. Benchmark is used for the assessment of effectiveness of active investment strategies, while passive strategies mainly use indexing strategy whose results are linked to the performance of the market index itself. (Brown and Reilly 2010) According to EDHEC – Risk Institute research (Amenc et al. 2008) conducted among financial experts, the most widely used measures of the absolute performance are Sharpe ratio and average return in excess of the risk-free rate, while most used relative performance measures are Information ration and Jensen's alpha (Brinson, Hood, and Beebower 1986; Carhart 1997).

$$S_p = \frac{E(R_p)-R_f}{\sigma_{(R_p)}} \tag{1}$$

S_p Sharpe ratio
$E(R_p)$ Expected portfolio return
R_f Risk free rate
$\sigma_{(R_p)}$ Standard deviation of a portfolio

$$IR = \frac{E(R_p)-E(R_b)}{\sigma(R_p-R_b)} \tag{2}$$

IR Information ratio
$E(R_b)$ Average benchmark return
$\sigma_{(R_p-R_b)}$ Standard deviation of excess of return

$$E(R_p)-R_f = \alpha_p + \beta_p(E(R_m)-R_f) \tag{3}$$

α_p Jensen's alpha
$E(R_m)$ Expected market return
β_p Beta of portfolio

Sharpe ratio is calculated as a difference of expected portfolio return and risk free rate divided by standard deviation of portfolio (Sharpe 1994), while Information ratio is calculated as difference of expected portfolio return and average benchmark return divided by standard deviation of excess of return (Goodwin 1998). Although those two measures seem similar, Information rate uses benchmark in its calculation, while Sharpe ratio only uses risk free rate and because of that Sharpe ratio is absolute performance measure (Amenc et al. 2008; Grinold and Kahn 2000; Sharpe 1966.). Jensen's alpha measures the excess of the difference between average yield of the investment funds and risk-free rate over the yield that can be expected using the CAPM model (Kothari and Warner 2001). Descriptive statistics methodology has also been used to present performance and risk measures of different types of investment funds.

2. RESULTS AND DISCUSSION

Based on the presented methodology and data following results has been obtained. Average daily yield of money market funds is 0.0064%, and 9 funds had higher yields than mean, while 5 funds had lower yields. Median of average daily return of money market funds was slightly higher (0.0065%) than its mean. Mean of Sharpe ratio of cash funds was 0.22, while mean of Information ratio was 0.508 and only 6 funds had higher

ratio than that. Skewness of average daily return and Sharpe ratio of money market funds shows an asymmetrical distribution with a long tail to the left, while skewness of Information ratio is close to zero, which means that it had close to symmetrical distribution. On the other hand, standard deviation of money market funds shows an asymmetrical distribution with a long tail to the right, which means that most of the money market funds had lower standard deviation, while only few had high values of standard deviation and those funds are located on the far right of the distribution.

Table 1. Descriptive statistics of key measures of money market funds

	Average daily return	Sharpe ratio	Information ratio	Standard deviation
Mean	0.006%	0.220	0.508	0.032%
Standard Error	0.001%	0.061	0.085	0.000
Median	0.006%	0.240	0.468	0.011%
Standard Deviation	0.002%	0.235	0.331	0.051%
Sample Variance	0.000	0.055	0.109	0.000
Kurtosis	1.659	1.044	-1.233	3.617
Skewness	-0.873	-0.727	0.142	2.205
Range	0.0077%	0.9003	1.0104	0.1525%
Minimum	0.0016%	-0.344	0.041	0.005%
Maximum	0.0093%	0.556	1.052	0.158%
Count	15	15	15	15
Confidence Level (95.0%)	0.00001	0.13021	0.18321	0.00028

Note: These data are based on Bloomberg

Money market funds that were more volatile generally yielded higher average daily return, but they have had worse results when those yields were risk adjusted by using risk-adjusted measures such as Sharpe ratio and Information ratio. On the other hand, funds that were less prone to risk, ie. they were less volatile, are compensated by having the better Sharpe ratio and Information ratio, as these measures take risk into account as well. For example, Hi-cash had standard deviation of 0.006% (second least volatile fund) and average daily return of 0.0069% (ranked 6th of 15 funds) which resulted in highest Sharpe ration (0.556) and highest Information ratio (1.05). Erste Euro Money had higher average daily return (0.007%), but higher standard deviation (0.158%) as well which resulted in third worst Sharpe ratio (0.023) and worst Information ratio (0.04).

