Risk, return and stock performance measures

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Abstract: - This paper evaluates risk, return and performance measures for twelve stocks traded at Belgrade Stock Exchange. Our findings indicate that investments in four stocks provide positive returns with the realized returns exceeding the required returns in the period from January 2007 to December 2011. Eight remaining stocks have negative realized returns and negative alphas during the same period. Treynor, Sharpe and Jansen performance measures have significant Pearson correlation coefficients. They result in almost the same ranking order of the stocks and lead to virtually the same investment decision.

Key-Words: - Realized rate of return, required rate of return, beta, performance measures

1 Introduction

The Sharpe [1], Litner [2] and Black [3] Capital Asset Pricing Model describes relationship between required rate of return and beta coefficient (systematic risk) of a particular asset. The key element of the model is beta and it represents a measure of tendency of the asset to move up or down with the market as a whole. According to the model, investor would expect that only assets that have high beta can earn a high average returns.

Risk and return of investments in particular stocks at Belgrade Stock Exchange have not sufficiently been studied, nor have different performance measures of the stocks.

For the purpose of this paper we will examine actual realized rate of return, required rate of return and beta of each stock that constitutes index BELEX 15 on Belgrade Stock Exchange and that exists for at least five years (January 2007-December 2011). CAPM model will be used to calculate the required rate of return for each stock on the basis of its beta. Also, evaluation of Treynor [4], Sharpe [5] and Jansen [6] performance measures of the stocks will be done in order to compare rankings of performance measures and discover if different performance measures could lead to different investment decisions.

2 Literature review

Financial analysts and individual investors rely on performance measures to select among available investments. We will review here the recent research findings that show that choice of particular performance measure has no significant influence on the ranking of an investment.

A high rank correlation between rankings of the performance measures was found by Pedersen and Rudholm-Alfin [7] in their study of risk-adjusted performance measures for different asset classes.

Pfingsten, Wagner and Wolferink [8] took a real world data from two trading books and examined rank correlations given different risk measures. They concluded that choice of risk measure might

not be critical, since they observed high values of Spearman's coefficient.

Eling and Schuhmacher [9] conducted empirical study based on return of 2763 hedge funds and compared Sharpe ratio and twelve other performance measures. Their comparison results in almost identical rank ordering of different performance measures across hedge funds.

Meric, Ratner and Meric [10] compared Treynor, Sharpe and Jansen performance measures for ten U.S. sector portfolios and concluded that correlation coefficients between performance measures are very high and lead to similar rankings.

3 Methodology and data

CAPM describes the relationship between the expected return on a risky asset and its beta coefficient (β). According to this model required return on risky asset R_i is:

$$R_i = R_f + \beta(R_m - R_f) \quad (1)$$

where R_f is the risk-free rate of return, R_m is the rate of return on the market and (R_m-R_f) represents market risk premium.

In the paper, we will use a monthly weighted average interest rate on the Republic of Serbia government bills [11] as a risk free rate of return R_f. Monthly realized returns of index BELEXline [12] will be used as a proxy for the market return R_m.

Beta coefficient of the risky asset can be defined as a measure of sensitivity of particular security on systematic or market risk. It can be calculated as follows:

$$\beta_i = \frac{\mathrm{cov}(R_{ir}, R_m)}{\sigma_m^2} \quad (2)$$

where $\mathrm{cov}(R_{ir}, R_m)$ is the covariance between actual realized returns on a particular stock and the return on the market and σ_m^2 is the variance of the market return.

Theory states that risk avers investor requires a risk premium for risky investment and the level of risk premium is based on the level of stock's systematic risk β. That is, investor would expect the higher risk premium if the level of β would be higher. Unsystematic risk can be diversified away and thus is not considered.

Beta of each examined securities will be calculated by regressing the actual realized returns on the security [13] against the returns of BELEXline index.

The slope of the regression line represents the beta of particular security. In calculations of beta monthly returns will be used, since empirical studies show that beta value can be influenced by data frequency. [14]

In this paper relative performance of the securities will be compared on the basis of three widely used performance measures (Treynor ratio, Sharpe ratio and Jansen's alfa).

Treynor ratio TR_i can be calculated as follows:

$$TR_i = \frac{(R_i - R_f)}{\beta_i} \quad (3)$$

The higher Treynor ratio indicates better performance of the stock. The same can be said for the Sharpe ratio SR_i, which can be calculated as follows:

$$SR_i = \frac{(R_i - R_f)}{\sigma_i} \quad (4)$$

where σ_i is the standard deviation of the returns of the security.

