THE DOWNSIDE RISK APPROACH TO COST OF EQUITY DETERMINATION FOR SLOVENIAN, CROATIAN AND SERBIAN CAPITAL MARKETS

Mirela Momcilovic, Dejan Zivkov, Sanja Vlaovic Begovic

Introduction

The cost of equity represents significant input in the investment process evaluation, company valuation or in the process of an acquisition. In developed countries, the cost of equity is usually determined on the basis of Capital Asset Pricing Model – CAPM (Sharpe, 1964; Litner, 1965) according to which in the state of market equilibrium investors expect return from the security proportional to its systematic risk. The model uses beta coefficient of secutity as a measure of systematic risk. The CAPM disregards unsystematic risk, because the model assumes that investors hold highly diversified portfolios, which enable investors to eliminate unsystematic risk (see Wagner & Lau, 1971; Klemosky & Martin, 1975). Investors at developed markets, besides CAPM often use some other asset pricing models, like Arbitrage Pricing Model (Ross, 1976) or Fama-French Three-Factor Model (Fama & French, 1992; 1993).

On the other hand, experts are still looking for an adequate and easy to use asset pricing model for emerging countries due to their specificities. Namely, emerging markets are relatively young, small and undeveloped (Harvey, 1995; Bekaert & Harvey, 2002). The first empirical studies showed that emerging markets have high returns, high volatility and low correlation to the world market and within emerging countries, as well as low betas (Harvey, 1995; Erb et al., 1996; Bekaert et al., 1998). Low beta coefficients of the stocks indicate low market integration, possibility of diversification benefits and underestimated emerging country's cost of equity based on the classical CAPM model.

The aim of this paper is to compare on the basis of Estrada's work (2000; 2007) the classical CAPM model with asset pricing models in which risk measures are based on standard deviation, downside risk and downside beta in order to determine the most appropriate risk measure and corresponding asset pricing model for Slovenian, Croatian and Serbian capital markets. Also, paper aims to estimate cost of equity for selected emerging markets. It should be pointed out that Slovenian, Croatian and Serbian capital markets are selected because similar research haven't been done up to now for these markets and according to the author's knowledge asset pricing research for these markets in general is relatively scarce.

In the first part of the paper the review of the most significant research that covers the field of determination of the emerging market's cost of equity is presented. Literature review is followed by methodology and data sections. The last part of the paper is dedicated to the presentation of obtained research results and conclusion.

1. Literature Review

Many researchers tried to formulate an appropriate asset pricing model for emerging markets and to determine their cost of equity.

For example, Godfrey and Espinosa (1996) suggested two main modifications of traditional United States (US) cost of equity calculation based on CAPM that should be made for emerging countries. The first modification requires addition of credit spread to the US risk free rate. The second modification requires determination of adjusted beta defined as a sixty percent of ratio between emerging country's standard deviation of returns and US standard deviation of returns. It should be said that adjusted CAPM model that includes credit spreads of particular countries was used for

determination of the cost of equity in emerging markets by different authors (e.g., Grandes et al. (2010) determined the cost of equity of particular sectors in selected countries in Latin America on the basis of adjusted CAPM model that includes credit spreads).

Erb et al. (1996) suggested a simple model for calculation of emerging country cost of equity, which is based on the use of a country's credit rating because they found that a country's credit rating is statistically significantly related with stock's returns.

In his research Estrada (2000) proposed the use of additional risk measures besides classical beta in CAPM model in order to determine emerging country's cost of equity. These additional measures of risk are: ratio between standard deviation of returns of particular stock and standard deviation of returns of world portfolio and the ratio between semideviation of returns with respect to the mean of a particular stock and semideviation of returns with respect to the mean of a world portfolio. Estrada gave advantage to the risk measure based on semideviation (downside risk) out of the three mentioned risk measures, because asset pricing model based on semideviation better explained variability in the cross-section of returns for emerging markets then asset pricing models based on two remaining risk measures.

