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Croatian and Slovenian Mutual Funds and Bosnian Investments Funds*

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Abstract

The paper provides a stock-market-performance analysis for three emerging European stock markets: Croatia, Slovenia, and Bosnia and Herzegovina. Using monthly observations we perform a detailed study of the performance of Croatian and Slovenian mutual funds and Bosnian investment funds. The risk-return measures of the funds are assessed using the Sharpe ratio, Treynor ratio, information ratio, Jensen's alpha, and an appraisal ratio. Furthermore, we analyze the timing ability of the funds. Descriptive statistics for the returns are given and different statistic tests are calculated in order to test ordinary-least-squares assumptions in the data. The results are also estimated by applying the bootstrap method.

1. Introduction

Over the last few years, the mutual fund industry in transition economies has exploded. In the process of promoting the mutual funds industry, Slovenia and Croatia are in the forefront among transition economies, while on the other hand, the Bosnian market is still in its infancy. This paper studies the mutual fund industry in these countries in the first years of its development, i.e. in the period which is characterized by important flows to mutual funds. This period is interesting, since this is the period when some of the stock market seems not to be efficient (Podobnik et al., 2006), (Jagric et al., 2005).

The mutual fund industry is among the most successful recent innovations. It is larger in countries with stronger rules, laws, and regulations, and specifically where mutual fund investors' rights are better protected. The industry is also larger in countries with a wealthier and more educated population, where the industry is older, trading costs are lower and in which defined contribution pension plans are more prevalent (Khorana et al., 2005). We think that the trends in the Slovenian, Croatian, and Bosnian mutual fund industry reflect these findings.

Most research on the mutual fund industry has been performed on US mutual funds. Recently there have been some studies of non-US mutual funds. In 2002

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Otten and Bams performed a cross-country analysis of European funds which includes Germany, France, Italy, the UK, Spain, and the Netherlands.

In this paper we evaluate the performance of mutual funds in Slovenia and Croatia, and investment funds in Bosnia and Herzegovina. We rank the funds on the basis of different parameters which give us the opportunity to gain some additional insight into the properties of financial markets in transition economies. In order to provide robust results, we also apply a bootstrap method and some additional statistical tests in order to study the properties of the observed data. To emphasize the financial perspective of South-East Europe, we also analyze the returns of major financial indices in Croatia (CRO), Bosnia and Herzegovina (BiH), Slovenia (SLO), Serbia and Montenegro (S&M), Bulgaria (BULG), and Macedonia (MAC), and show that the financial equity market for the whole region has exhibited strong performance in recent years.

This paper is organized as follows. In Section 2 we introduce the performance measures used in the evaluation of funds: the Sharpe ratio (1994), the Treynor ratio (1966), the Information ratio, the Jensen's alpha (1968), the Appraisal ratio (Treynor, Ficher, 1973), and the Treynor-Mazuy (1966) timing measure. In Section 3 we briefly explain the data. In Section 4 we calculate and discuss the performance measures of Croatian mutual funds, Bosnian investment funds and Slovenian mutual funds. Finally, the concluding remarks are given in Section 5.

2. Risk-Return Statistic

To evaluate the performance of an investment, following the Markowitz return-risk paradigm, one must always consider the investment's return in conjecture with the performance risk as measured by standard deviation of returns (assuming the normality distribution). The Capital Asset Pricing Model (CAPM) states that return on an investment *i* should be a linear function of the systematic or market risk (beta) and return premium over the market:

$$R_{i,t} = R_{f,t} + \alpha_i + \beta_i (R_{m,t} - R_{f,t}) + \varepsilon_{i,t} \tag{1}$$

Here R_m is the market return, R_f risk free return, R_i return on fund i and t represents the time when the observations occur. ε_{it} is a stochastic fund-specific return, and β determines the level of fund's market exposure. By definition, for a risk--free investment β is zero.

The constant term in the above regression, the so-called Jensen's α, indicates whether the portfolio manager is superior ($\alpha > 0$) or inferior ($\alpha < 0$) in stock selection compared to the market. In Jensen's paper (1968) this measure indicates the difference between the fund's actual return and the expected return the manager would earn if the money has been passively invested at the same risk level of the market index. To further quantify the manager's ability to predict market moves, Treynor and Mazuy (1966) added a quadratic term in the CAPM:

$$R_{i,t} = R_{f,t} + \alpha_i + \beta_i (R_{m,t} - R_{f,t}) + \gamma_i (R_{m,t} - R_{f,t})^2 + \varepsilon_{i,t} \tag{2}$$

From estimates of the above parameters one may distinguish between selection and timing ability. If α is positive and significantly different from zero, one iden-

tifies selection ability. The Treynor-Mazuy coefficient γ shows a manager's timing ability to shift funds into high β stocks when the market is going to go up and to shift into low β stocks when the market is going to go down.

Keeping in mind the Markowitz return-variance paradigm, Sharpe found how two statistical measures (mean and standard deviation of return) can be replaced with just one, later called the Sharpe ratio. The Sharpe ratio is calculated by dividing the premium (excess) return by the standard deviation (total risk) of the return:

$$S_h = \frac{\overline{R} - \overline{R}_f}{\sigma} \tag{3}$$

where $\overline{R}$ is the average value of the return.

The advantage of using the Sharpe ratio for evaluation of fund performance is that it does not refer to any particular benchmark.

From equation 1, one easily derives the relation $\sigma^2 = \beta^2\sigma_M^2 + \sigma_e^2$ between the total risk, the systematic (market) risk, $\beta^2\sigma_M^2$, and unsystematic risk, σ_e^2, where the latter can be reduced or even eliminated through the proper diversification of the fund. The β coefficient is a very useful measure for an investor who holds multiple investments in the same market. This is because the unsystematic risk can be reduced by diversifying the fund, but the systematic risk cannot be diversified away. Bearing this in mind, the Treynor ratio of a fund is defined by its premium return divided by its β:

$$T_h = \frac{\overline{R} - \overline{R}_f}{\beta} \tag{4}$$

By combining the Treynor ratio and the Sharpe ratio an investor can have a good picture of the fund's performance. If a fund is not fully diversified, the Sharpe ratio can be low, but the Treynor ratio can be high.