Third performance measure is Jansen's alfa α_i. It can be calculated as follows:

$$\alpha_i = R_i - \left[R_f + \beta(R_m - R_f)\right] \quad (5)$$

It should be said that Jansen's alfa indicates weather realized returns of the security excide the required returns of the security. Higher α_i speaks about better performance of the security.

On the basis of the calculated three performance measures for each security, we will determine rankings of the security's performance and review if differences in rank ordering of securities exist between securities. Also, we will determine Person correlation coefficients between Treynor, Sharpe and Jansen performance measures.

4 Empirical results

Regression results of realized returns for selected securities for the period from January 2007 to December 2011 against market returns during the same period are presented in the Table 1. Standard procedure requires determination of regression line coefficients (intercept and slope). Beta coefficients of the selected companies range from 1.498 for AIK banka to 0.507 for Alfa plam Vranje.

Percentage of variation in realized stock's returns that can be explained with variations in returns of market index is shown with R^2 of the regression.

Table 1. Regression results of stock's returns on market returns

Company	Company	Intercept	Slope	R^2
AIK banka a.d. Nis	AIKB	0.012	1.498	0.768
Veterinarski zavod Subotica a.d. Subotica	VZAS	0.030	1.490	0.414
Komercijalna banka a.d. Beograd	KMBN	-0.017	1.317	0.452
Soja protein a.d. Bečej	SJPT	0.003	1.266	0.696
Energoprojekt holding a.d. Beograd	ENHL	0.004	1.215	0.762
Jubmes banka a.d. Beograd	JMBN	0.002	1.155	0.448
Tigar a.d. Pirot	TIGR	0.001	1.042	0.574
Galenika Fitofarmacija a.d. Zemun	FITO	0.016	0.950	0.348
Metalac a.d. Gornji Milanovac	MTLC	0.002	0.941	0.698
Imlek a.d. Beograd	IMLK	0.028	0.811	0.345
Jedinstvo Sevojno a.d. Sevojno	JESV	0.037	0.768	0.218
Alfa plam a.d. Vranje	ALFA	-0.015	0.507	0.269

The rest of the variations in security's returns comes from factors specific for particular company. For example, for the first security in Table 1 R^2 is 0.768 and 76.8% of variations in AIK banka Nis returns can be explained with market sources and 23.2% comes from components characteristic for this company.

Table 2. presents beta coefficients, realized rate of returns and alphas of the selected companies. According to the CAPM investor would expect that stocks with highest beta have the highest return. From Table 2. it can be seen that the highest realized return has Jedinstvo Sevojno stock while its beta has second smoolest rank.

Stocks of AIK banka Nis have the highest beta and its average annual realized rate of return for the period of five years is negative and amounts -5.85%, while CAPM predicts return of -0.84%.

Also, from the Table 2. can be seen that the average annual risk-free interest rate is 10.16% and average annual market rate of return is 2.82% for the five-year period. Average annual risk-free rate of return is significantly higher than the market rate of return in the five-year period and thus, a market premium is negative and amounts -7.35%. That can be explained with the fact that Serbia experienced and still is experiencing severe crisis and that financial market is undeveloped.

Table 2. Betas, realized rates of return, required rates of return and alphas of the selected companies

Company	Beta	Realized rate of return	Risk free rate of return	Market rate of return	Market risk premium	Required rate of return	Alpha
	β	R_{ir}	R_f	R_m	R_m-R_f	R_i	α_i
JESV	0.768	38.26%	10.16%	2.82%	-7.35%	4.52%	33.74%
IMLK	0.811	25.21%	10.16%	2.82%	-7.35%	4.20%	21.01%
VZAS	1.490	16.26%	10.16%	2.82%	-7.35%	-0.78%	17.04%
FITO	0.950	5.96%	10.16%	2.82%	-7.35%	3.18%	2.78%
BELEXline	**1.000**	**-1.15%**	**10.16%**	**2.82%**	**-7.35%**	**2.82%**	**0.00%**
AIKB	1.498	-5.85%	10.16%	2.82%	-7.35%	-0.84%	-5.00%
ENHL	1.215	-11.19%	10.16%	2.82%	-7.35%	1.24%	-12.43%
MTLC	0.941	-9.80%	10.16%	2.82%	-7.35%	3.25%	-13.05%
JMBN	1.155	-12.06%	10.16%	2.82%	-7.35%	1.68%	-13.73%
SJPT	1.266	-13.15%	10.16%	2.82%	-7.35%	0.86%	-14.01%
TIGR	1.042	-11.90%	10.16%	2.82%	-7.35%	2.51%	-14.41%
ALFA	0.507	-22.46%	10.16%	2.82%	-7.35%	6.44%	-28.90%
KMBN	1.317	-31.87%	10.16%	2.82%	-7.35%	0.49%	-32.36%