Additionally, Estrada (2002) proposed use of Downside CAPM (D-CAPM) with downside beta as a corresponding risk measure for calculation of emerging markets' cost of equity, because he showed that downside model explained almost 55% of the variability in the emerging markets' cross-section of returns. Also, Estrada (2007) conducted research in which he compared results of CAPM and D-CAPM for developed and emerging countries' returns. Results of Estrada's research showed that 55% of variability of returns was explained with downside CAPM model while 36% of variability of returns was explained with classical CAPM model in selected emerging countries. Therefore, one more time he recommended the use of D-CAPM model for determination of the cost of equity in emerging countries.

Estrada's (2000; 2002) methodology was used by different authors (e.g., Collins and Abrahamson (2006) calculated industry cost of equity for selected emerging countries in Africa on the basis of Estrada's work, Artavanis et al.

(2010) investigated relationship between risk and return in a downside risk framework and in a regular risk framework for stocks traded on The London and Paris Stock Exchanges and gave advantage to downside risk measures because they explained better mean returns than regular risk measures, Momcilovic et al. (2015) determined cost of equity of food industry in Serbia on the basis of Estrada's methodology).

It should be said that the number of authors pointed out significance of other factors that are important for determination of the cost of equity in emerging countries. For example, Galagedera and Brooks (2007) and Galagedera (2009) suggested use of co-skewness as an appropriate measure of systematic risk in asset pricing model for emerging countries.

On the basis of the Chen, Roll and Ross (1986) multifactor model that includes macroeconomic variables, Borys (2011) examined macroeconomic factor models and compared them to CAPM for the Visegrad countries. She found that CAPM was not able to explain the average stock returns. On the other hand, factor models that included factors such as excess market returns, industrial production, inflation, money, the exchange rate, exports, the commodity index and the term structure, could explain part of the variance in the Visegrad countries' stock returns, so she suggested use of macroeconomic multifactor asset pricing model for them.

Hearn and Piesse (2009) used Liu's (2006) multifactor Liquidity CAPM (LCAPM) model with size and liquidity as additional factors in calculation of the cost of equity for particular sectors of the most important capital markets in Africa. This research emphasized the importance of liquidity factor in the process of determination of the cost of equity in emerging countries because of significant illiquidity problem in their capital markets.

As it was mentioned earlier asset pricing research for Slovenian, Croatian and Serbian capital markets is scarce. However, we have to point out research conducted by Minovic and Zivkovic (2014) who examined CAPM and LCAPM for Croatian market from 2005 to 2009 and found that LCAPM performs better in explaining stock returns than standard CAPM. Also, Minovic and Zivkovic (2012) examined for Serbian capital market four different asset pricing models: CAPM, Fama-French model

(FF), Liquidity CAPM (LCAPM) and combination LCAPM and FF factors for the period from the 2005 to 2009 and found that LCAPM model performs better than other models in explaining stock returns.

2. Methodology
In this paper determination of the cost of equity is based on Estrada's (2000; 2007) methodology. It is calculated on the basis of the following formula:

$$CE_i = R_f + RM_i * RP \qquad (1)$$

where R_f – US risk free rate of return, RM_i – i-th measure of risk and RP – world market risk premium.

Four different measures of risk are used in the paper and they are based on: standard deviation, beta, semideviation and downside beta.

1. Standard deviation (total risk)
The first measure of risk used in this paper is measure of risk based on standard deviation or total risk. It is calculated as follows:

$$RM_1 = \frac{\sigma_i}{\sigma_w} \qquad (2)$$

where σ_i – standard deviation of rate of return of stock i, and σ_w – standard deviation of rate of return of the world market portfolio.

2. Beta (systematic risk)
The following measure of risk used for determination of the cost of equity in this paper is β_i, since beta of the world market portfolio β_w is equal to 1.

$$RM_2 = \frac{\beta_i}{\beta_w} = \beta_i \qquad (3)$$

Beta coefficient for each stock is calculated on the basis of regression of rate of return of particular stock i against the rate of return of the world market portfolio:

$$r_{i,t} = \alpha_i + \beta_i r_{m,t} + \mu_{i,t},$$
$$i = 1,2,...,n \ , \ t = 1,2,...,T \qquad (4)$$

where $r_{i,t}$ – rate of return of particular stock i for a period from $t-1$ to t, α_i – constant of regression model, β_i – regression coefficient or

beta coefficient of the stock i, $r_{w,t}$ – rate of return of world market portfolio for the period from $t-1$ to t, $\mu_{i,t}$ – regression residual, n – number of stocks in the sample, T – periods in days, weeks, months.