Generally, one can define the Sharpe ratio for a fund relative to any benchmark, not only the risk-free rate. For the active return defined as the difference between the fund's return and the benchmark return, the mean divided by its standard deviation is called the Information ratio.

The Appraisal Ratio is a transformation of the Jensen's α (see Treynor, Ficher, 1973), defined to adjust the Jensen's α for the unsystematic risk σ_e through the equation:

$$AR_h = \frac{\alpha}{\sigma_e} \tag{5}$$

For funds with a low Appraisal ratio, investors pay a higher price (in terms of risk) for the fund's market outperformance (α).

3. The Data

The data set includes the time series of major financial indices for the six South-East transition economies: Croatia, Slovenia, Bosnia and Herzegovina, Serbia and Montenegro, Macedonia, and Bulgaria. According to an empirical analysis performed by Sirri and Tuffano (1998), investors are more inclined to make their in-

TABLE 1 Proportional Return for Major Indices of South-East European Transition Countries

Country	Year				
	01	02	03	04	05
Slovenia	18.6	56.0	17.5	25.1	-0.06
Croatia	16.6	13.4	0.01	32.1	27.6
Serbia and Montenegro	N/A	N/A	N/A	N/A	40.2
Macedonia	N/A	N/A	N/A	N/A	129.0
Bulgaria	11.3	52.9	147.0	39.2	32.4
Bosnia and Herzegovina	N/A	N/A	N/A	151	23.2

Note: Proportional returns are measured in percentage and dividends are not included. Inflation (or risk-free return) is also not included, but is generally very low.

vestment decisions based on a fund's return as opposed to a fund's risk adjusted return. *Table 1* reports annualized returns calculated as percentage rates for the following financial indices: CROBEX (Croatia), SBI20 (Slovenia), BELEX20 (Serbia and Montenegro), SOFIX (Bulgaria), MBI-10 (Macedonia). Since the Bosnian market index is still not available, as a representative of the Bosnian capital market, in Table 1 we report the Bosnian Investment Funds Index (BIFX). One can notice that for some years, annual returns exceeded 100 % in countries such as Macedonia, Bosnia and Herzegovina and Bulgaria. These types of returns are unseen in developed markets and economies.

We also use data for mutual funds in Croatia and Slovenia, and data for Bosnian privatization investment funds (PIFs). The funds selected for the analysis are presented in *Table 2*. Selection was based on the number of observations and the importance of funds on the observed market. The mutual funds started at different points in time, but all are present at the end of the period. The returns, R_{it} are defined for each fund i as $R_{i,t} = \ln(S_{i,t} / S_{i,t-1})$, where $S_{i,t}$ is the month-end performance of fund i in month t. As a risk-free rate benchmark, we use three-month Treasury bills issued by national banks in selected countries. We believe that it could be more appropriate to apply one-month Treasury bills or any other asset with an even shorter period to expire; however, it was not possible to select such an asset in the case of the observed markets. We think that, as in the case of developed countries, where the returns of three-month Treasury bills can be considered as a good proxy of risk-free rate, the three-month returns reflect a true risk-free rate also in the selected countries.

As we outlined in the introduction, the selection of stock markets is also based on the differences in the presence of long memory. In addition to the already mentioned references in the introduction, we performed a robust test of long memory. According to Lo and MacKinlay (1988) it is necessary to examine the Variance ratio tests for several selected values of lag q and the random walk hypothesis is rejected if the test statistics are rejected for all q values. From *Appendices 1* and *2* we see that for all Croatian funds and Bosnian PIFs the random walk hypothesis can not be rejected. In contrast to these results, we can reject the random walk hypothesis for all Slovenian funds.

Since, the models are estimated with the standard least square method, we also performed a statistical test for the departure of classical assumptions of the se-

TABLE 2 Selected Mutual and Privatization Investment Funds

FUND (COUNTRY)	START	*N*	A.R.	FUND (COUNTRY)	START	*N*	A.R.
NKD (SLO)	31/12/99	81	0.192	ILIRIKA JIE (CRO)	31/12/04	24	0.300
NKS (SLO)	31/12/99	81	0.180	RBA ACTIVE (CRO)	31/12/04	24	0.084
KDS (SLO)	31/03/00	78	0.180	ZB GLOBAL (CRO)	31/12/04	24	0.108
RPMK (SLO)	29/09/00	72	0.204	ZB TREND (CRO)	31/12/04	24	0.096
TGR (SLO)	31/08/00	73	0.156	ERSTE BALANCED (CRO)	31/12/04	24	0.060
ZI (SLO)	31/12/99	81	0.168	ST BALANCED (CRO)	31/12/04	24	0.156
PRA (SLO)	31/12/99	81	0.228	ST GLOBAL (CRO)	31/12/04	24	0.108
KMR (SLO)	31/12/99	81	0.168	HI – BALANCED (CRO)	31/12/04	24	0.048
AVV (SLO)	31/12/99	81	0.156	CROBIH (BIH)	31/03/03	36	0.540
ABP (SLO)	31/12/99	81	0.132	BONUS (BIH)	31/03/03	36	0.540
KMG (SLO)	31/12/99	81	0.180	HERBOS (BIH)	31/03/03	36	0.504
MLP (SLO)	31/12/99	81	0.108	FORTUNA (BIH)	31/03/03	36	0.468
MXP (SLO)	31/12/99	81	0.108	MIGROUP (BIH)	31/03/03	36	0.324
RBA CE (CRO)	29/04/05	9	0.252	BOSFIN (BIH)	31/03/03	36	0.312
ZB EUROAKTIV (CRO)	30/06/04	19	0.156	PROPLUS (BIH)	31/03/03	36	0.312
RBA BALANCED (CRO)	31/12/04	24	0.240	NAPRIJED (BIH)	31/03/03	36	0.348
FIMA EQUITY (CRO)	30/06/04	19	0.252	EUROFOND (BIH)	31/03/03	36	0.300
KD VICTORIA (CRO)	31/12/04	24	0.276				

Note: All series end on 31/12/05. START – beginning of the time series, *N* – number of observations, A.R. – annual proportional return.

lected method (see Appendices 1, 2, and 3). In some cases the data do not support all of the classical assumptions; however, the applied bootstrap method confirms the robustness of the results.