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Table 3. Alpha, Treynor ratio, Sharpe ratio and their rankings

Company	Alpha	Rank	Treynor ratio	Rank	Sharpe ratio	Rank
JESV	0.3374	1	0.3659	1	1.6935	1
IMLK	0.2101	2	0.1855	2	1.0778	2
VZAS	0.1704	3	0.0409	3	0.2604	3
FITO	0.0278	4	-0.0442	4	-0.2571	4
AIKB	-0.0500	5	-0.1069	5	-0.9265	5
ENHL	-0.1243	6	-0.1757	6	-1.5168	7
MTLC	-0.1305	7	-0.2122	10	-1.7571	10
JMBN	-0.1373	8	-0.1924	8	-1.2747	6
SJPT	-0.1401	9	-0.1841	7	-1.5191	8
TIGR	-0.1441	10	-0.2117	9	-1.5925	9
ALFA	-0.2890	11	-0.6435	12	-3.3141	12
KMBN	-0.3236	12	-0.3192	11	-2.1003	11

Alphas are calculated as difference between realized rate of return and required rate of return for each stock, where required rate of return for stock is calculated on the basis of CAPM model.

Table 2. shows that only four stocks from the sample have positive average annual realized rate of return and alpha coefficient for the five-year period. It should be pointed out that construction company Jedinstvo Sevojno has experienced the abnormal positive return and has the highest positive alpha. Three remaining companies with positive alphas are involved in manufacturing (Imlek Beograd, Veterinarski zavod Subotica, Galenika Fitofarmacija Zemun). In the sample we can find three banks (AIK banka Nis, Komercijalna banka Beograd, Jumbes banka Beograd) and all three have negative average annual realized rate of return and alpha for the observed period.

In the Table 3. can be seen Alpha, Treyor ratio and Sharpe ratio for the selected companies.

Table 4. Pearson correlation

	Alpha	Treyor	Sharpe
Alpha	1		
Treyor	0.935072**	1	
Sharpe	0.967971**	0.981864**	1

**Correlation is significant at the 0.01 level (2-tailed).

Also, this table presents ranks of these three performance measures. Rankings of the companies according to Treynor, Sharpe and Jansen performance measure are quite similar.

The Pearson correlation coefficients between Treynor, Sharpe and Jansen performance measures are calculated and presented in Table 4. All three correlation coefficients are statistically significant at level 1%.

4 Conclusion

In this paper, we examine the risk, return and performance measures of investments in 12 stocks that constitute index BELEX 15 on Belgrade Stock Exchange. For each stock beta, as a measure of market risk, is calculated for the period from January 2007 to December 2011.

We saw that for examined time period beta's of the stocks are rather low, but we have to take these results with some reserve. Muminovic and Pavlovic [15] claim that beta coefficients on undeveloped financial markets, in which Serbian market can be included, is not representative and it does not represent adequate measure of return nor adequate measure of risk.

Average annual required rate of return is determined for each stock on the basis of the CAPM model and compared with average annual realized rate of return for each stock. As a measure of the difference between realized and required rate of return we used stock's alpha coefficient. We saw that only four out of twelve companies have realized returns higher than required returns. This is certainly result of the world financial crisis in the past period, recession in Serbia and the fact that Serbian financial market is undeveloped.

Also, we calculated Treynor, Sharpe and Jansen stock's performance measures and ranked them in order to find out could different performance measures lead investor to different investment decisions. We found out that Pearson correlation coefficients indicate that all three performance

measures are highly correlated and thus lead to virtually the same investment decisions.
It has to be pointed out that we used only twelve shares which do not have to make representative sample. Therefore, more extensive study should be undertaken.

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