3. Semideviation with respect to the mean (downside risk)
Downside risk is the third measure of risk used in this paper. It accounts only for downside volatility which investors want to avoid and it is determined by the following formula:

$$RM_3 = \frac{\Sigma_i}{\Sigma_w} \qquad (5)$$

where Σ_i – semideviation of rate of return of stock i, Σ_w – semideviation of rate of return of the world market portfolio.

Semideviation of stocks' i rate of return measures standard deviation of rate of return which is lower than their mean and it is calculated as follows:

$$\Sigma_i = \sqrt{E\left\{ \min\left[(r_{i,t} - \mu_i),0\right]^2 \right\}} \qquad (6)$$

where $r_{i,t}$ – rate of return of stock i for period from $t-1$ to t, and $\mu_{i,t}$ – mean of rate of return of particular stock i for period from $t-1$ to t.

Semideviation of rate of return of the world market portfolio is calculated on the basis of the formula:

$$\Sigma_w = \sqrt{E\left\{ \min\left[(r_{w,t} - \mu_w),0\right]^2 \right\}} \qquad (7)$$

where $r_{w,t}$ – rate of return of world market portfolio for the period from $t-1$ to t, and μ_w – mean of rate of return of the world market portfolio.

4. Downside beta
Downside beta is a part of beta that measures downside risk, which investors want to exclude. According to Estrada (2002; 2007) downside beta of particular stock i is determined on the basis of simple linear regression without the constant in which dependent variable is y_t and independent variable is x_t:

$$y_{i,t} = \min\left[(r_{i,t} - \mu_i),0\right] \qquad (8)$$

$$x_{i,t} = \min\left[(r_{m,t} - \mu_m),0\right] \qquad (9)$$

$$y_{i,t} = \lambda_i x_{i,t} + \varepsilon_{i,t} \ , \quad i = 1,2,...,n \ ,$$
$$t = 1,2,...,T$$
(10)

where $r_{i,t}$ – rate of return of stock i for period from t-1 to t, $\mu_{i,t}$ – mean of rate of return of particular stock i for period from t-1 to t, $r_{m,t}$ – rate of return of the world market portfolio for period from t-1 to t, μ_w – mean of rate of return of the world market portfolio, λ_i – regression coefficient or beta coefficient of the stock i, $\varepsilon_{i,t}$ – regression residual, n – number of stocks, T – period in days, weeks, months.

The fourth measure of risk used in this paper is

$$RM_4 = \beta_D = \lambda_i$$
(11)

All regression standard errors are corrected for the effects of heteroscedasticity and autocorrelation using the method of Newely and West (1987).

Damodaran (2009) points out that it is unlikely that risk measure will reflect country risk even when the world index is used for its determination, because of the small size of emerging market companies. Therefore, according to his recommendation the cost of equity is increased for the country risk premium.

3. Data
A data base which is used for this research consists of the 165 most liquid stocks from which 26 are traded on the Ljubljana Stock Exchange (LJSE), 98 are traded on the Zagreb Stock Exchange (ZSE) and 41 are traded on the Belgrade Stock Exchange (BSE). All stocks that are traded on selected stock exchanges and have no more than 30 percent of zero returns and missing values out of total returns are included in the data base. Price data is collected from selected stock exchanges. All returns are on a monthly basis, measured in dollars and calculated as a difference in log prices at closing. Research covers the period from January 2005 to January 2015.

As an approximation of the world market portfolio MSCI World Index (MSCI) is used. The 2.12% risk free rate is the yield on 10-year US Treasury bonds, which predominated at the end of research period (US Treasury). The world market risk premium used for the estimation of cost of equity amounts to 4.5% and is similar

to one determined by Dimson et al. (2011) and Picerno (2014). Country risk premiums amount to 3.75% for Slovenia, 3.75% for Croatia and 6.75% for Serbia and are taken from Damodaran (2015).