4. Results and Discussion

4.1 Croatian Mutual Funds

The Croatian financial market might be interesting as an example of one of the successful emerging markets in the Central and South-East Europe. In particular, the Croatian market has a chance to become as equally successful as the neighboring Slovenian market was in the last decade (Jagric et al., 2004), (Jagric et al., 2005). In 1999, The Wall Street Journal Europe put the Slovenian Galileo mutual fund (size of EUR 100 million) at the top among open-end funds in the region. In 2003 the U.S. Lip-

per company, under the request of the same journal, put Galileo at the top of the list of 15 most successful open investment funds in the world. However, the performance of the Slovenian funds in last two years has changed, as we will show later in our analysis.

In the last two years, as a result both of EU accession efforts and accumulated investment reports, the Croatian equity market, having two stock exchange markets, exhibited an upward trend. Equity market capitalization has doubled in the case of the Zagreb Stock Exchange (ZSE), and in the case of the Varazdin Stock Exchange (VSE) it has increased by four times. The market capitalization of all the companies listed on the Zagreb Stock Exchange is equal to EUR 23 billion, which should be compared with the Prague Stock Exchange with EUR 50 billion and the Ljubljana Stock Exchange with EUR 15 billion (EFAMA, 2006). One of the strategic goals for the Croatian financial system is to adjust its rules and regulation to those of the EU. This would encourage foreign investors to enter this market and attract more foreign capital.

Aside from Greece, investment in mutual funds is not widespread in the countries of South-East Europe. Only recently has interest in mutual funds begun to grow. The reasons for this increasing attention are to be found in both positive trends in the securities market and the low interest rates applied by banks to savings deposits. The gradual transfer of some deposits to mutual funds can also be expected.

The Croatian mutual fund market emerged with four funds in the period 1999–2000. Similarly as in Slovenia, over the past five years the Croatian market has witnessed strong growth of the mutual fund industry, with roughly nine funds launched each year. During the same time period, total institutional assets have grown from EUR 2.56 billion to EUR 37.53 billion. The average annual growth of assets is 17 %. Assets of pension and investment funds have experienced the highest average annual return (96 % and 127 %). For the period 2000–2005, total retail investment in mutual funds grew by HRK 2.6 billion. Retail market share increased to 39 %. A visible flow of assets from money market instruments to investment funds was a result of several factors: low interest rates, education of retail investors, enhancement of the general investment culture, development of private banking, an increase in the number of investment funds with various investment policies, introduction of structured products to the market. During the last five years, all larger banks launched at least one fund for most popular investment styles (equity, balanced, fixed income, money market). The increase in total assets is continuously accelerating, so in 2005 mutual funds grew by more than EUR 533.33 million or more than 85 % compared to 2004 (Croatian National Bank, 2006).

Despite increased investment in Croatian mutual funds, Croatia has a significantly lower average amount of investment in mutual funds per capita (EUR 222 in 2004) compared to "New Europe" countries (Poland, Hungary, Czech Republic, Slovakia, Slovenia), where the same amount per capita is EUR 365. For further comparison, by the end of 1995, the capital invested in mutual funds in the U.S. was USD 10,933 per capita, while in Germany it was USD 2,143 (Krahnen et al., 2006).

In the performance evaluation process, we start by estimating CAPM (equation 1) parameters for fourteen Croatian mutual funds for the period from 1 January 2004 to 31 December 2005. Parameters are estimated by OLS – the standard method

TABLE 3 Croatian Mutual Funds For Monthly Recorded Log- Returns

FUND	μ	σ_D	σ_e	***S***	***K***	β	β^-	β^+	$\overline{\beta}$	R^2	β	γ
RBA Ce	0.021	0.021	0.009	-0.268	2.545	0.680 (5.027)*	0.436	0.917	0.683	0.808	0.853 (3.223)	-5.920 (-0.771)
ZB Eu	0.013	0.023	0.022	-0.718	2.507	0.105 (1.357)	-0.037	0.248	0.109	0.103	0.152 (1.608)	-0.578 (-0.879)
RBA BI	0.020	0.039	0.017	1.260	7.938	0.542 (9.437)*	0.432	0.647	0.540	0.809	0.511 (7.140)	0.373 (0.736)
KD Vict	0.023	0.044	0.025	0.379	4.359	0.570 (6.866)*	0.413	0.727	0.570	0.692	0.584 (5.577)	-0.170 (-0.229)
ILIRIKA JIE	0.025	0.047	0.039	2.068	6.684	0.353 (2.376)*	0.084	0.622	0.354	0.320	0.152 (0.993)	2.439 (2.328)*
RBA Ac	0.007	0.027	0.027	-0.080	2.130	0.077 (0.859)	-0.084	0.245	0.075	0.034	0.165 (1.516)	-1.057 (-1.375)
ZB GI	0.009	0.021	0.012	-0.016	3.421	0.274 (6.781)*	0.196	0.347	0.274	0.686	0.284 (5.574)	-0.118 (-0.328)
ZB Tr	0.008	0.021	0.020	-0.666	2.486	0.094 (1.392)	-0.030	0.216	0.095	0.085	0.151 (1.817)	-0.681 (-1.161)
ERSTE BI	0.005	0.020	0.018	-0.172	2.349	0.103 (1.661)	-0.010	0.214	0.101	0.116	0.187 (2.598)	-1.009 (-1.983)
ST BI	0.013	0.029	0.023	0.972	3.942	0.271 (3.506)*	0.131	0.435	0.268	0.369	0.296 (3.045)	-0.302 (-0.438)
ST GI	0.009	0.036	0.033	0.003	3.072	0.225 (2.014)	0.015	0.421	0.227	0.162	0.264 (1.880)	-0.470 (-0.473)
FIMA Eq	0.021	0.044	0.019	0.710	4.620	0.564 (8.608)*	0.439	0.697	0.566	0.822	0.529 (6.565)	0.426 (0.757)
HI - Gr	0.006	0.025	0.021	-0.640	2.558	0.208 (3.005)*	0.075	0.329	0.207	0.301	0.266 (3.157)	-0.711 (-1.189)
HI - BI	0.004	0.019	0.016	-0.683	2.609	0.158 (2.935)*	0.056	0.251	0.157	0.291	0.224 (3.569)	-0.808 (-1.816)
CROBEX	**0.022**	**0.065**		0.713	4.781	**1**				**1**		

Note: Average monthly log-return (μ), total risk (standard deviation (σ_D)), unsystematic risk (σ_e), systematic risk (β), and R^2 values are calculated from the simple regression of equation 1. Coefficient couples (β, γ) are estimated with multiple regression of equation 2. For the benchmark we use the CROBEX index. The average risk-free annual return for the period analyzed is 4.3 %.