Table 2. Average daily return, Sharpe ratio, information ratio and standard deviation of money market funds

	Average daily return	Sharpe ratio	Information ratio	Standard deviation
Top 3	Money One (0.009%)	Hi-cash (0.556)	Hi-cash (1.05)	Erste Euro M. (0.158%)
	PBZ Euro money (0.009%)	PBZ Euro money (0.552)	ZB europlus (0.91)	Erste Money (0.154%)
	NETA MultiCash (0.009%)	PBZ Money (0.408)	PBZ Euro Money (0.87)	NETA MultiCash (0.052%)
Bottom 3	Raiffeisen euroCash (0.005%)	Erste Euro M. (0.023)	NETA MultiCash (0.16)	ZB europlus (0.006%)
	PBZ Dollar (0.004%)	PBZ Dollar (0.019)	Erste Money (0.04)	Hi-cash (0.006%)
	Auctor Cash (0.002%)	Auctor Cash (-0.344)	Erste Euro M. (0.04)	Auctor Cash (0.005%)

Note: These data are based on Bloomberg

Mean and median of average daily return of bond funds is almost the same as cash funds, but mean of standard deviation is significantly higher, which explains why bond funds had lower mean of Sharpe and Information ratio comparing to cash funds. Similar values of mean and median of average daily return is a sign of fairly symmetrical distribution, which is confirmed by close to zero value of skewness (0.043). While both Sharpe ration and standard deviation had asymmetrical distribution with long tail to the right, information ratio had slightly negative asymmetrical distribution.

Table 3. Descriptive statistics of key measures of bond funds

	Average daily return	Sharpe ratio	Information ratio	Standard deviation
Mean	0.006%	0.050	-0.097	0.302%
Standard Error	0.006%	0.035	0.010	0.001
Median	0.006%	0.028	-0.096	0.263%
Standard Deviation	0.014%	0.087	0.024	0.201%
Sample Variance	0.000	0.008	0.001	0.000
Kurtosis	-2.549	-1.874	-0.606	-1.211
Skewness	0.043	0.503	-0.199	0.618
Range	0.0334%	0.2081	0.0673	0.4939%
Minimum	-0.0102%	-0.037	-0.132	0.115%
Maximum	0.0232%	0.171	-0.065	0.609%
Count	6	6	6	6
Confidence Level (95.0%)	0.00015	0.09124	0.02533	0.00211

Note: These data are based on Bloomberg

The analysis of the results shows that Hi-conservative fund and Capital One fund were most successful funds. These funds had both high average daily returns and were among funds with lowest standard deviation which resulted in good results measured by Sharpe and Information ratio. Results of the Information ratios can be compared among funds which have similarly diversified risk, and results shows that NETA Emerging Bond fund had relatively high standard deviation and because of that the value of denominator was high as well, which resulted in final value of Information ratio closer to zero. Since all the funds had lower yield than CROBIStr index, it resulted that all funds had negative Information ratio and because of that NETA Emerging Bond emerged at the top of the rankings.

Table 4. Average daily return, Sharpe ratio, information ratio and standard deviation of bond funds

	Average daily return	Sharpe ratio	Information ratio	Standard deviation
Top 3	Hi-conservative (0.023%)	Hi-conservative (0.171)	NETA Emerging B. (-0.06)	NETA Emerging B. (0.61%)
	Capital One (0.020%)	Capital One (0.131)	Hi-conservative (-0.08)	Raiffeisen Bonds (0.44%)
	ZB bond (0.014%)	ZB bond (0.064)	Capital One (-0.09)	PBZ Bond (0.37%)
Bottom 3	NETA Emerging B. (-0.002%)	NETA Emerging B. (-0.009)	Raiffeisen Bonds (-0.11)	ZB bond (0.16%)
	Raiffeisen Bonds (-0.007%)	Raiffeisen Bonds (-0.023)	ZB bond (-0.11)	Capital One (0.13%)
	PBZ Bond (-0.010%)	PBZ Bond (-0.037)	PBZ Bond (-0.13)	Hi-conservative (0.12%)

Note: These data are based on Bloomberg

Balanced funds had slightly higher mean of average daily returns than cash funds and bond funds, but its mean of standard deviation is significantly higher, thus its mean of Sharpe ratio is lower. Skewness of average daily return is near -1, which means that distribution is asymmetrical with most of the funds having higher average daily returns comparing to mean. Skewness of standard deviation is close to 2, which means that only few funds had high values of standard deviation which were above mean – in this case KD Balanced (0.86%) and Agram Trust (0.49%).

Table 5. Descriptive statistics of key measures of balanced funds

	Average daily return	Sharpe ratio	Information ratio	Standard deviation
Mean	0.012%	0.027	-0.003	0.449%
Standard Error	0.008%	0.021	0.019	0.001
Median	0.019%	0.023	0.007	0.378%
Standard Deviation	0.020%	0.056	0.050	0.193%
Sample Variance	0.000	0.003	0.002	0.000
Kurtosis	0.308	0.051	-0.161	4.524
Skewness	-1.026	0.066	-0.116	1.994
Range	0.0585%	0.1714	0.1496	0.5908%
Minimum	-0.0241%	-0.056	-0.077	0.269%
Maximum	0.0344%	0.115	0.072	0.859%
Count	7	7	7	7
Confidence Level (95.0%)	0.00019	0.05202	0.04599	0.00179

Note: These data are based on Bloomberg

Empirical analysis showed similar results as with the bond funds – the least volatile funds were also among most successful as measured both by average daily return and by more complex measures such as Sharpe ratio and Information ratio. Allianz Portfolio fund achieved the best results by all measures, while Agram Trust fund was worst ranked fund by both Sharpe and Information ratio. Of the seven observed funds, four funds achieved yields greater than benchmark (which consists of EONIA, CROBEX index and CROBIStr index – based on average share of different securities type among balanced funds), while three funds have not manage to beat the market.