"* " - Significant at the 5% level.

We apply the bootstrap method to estimate the 95% confidence intervals (β^- , β^+ , $\overline{\beta}$) of a population parameter. The method is based on resampling with replacement from the original sample. Among possible bootstrapping options, we choose an approach where residuals obtained in regression analysis are resampled.

of linear regression. *Table 3* shows risk and return statistics for 14 Croatian mutual funds and the CROBEX index. In particular, we show the average monthly return (μ), total risk (σ_D), unsystematic risk (σ_e), skewness (*S*), kurtosis (*K*), systematic risk (β), the 95% bootstrapping confidence interval (left side (β^-), right side (β^+) and the mean value ($\overline{\beta}$) of the interval), and the R^2 for the regression. We see that, if only return is considered, for the last two years only KD Victoria and JIE Ilirika outperformed CROBEX (KD Victoria having an average monthly log-return of 2.3% and JIE Ilirika 2.5%). KD Victoria and JIE Ilirika are also the riskiest among all the funds, which is reflected by the highest standard deviations. KD Victoria, JIE Ilirika, RBA Central Europe, RBA Balanced, and FIMA Equity have shown practically the same average return, but the total risk of each one of them is substantially lower than the total risk of the CROBEX index. Eight funds exhibit negative skewness, and RBA Bl, Ilirika JIE and Fima Eq exhibit kurtosis greater than 6.

The values for R^2 statistics calculated between 0.103 and 0.822 indicate that the CROBEX index does not fully explain the mutual fund returns. The beta of these funds is typically less than 0.7. This is due to the fact that the funds invest across asset classes – stocks, bonds and cash (the bond part of the portfolio typically reduces the risk and return). Equity exposure of funds is not limited to domestic securities only.

In order to investigate potential market timing ability, next we analyze the timing coefficients in the Treynor-Mazuy model. The analysis reported in Table 3 shows that only 3 of the 14 timing coefficients γ are positive, where only one of them is significant at the 5% level (Ilirika JIE). We note that the funds with positive γ values (RBA Balanced, Ilirika JIE and FIMA Equity) also had the largest average returns. On the other hand, negative γ values calculated for the other 11 funds imply perverse timing since the managers of those funds increase exposure to the market when the market performs badly and decrease exposure in a good market. Generally, the managers on the Croatian market are not able to correctly predict market performance. Cumby and Glen (1990) reported the same result by analyzing international mutual funds, where evidence of no timing ability or perverse timing ability was found.

Table 4 contains the results obtained for the Sharpe ratio, Traynor ratio, Information ratio *IR*, Jensen's α, and Appraisal ratio *AR*. The funds are ranked according to the Sharpe rule which states that in assessing between two funds we have to choose the fund with the higher Sharpe ratio. The Sharpe ratio for mutual funds is typically between 0.5 and 3. The rule of a thumb is that if the annualized Sharpe ratio is over 1.0, the fund had a 'pretty good' year. Outstanding funds have a Sharpe ratio over 2.0. From this point of view, the RBA Central Europe fund might be characterized as outstanding, while JIE Ilirika, KD Victoria, RBA Balanced, FIMA Equity, ZB Euroaktiv, and ST Balanced might be characterized as 'pretty good'. As far as the Sharpe ratio is considered, those seven funds have superior performance over its benchmark. We find that rankings obtained by Sharpe and Treynor rules are not the same, implying that funds are not well diversified. However, we also note that the two funds with the largest Sharpe ratio also exhibit the largest values for Treynor and Appraisal ratio.

From Table 4 we find that 11 of the 14 Jensen's α are positive, implying that the overall fund performance is superior to the market index, CROBEX. Of these 11 positive estimates, only one is significant at the 5% level (RBA Central Europe). As a com-

TABLE 4 Risk/Return Measures Calculated for Different Funds

Fund	S_h	T_h	*IR*	α	*AR*
RBA Ce	2.908	0.314	2.011	0.130 (2.832)*	4.026
ILIRIKA JIE	1.608	0.748	0.144	0.182 (1.348)	1.344
KD Vict	1.504	0.406	0.048	0.103 (1.566)	1.207
RBA Bl	1.480	0.369	-0.210	0.078 (1.719)	1.325
FIMA Eq	1.407	0.379	-0.917	0.029 (0.499)	0.452
ZB Eu	1.362	1.037	-0.949	0.074 (1.085)	0.983
ST Bl	1.107	0.410	-0.627	0.050 (0.814)	0.628
ZB Gl	0.929	0.251	-0.928	0.007 (0.228)	0.176
ZB Tr	0.733	0.566	-0.798	0.032 (0.599)	0.462
ST Gl	0.516	0.290	-0.764	0.015 (0.164)	0.123
RBA Ac	0.429	0.522	-0.814	0.023 (0.322)	0.248
HI - Gr	0.343	0.140	-1.022	-0.018 (-0.321)	-0.247
ERSTE Bl	0.190	0.125	-1.004	-0.010 (-0.209)	-0.161
HI - Bl	0.152	0.063	-1.091	-0.025 (-0.598)	-0.461
CROBEX	**1.060**	**0.179**	**0**	**0**	**0**

Note: Sharpe ratio S_h, Traynor ratio T_h, Information ratio *IR*, Jensen's α, and Appraisal ratio *AR*. The benchmark market portfolio is the CROBEX index.

"* " - Significant at the 5% level.

parison, Ippolito (1989), by analyzing 143 US mutual funds, showed that 127 out of 143 funds had alphas equal to zero, 12 had positive alphas and only for had negative alphas.

In order to test the robustness of the results above, we additionally perform some standard statistical tests. In Appendix 1 we report the Jarque-Bera statistic (*JB*) to test normality; the Ljung-Box statistic is employed to identify correlations in errors, the White test for heteroscedasticity in errors, the Dickey-Fuller test (*DF*) for stationarity, and the Variance-ratio test is widely used to draw conclusions about the random walk hypothesis. According to Grinblatt and Titman (1994) the Jensen measure is biased if the fund and benchmark returns are not jointly normal or are non-linear. In Appendix 1 we show that only for Ilirika JIE and RBA Bl normality can be rejected. Note that these two funds are also characterized with the largest kurtosis (see Table 3). Apart from these two funds, the Ljung-Box test cannot reject the hypothesis of independence in the residual series. Applying the DF test from Appendix 1, we conclude that in all cases we cannot reject stationarity. Applying the White test, we conclude that heteroscedasticity is present only in the RBA Bl fund. According to Lo and MacKinley (1998) the random walk hypothesis can be

rejected if the Variance-ratio test statistics are rejected for all analyzed lags q. We find from the Table in Appendix 1 that the random walk hypothesis cannot be rejected for all funds.

4.2 Bosnian Mutual Funds

Next we analyze the performance of Bosnian investment funds. In Bosnia and Herzegovina it is not easy or straightforward to incorporate funds. Firstly, the funds are only allowed to invest in assets traded on the Sarajevo Stock Exchange (2006), which rules out the ability to invest in non-liquid assets, such as property and private equity. The possibility of investment in foreign markets is also ruled out. Secondly, the domestic market itself is dominated by privatization investment funds (PIFs), financial institutions and state-controlled companies. Access to companies that are not controlled by the state appears to be dictated by PIFs. This leaves little space for mutual funds in the company selection process.

In *Table 5* we report their average monthly log-returns for the period from 1 April 2003 to 1 April 2006. As far as return is considered, for the three-year period among funds we particularly point out CROBIH, BONUS, FORTUNA, and HERBOS, which exhibit excellent performance. The average monthly log-return ranges from 2.6 % to 4.5 % (31 % to 54 % in annual terms), where the BIFX index has log-return equal to 3.3 %. Nevertheless, those excellent results for returns are followed by very high standard deviation ranging on the monthly level between 10 % and 14 %. Only HERBOS, FORTUNA and NAPRIJED have β value close to 1, if simple regression is employed. Timing coefficients γ in the Treynor-Mazuy model are estimated using individual funds. Analysis of timing coefficients γ shows that eight of the nine timing coefficients γ are negative.

To quantify the relation between risk and reward for bearing it, we calculate different risk adjusted performances. In *Table 6* we rank all the funds according to the Sharpe rule where we find that three funds outperform the benchmark for the past three-year period. We find a similar ranking according to the Treynor ratio with deviations found for BOSFIN and PROPLUS. In Table 5 we see that these two funds are characterized by smaller β values that explain larger values for the Treynor ratio. From the values calculated for the Information ratio, we see that four funds exhibit better performance than the benchmark, as far as return is concerned.

Results for the funds, reported in Table 6, indicate that eight of the nine α estimates are positive, indicating that the managers might have had superior ability in market stock selection. Of these eight positive estimates, one is significant at the 5% level.

In Appendix 2 we show that only for FORTUNA and MIGROUP normality can be rejected. The Ljung-Box test cannot reject the hypothesis of independence in the residual series for all PIFs. Applying the DF test from Appendix 2, we conclude that in all cases we cannot reject stationarity. Applying the White test, we conclude that heteroscedasticity is present only in BOSFIN PIF. We find from the Table in Appendix 2 that the random walk hypothesis cannot be rejected for all PIFS.

4.3 Slovenian Mutual Funds

In Slovenia, the net inflows into the mutual funds managed by domestic administrators dropped significantly in 2005 although the number of the funds increased. Apart from the stronger presence of foreign mutual funds, another reason for

TABLE 5 Bosnian Investment Funds for Monthly Recorded Data

Fund	μ	σ_D	σ_e	***S***	***K***	β	β^-	β^+	$\overline{\beta}$	R^2	β	γ
CROBIH	0.045	0.108	0.095	0.742	3.659	0.490 (3.127)*	0.197	0.800	0.482	0.229	0.954 (4.207)*	-2.056 (-2.651)*
BONUS	0.045	0.132	0.106	0.242	2.039	0.741 (4.237)*	0.429	1.078	0.740	0.352	1.277 (5.073)*	-2.368 (-2.753)*
HERBOS	0.042	0.135	0.080	0.473	3.264	1.026 (7.779)	0.784	1.293	1.029	0.647	1.183 (5.686)*	-0.692 (-0.973)
FORTUNA	0.039	0.132	0.071	1.064	3.959	1.058 (9.082)*	0.833	1.308	1.054	0.714	1.037 (5.569)*	0.091 (0.143)
MIGROUP	0.027	0.104	0.063	0.794	5.569	0.784 (7.560)*	0.580	0.990	0.791	0.634	0.940 (5.805)*	-0.691 (-1.248)
BOSFIN	0.026	0.111	0.105	0.783	3.319	0.331 (1.917)*	0.012	0.670	0.329	0.100	1.000 (4.347)*	-2.961 (-3.764)*
PROPLUS	0.026	0.118	0.116	0.574	4.305	0.216 (1.135)	-0.111	0.610	0.225	0.038	0.553 (1.877)	-1.491 (-1.480)
NAPRIJED	0.029	0.142	0.091	0.748	4.144	1.035 (6.921)*	0.752	1.310	1.033	0.592	1.054 (4.407)*	-0.084 (-0.103)
EUROFOND	0.025	0.118	0.100	0.589	3.252	0.581 (3.515)*	0.264	0.901	0.569	0.272	1.237 (5.687)*	-2.904 (-3.905)*
BIFX	**0.033**	**0.106**		**1.561**	**6.615**	**1**				**1**		

Note: Average monthly log-retum (μ), total risk (standard deviation (σ_D)), unsystematic risk (σ_e), systematic risk (β), and R^2 values are calculated from the simple regression of equation 1. Coefficient couples (β, γ) are estimated with multiple regression of equation 2. For the benchmark we use the CROBEX index. For the benchmark we use the BIFX index. The average risk-free annual return for the period analyzed is 1.3 %.