Table 6. Average daily return, Sharpe ratio, information ratio and standard deviation of balanced funds

	Average daily return	Sharpe ratio	Information ratio	Standard deviation
Top 3	Allianz Portfolio (0.034%)	Allianz Portfolio (0.115)	Allianz Portfolio (0.072)	KD Balanced (0.86%)
	Hi-balanced (0.027%)	Hi-balanced (0.068)	Hi-balanced (0.032)	Agram Trust (0.49%)
	KD Balanced (0.023%)	ZB global (0.041)	KD Balanced (0.008)	HPB Global (0.42%)
Bottom 3	PBZ Global (0.012%)	PBZ Global (0.022)	PBZ Global (-0.011)	ZB global (0.38%)
	HPB Global (-0.006%)	HPB Global (-0.022)	HPB Global (-0.049)	Hi-balanced (0.35%)
	Agram Trust (-0.024%)	Agram Trust (-0.056)	Agram Trust (-0.077)	Allianz Portfolio (0.27%)

Note: These data are based on Bloomberg

Mean of average daily returns of equity funds is higher comparing to other types of funds, but mean of standard deviation is higher as well. Because equity funds are by nature most volatile fund type its Sharpe ratio was somewhat lower in relation to cash,

bond and balanced funds. Range of average daily returns is 0.088%, which is also the biggest gap between fund with lowest average daily return and fund with highest average daily return, comparing to other fund types. Sharpe ratio and Information skewness is close to zero which means it has distribution close to normal.

Table 7. Descriptive statistics of key measures of equity funds

	Average daily return	Sharpe ratio	Information ratio	Standard deviation
Mean	0.019%	0.024	0.025	0.738%
Standard Error	0.004%	0.005	0.004	0.001
Median	0.016%	0.028	0.029	0.713%
Standard Deviation	0.020%	0.026	0.023	0.283%
Sample Variance	0.000	0.001	0.001	0.000
Kurtosis	1.024	0.179	-0.518	0.665
Skewness	0.705	0.212	-0.046	0.943
Range	0.0881%	0.1104	0.0904	1.114%
Minimum	-0.0142%	-0.022	-0.017	0.286%
Maximum	0.0739%	0.089	0.073	1.400%
Count	27	27	27	27
Confidence Level (95.0%)	0.00008	0.01010	0.00912	0.00112

Note: These data are based on Bloomberg

Among the most successful equity funds are funds with varying degrees of risk - from funds with low risk such as Allianz Equity Fund, to high-risk and high-yield funds like KD Victoria.

Table 8. Average daily return, Sharpe ratio, information ratio and standard deviation of equity funds

	Average daily return	Sharpe ratio	Information ratio	Standard deviation
Top 3	KD Victoria (0,074%)	Allianz Equity (0,089)	Allianz Equity (0,073)	KD Victoria (1,40%)
	NETA US Algorithm (0,054%)	Platinum Global O. (0,058)	OTP Index fond (0,06)	KD Nova Europa (1,38%)
	Platinum Global O. (0,045%)	Hi-growth (0,052)	Platinum Global O. (0,052)	NETA US Algorithm (1,24%)
Bottom 3	PBZ I-Stock (-0,003%)	PBZ I-Stock (-0,01)	PBZ I-Stock (-0,01)	PBZ Equity (0,44%)
	NETA New Europe (-0,013%)	Ilirika BRIC (-0,02)	Ilirika BRIC (-0,02)	Allianz Equity (0,37%)
	Ilirika BRIC (-0,014%)	NETA New Europe (-0,02)	NETA New Europe (-0,02)	Smart Equity (0,29%)

Note: These data are based on Bloomberg

The most successful fund by Sharpe ration and Information ratio was the least volatile one – Allianz Equity fund, while KD Victoria fund had highest average daily return and highest standard deviation, but was still ranked 4th (of 27 funds) by Sharpe ratio and Information ratio. On the other hand, the funds that were least successful had higher standard deviation in average.

CONCLUSION

Empirical analysis has shown that those money market funds that had volatile yields generally had greater average daily yields, but they have had worse results when yields

were adjusted to risk. On the other hand, funds that were less volatile had better results in risk-adjusted measures such as Sharpe and Information ratio. Analysis of performance of bond funds and balanced funds showed that funds with lower risk had higher average yields compared to riskier funds, which contradicts the results of cash funds, and therefore such funds were the most successful when calculation both Sharpe and Information ration. Among the most successful equity funds are funds with varying degrees of risk, but equity funds that are least successful in accordance with these measures generally had high values of standard deviation, ie. were among the riskier funds.

Looking at the empirical analysis, a general conclusion is that funds with higher assets values were successful by Sharpe and Information ratio compared to funds with below-average assets values, while funds with below-average values of the assets were more volatile. At the same time, funds which were managed by management companies with foreign ownership were more successful than funds that were managed by management companies in the domestic ownership, but on those funds had higher values of standard deviation as well.

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