"* " – Significant at the 5% level.

We apply the bootstrap method to estimate the 95% confidence intervals (β^- , β^+ , $\overline{\beta}$) of a population parameter. The method is based on resampling with replacement from the original sample. Among possible bootstrapping options, we choose an approach where residuals obtained in regression analysis are resampled.

TABLE 6 Risk/Return Measures Calculated for Different Investment Funds

Fund	S_h	T_h	*IR*	*α*	*AR*
CROBIH	1.391	1.065	0.373	0.335 (1.639)*	1.018
BONUS	1.149	0.709	0.381	0.243 (1.064)	0.661
HERBOS	1.063	0.484	0.417	0.106 (0.614)	0.381
FORTUNA	0.983	0.426	0.283	0.048 (0.312)	0.194
MIGROUP	0.851	0.391	-0.320	0.008 (0.060)	0.037
BOSFIN	0.771	0.891	-0.195	0.169 (0.749)	0.466
PROPLUS	0.746	1.409	-0.155	0.222 (0.893)	0.555
EUROFOND	0.702	0.492	-0.249	0.065 (0.301)	0.187
NAPRIJED	0.675	0.321	-0.153	-0.061 (-0.315)	-0.195
BIFX	**1.04**	**0.382**	**0**	**0**	**0**

Note: Sharpe ratio S_h , Traynor ratio T_h, Information ratio *IR*, Jensen's *α*, and Appraisal ratio *AR*. For the benchmark market portfolio we use the BIFX index. CROBIX, BONUS, and FORTUNE provide more reward per unite of risk, either variance or beta, than the benchmark.

"* " – Significant at the 5% level.

such dynamics was the domestic funds' investment structure. A large part of this consists of domestic securities, having mainly dropped in 2005. The data clearly demonstrate the connection with the domestic stock market: in the time of the slowdown on the Ljubljana stock exchange, the net flows into mutual funds with mainly domestic investment changed in favor of net flows into mutual funds with mainly foreign investment. Developments in recent years have shown that the Slovenian capital market does not follow the dynamics in the more developed foreign capital markets. The growth of mutual funds in the near future is therefore almost unpredictable.

The asset allocation of mutual funds shows that funds have tended to diversify their portfolios in flavor of foreign securities. This strategy was due to the behavior of mutual fund managers, who dislike small and illiquid domestic capital markets with inelastic supply, which are unable to absorb additional funds without causing excessive price movements. The tendency to invest more in foreign securities was further intensified by deregulation in 2004 and is not specific to Slovenia. Similar strategies were observed in other new members of the EU (Estonia and the Czech Republic).

In Slovenia the number of savers in mutual funds is now over 200,000. There are a number of different products which are available: sector mutual funds, regional mutual funds, index funds, etc. With a growing number of mutual funds one can recognize a rising problem for managers of mutual funds, since they will have to increase their efforts strongly if they want to hold market share. It seems that big suppliers with more than ten funds and with broad a spectrum of investment possibilities will have

TABLE 7 Slovenian Mutual Funds for Monthly Recorded Log- Returns

Fund	μ	σ_D	σ_e	***S***	***K***	β	β^-	β^+	$\overline{\beta}$	R^2	β	γ
NKD	0.016	0.029	0.014	0.375	2.921	0.621 (15.794)*	0.543	0.700	0.621	0.762	0.629 (13.148)*	-0.197 (-0.300)
NKS	0.015	0.026	0.014	0.632	4.199	0.554 (14.044)*	0.473	0.632	0.552	0.717	0.522 (10.962)*	0.795 (1.212)
KDS	0.015	0.024	0.012	0.987	5.521	0.535 (14.676)*	0.470	0.598	0.534	0.742	0.496 (10.655)*	0.832 (1.336)
RPMK	0.017	0.028	0.014	0.715	4.226	0.598 (13.703)*	0.514	0.692	0.598	0.731	0.559 (9.586)*	0.766 (1.013)
TGR	0.013	0.019	0.009	0.192	2.540	0.427 (14.375)*	0.366	0.479	0.426	0.747	0.487 (12.903)*	-1.215 (-2.443)
ZI	0.014	0.030	0.013	0.445	3.640	0.678 (18.459)*	0.611	0.750	0.677	0.814	0.682 (15.242)*	-0.086 (-0.140)
PRA	0.019	0.054	0.051	0.505	18.349	0.451 (3.152)*	0.196	0.760	0.460	0.113	0.355 (2.047)*	2.367 (0.993)
KBH	0.017	0.058	0.054	-0.064	18.838	0.551 (3.643)*	0.287	0.847	0.552	0.145	0.430 (2.356)*	2.964 (1.179)
KMR	0.014	0.032	0.015	0.639	4.036	0.716 (16.919)*	0.637	0.799	0.718	0.786	0.683 (13.361)*	0.822 (1.168)
AVV	0.013	0.030	0.019	0.930	4.398	0.557 (9.943)*	0.451	0.668	0.558	0.559	0.533 (7.833)*	0.590 (0.630)
ABP	0.011	0.022	0.009	0.702	3.982	0.505 (18.785)*	0.453	0.556	0.505	0.819	0.501 (15.299)*	0.108 (0.240)
KMG	0.015	0.031	0.014	0.973	5.677	0.694 (17.929)*	0.618	0.770	0.696	0.805	0.654 (14.091)*	0.968 (1.514)
MLP	0.009	0.014	0.007	0.634	4.400	0.294 (14.144)*	0.255	0.336	0.295	0.719	0.293 (11.550)*	0.042 (0.121)
MXP	0.009	0.019	0.010	0.223	3.006	0.406 (14.395)*	0.348	0.458	0.406	0.726	0.400 (11.657)*	0.147 (0.310)
SBI	**0.014**	**0.0403**		**0.574**	**5.014**	**1**				**1**		

Note: Average monthly log-return (μ), total risk (standard deviation (σ_D)), unsystematic risk (σ_e), systematic risk (β), and R^2 values are calculated from the simple regression of equation 1. Coefficient couples (β, γ) are estimated with multiple regression of equation 2. For the benchmark we use the CROBEX index. For the benchmark we use the SBI index. The average risk-free annual return for the period analyzed is 6 %.

"* " – Significant at the 5% level.

We apply the bootstrap method to estimate the 95% confidence intervals (β^- , β^+ , $\overline{\beta}$) of a population parameter. The method is based on resampling with replacement from the original sample. Among possible bootstrapping options, we choose an approach where residuals obtained in regression analysis are resampled.

TABLE 8 Risk/Return Measures Calculated for Different Funds

Fund	S_h	T_h	*IR*	*α*	*AR*
RPMK	1.528	0.245	0.013	0.059 (2.759)*	1.195
KDS	1.466	0.233	0.049	0.060 (3.385)*	1.389
TGR	1.381	0.221	-0.478	0.036 (2.477)*	1.059
NKS	1.323	0.218	0.172	0.061 (3.161)*	1.262
NKD	1.312	0.209	0.321	0.064 (3.286)*	1.312
KMG	1.117	0.174	0.207	0.046 (2.421)*	0.967
MLP	1.102	0.181	-0.530	0.022 (2.127)*	0.849
ZI	1.028	0.159	0.009	0.035 (1.939)	0.774
KMR	1.014	0.159	0.107	0.037 (1.797)	0.718
ABP	1.002	0.155	-0.382	0.024 (1.799)	0.719
PRA	0.899	0.373	0.318	0.120 (1.702)	0.679
AVV	0.893	0.167	-0.156	0.033 (1.199)	0.479
MXP	0.799	0.131	-0.603	0.009 (0.687)	0.274
KBH	0.715	0.262	0.188	0.085 (1.143)	0.456
SBI	**0.769**	**0.161**	**0**	**0**	**0**

Note: Sharpe ratio S_h , Traynor ratio T_h, Information ratio *IR* , Jensen's α, and Appraisal ratio *AR*. Benchmark market portfolio is SBI index.

"* " – Significant at the 5% level.

In the last two years another convergence to developed markets emerged: banks, led by NLB, Bank Austria and Raiffeisen Krekova bank, started to offer mutual funds in an over-the-counter manner. This kind of marketing was a great success which significantly affected market shares. The banks in Slovenia encouraged the formation of a strong fund industry, as they had begun to see the fund business as a complement to or substitute for their traditional deposit-taking activities.

The developments presented above are reflected in the results which are reported in *Tables 7* and *8* (data sample covers time period from 31/12/1999 to 31/08/2006). As far as return is considered, we find that seven Slovenian mutual funds outperformed the SBI index for the period analyzed. R^2 values range from 0.113 to 0.819, implying that SBI20 does not fully explain the funds' return. All values of β are lower than one (less than 0.75) due to the fact that most of funds are 'balanced', i.e. they allocate capital between stocks, bonds and cash. Table 7 further shows that none of the timing coefficients γ is significantly positive at the 5% level.

From fourteen funds analyzed, ten of them are with a Sharp ratio larger than 1. All funds exhibit positive Jensen's α indicating that the managers might have had superior ability in market stock selection. For seven of them we find statistically significant α. For other funds, the hypothesis that α is zero can not be rejected. We find that rankings obtained by applying the Sharpe ratio, Treynor ratio, and the Appraisal ratio are with few exceptions very similar, implying that the funds are very well diversified.

These results show a different picture of the industry as it was expected in the studies conducted before the slowdown appeared in 2005 (Jagric et al., 2004), Jagric et al., 2005). We believe that, while a pull-back in this market is possible in the near term, the long-term outlook for Slovenia is still very attractive. There are three main drivers of growth: strong economic development and consumer growth, structural improvements and relatively attractive valuations for this emerging market.

In *Appendix 3* we show that for only four funds normality cannot be rejected. This was expected due to the properties of the Slovenian stock market ((Podobnik et al., 2006) and results in Appendix 3). The Ljung-Box test cannot reject the hypothesis of independence in the residual series for all PIFs. Applying the DF test from Appendix 3, we conclude that in all cases we cannot reject stationarity. Applying the White test, we conclude that heteroscedasticity is present only in the KMG fund.

5. Conclusions

Stock market investment has been gradually increasing since the fall of socialism in the newly industrialized countries of Central and Eastern Europe. As a representative market, Poland was considered as the best worldwide stock market performer in 1993, while in 2003 The Wall Street Journal Europe ranked the Slovenian Galileo mutual fund at the top of the 15 most successful open funds in the world, indicating that money has been gradually moving from north to south.

Using time series of monthly log-returns, we analyzed the performance of mutual funds in Croatia and Slovenia, and investment funds in Bosnia and Herzegovina. There are several interesting properties which make these markets worth examining. We provided some evidence for long memory for the Slovenian stock market. Additionally, for all three markets high correlation can be identified between the funds' returns. This is especially evident in the case of Slovenia, where almost all coefficients are close to one.

In our analysis, the best performing funds are ranked on a risk-adjusted basis just because the returns are equally important as the absolute value of return. Applying the standard CAPM single index model and the quadratic Treynor and Mazuy model, we analyzed the selection and timing abilities of these funds. It is assumed that OLS errors can be used only if the residuals are independent and identically distributed. We show that for most of the funds analyzed these two conditions are fulfilled. Clearly, one may expect that more appropriate results would be obtained if adjusted errors were employed using, for example, the Newey-West procedure. However, by applying the bootstrap method, we provide extremely robust results also for cases where residuals do not fulfill the required conditions.

With rare exceptions, for all the markets we found no evidence of market timing ability as Hendrics et al. (1993) previously found for US mutual funds. Nor

did we find selection ability for any of the markets in general. The defensive characteristic of the funds are due to beta values shown to be generally smaller than one. One of the benefits of investment in mutual funds in this region is that most of the funds are further diversified through investment in different markets of the region.

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APPENDIX 1 Statistical Tests for Croatia

Fund	JB test statistic	Ljung-Box test Statistic ($LB(n)$)	White test		DF test statistic	Variance-ratio test			
			R^2	Test statistic		Test statistic (q = 2)	Test statistic (q = 4)	Test statistic (q = 6)	Test statistic (q = 8)
ERSTE BI	0.793	37.986*	0.010	0.234	-6.294*	0.257*	0.240	0.176	0.136
FIMA Eq	2.217	4.628	0.037	0.696	-2.926*	0.853	0.458	0.458	0.279
HI - BI	1.927	25.668	0.001	0.020	-5.696*	0.317*	0.268	0.211	0.151
HI - Gr	1.790	31.450	0.027	0.659	-6.229*	0.298*	0.233*	0.183	0.130
ILIRIKA JIE	12.444*	4.367	0.284	4.265	-2.747*	0.856	0.449	0.283	0.453
KD Vict	1.418	8.705	0.003	0.062	-3.466*	0.868	0.515	0.351	0.373
RBA Ac	1.080	22.428	0.035	0.839	-5.502*	0.308*	0.207*	0.105	0.115
RBA BI	22.738*	5.065	0.294	7.066*	-4.104*	0.629	0.431	0.340	0.284
RBA Ce	0.433	8.790	0.191	1.718	-2.701*	0.980	1.262	0.662	NaN
ST BI	3.523	23.119	0.034	0.807	-4.000*	0.529*	0.297	0.335	0.152
ST GI	0.034	18.316	0.025	0.606	-4.234*	0.456*	0.263	0.255	0.117
ZB Eu	1.742	13.165	0.105	1.997	-4.072*	0.649	0.360	0.187	0.260
ZB GI	0.017	17.353	0.012	0.293	-4.696*	0.428*	0.309	0.319	0.249
ZB Tr	1.993	33.513*	0.042	1.018	-6.257*	0.233*	0.189*	0.128	0.108
CROBEX	3.515	5.464			-4.043*	0.625	0.375	0.381	0.304

Note: "* " - Significant at the 5% level. $LB(n)$ is the Ljung-Box statistic at lag n, distributed as a chi-squared with n degrees of freedom.

APPENDIX 2 Statistical Tests For Bosnia

Fund	JB test statistic	Ljung-Box test statistic (*LB*(*n*))	White test		DF test statistic	Variance-ratio test			
			R^2	Test statistic		Test statistic (*q* = 2)	Test statistic (*q* = 4)	Test statistic (*q* = 6)	Test statistic (*q* = 8)
CROBIH	3.242	18.084	0.018	0.631	-4.485*	0.742	0.380*	0.242	0.268
BONUS	2.003	24.614	0.083	2.991	-4.834*	0.720	0.442	0.134*	0.272
HERBOS	1.207	13.502	0.002	0.073	-4.966*	0.677	0.355*	0.169*	0.216
FORTUNA	6.840*	18.872	0.005	0.168	-4.595*	0.798	0.287*	0.238	0.277
MIGROUP	10.794*	14.604	0.141	5.078	-4.280*	0.570*	0.401	0.285	0.241
BOSFIN	3.301	20.749	0.183	6.604*	-4.617*	0.772	0.321*	0.249	0.249
PROPLUS	3.408	18.691	0.001	0.037	-4.503*	0.649*	0.357*	0.199	0.259
NAPRIJED	4.203	17.958	0.003	0.101	-6.183*	0.466*	0.273*	0.157*	0.212
EUROFOND	1.863	17.922	0.086	3.090	-4.270*	0.756	0.416	0.203	0.285
BIFX	28.360*	14.731			-4.483*	0.690	0.418	0.222	0.253

Note: "* " – Significant at the 5% level. *LB*(*n*) is the Ljung-Box statistic at lag *n*, distributed as a chi-squared with n degrees of freedom.

APPENDIX 3 Statistical Tests for Slovenia

Fund	JB test statistic	Ljung-Box test statistic ($LB(n)$)	White test		DF test statistic	Variance-ratio test			
			R^2	Test statistic		Test statistic ($q = 2$)	Test statistic ($q = 4$)	Test statistic ($q = 6$)	Test statistic ($q = 8$)
ABP	8.921*	17.054	0.050	4.033	-7.796*	0.503*	0.318*	0.198*	0.164*
AVV	16.648*	30.753	0.004	0.347	-9.646*	0.449*	0.204*	0.193*	0.143*
KBH	787.558*	18.902	0.009	0.714	-12.931*	0.405*	0.129*	0.105*	0.098*
KDS	30.180*	28.647	0.069	5.394	-6.560*	0.629*	0.318*	0.228*	0.205*
KMG	33.575*	25.770	0.089	7.204*	-6.563*	0.571*	0.356*	0.220*	0.197*
KMR	8.167*	24.199	0.009	0.706	-6.774*	0.614*	0.357*	0.228*	0.209*
MLP	10.717*	29.219	0.028	2.253	-6.821*	0.618*	0.357*	0.190*	0.178*
MXP	0.652	16.483	0.001	0.063	-8.093*	0.479*	0.270*	0.162*	0.156*
NKD	1.877	21.846	0.009	0.768	-6.944*	0.536*	0.359*	0.236*	0.186*
NKS	9.123*	22.893	0.011	0.868	-7.217*	0.506*	0.349*	0.232*	0.177*
PRA	742.66*6	24.712	0.010	0.822	-12.776*	0.394*	0.125*	0.093*	0.098*
RPMK	9.425*	17.636	0.007	0.530	-7.549*	0.489*	0.306*	0.208*	0.170*
TGR	1.266	24.892	0.059	4.274	-7.433*	0.589*	0.326*	0.202*	0.199*
ZI	3.551	20.355	0.000	0.023	-7.651*	0.593*	0.331*	0.205*	0.175*
SBI20	5.014	20.111			-7.075*	0.577*	0.305*	0.196*	0.189*

Note: "* " – Significant at the 5% level. $LB(n)$ is the Ljung-Box statistic at lag n, distributed as a chi-squared with n degrees of freedom.