4. Research Results
Summary statistics for the selected markets and examined period is given in Tab. 1 and it shows that the selected markets exhibit high volatility and low betas, which is consistent with results of the first emerging markets' studies. When total risk measured with standard deviation is high and systematic risk measured with beta is low, market is unlikely fully integrated into world capital markets. Emerging markets are normally seen as partially integrated into the world markets (see Bekaert & Harvey, 1995; 2000). Recent evidence confirms that emerging markets are still not completely integrated (see Bekaert et al., 2011; Bekaert & Harvey, 2014), although their level of integration has been increased during last two decades.

A probable lack of integration of Slovenian, Croatian and Serbian capital markets into the world capital market is confirmed by low value of correlation coefficients. Tab. 1 shows that the Croatian stock exchange has the highest average beta (0.9567) and the highest correlation to the world market (0.2987) leading to conclusion that Croatian capital market is the most developed and integrated out of three selected markets.

High total risk and low systematic risk indicate high level of unsystematic risk. Therefore, summary statistics results lead to expectation that beta is not appropriate risk measure and classical CAPM model is not adequate asset pricing model for selected markets.

In Tab. 1 it can be seen that mean monthly returns are slightly negative for all selected markets and examined period, possibly because of turbulence periods and a dominant bear market during the world financial crisis in the selected markets. Although the first studies show that emerging markets had high returns, Bekaert and Harvey's (2002) study exhibits that emerging market returns have decreased significantly post-1990s compared to the returns pre-1990. The recent studies (Bekaert et al., 2007; Galagedera & Brooks, 2007; Galageder, 2009) confirm a decrease or relatively low level in emerging markets' returns,

Tab. 1: Summary statistics (Monthly dollar returns)

Market	R (%)	MIN (%)	MAX (%)	σ_i (%)	ρ_i	β_i	SSkw
Slovenia	-1.1911	-4.9697	1.1569	17.2729	0.2421	0.6331	-3.3488
Croatia	-0.7536	-7.6422	1.7228	16.7186	0.2987	0.9567	-1.0649
Serbia	-0.5343	-3.4263	2.4239	15.2994	0.2082	0.6505	1.5876
Average	-0.8263	-5.3461	1.7679	16.4303	0.2497	0.7468	-0.9420

Source: own

Note: R – mean return, MIN – minimal return, MAX – maximal return, σ_i – total risk (standard deviation) of stock i, ρ_i – correlation coefficient with respect to the world market, β_i – beta (systematic risk) with respect to the world market, SSkw – coefficient of standardized skewness.

which is in accordance with the obtained results of this study.

Coefficients of standardized skewness show that Slovenian market returns exhibit negative departure from symmetry, indicating that downside risk approach might be appropriate for this market. Other market returns do not show significant departures from symmetry.

Correlation matrix (Tab. 2) exhibits Pearson correlation coefficients between returns and selected risk measures based on: unsystematic risk, beta, total risk, downside risk and downside beta. Correlation results show strong negative correlation between mean returns on one side and unsystematic risk, total risk and downside risk on the other side. Negative correlation is caused by negative mean returns in the examined period. The obtained results indicate that majority of total risk comes from unsystematic risk as it was expected. Tab. 2 shows that total risk and downside risk measures outperform beta and downside beta

in the total sample. Extremely high positive correlation exists between total risk and unsystematic risk, as well as between downside risk and unsystematic risk, which indicates that high correlation between mean returns and total risk comes mostly through downside risk measure.

Regression analysis gives more details about the relationship between mean returns and selected risk measures (Tab. 3). Unsystematic risk is not considered because the unsystematic risk of the world market portfolio is 0 and therefore, ratio between unsystematic risk of the particular stock and unsystematic risk of the world market portfolio cannot be defined.

Results show that total risk and downside risk are significant and that they explain approximately one quarter of the cross section of total returns, which is in accordance with results of Estrada (2000; 2002; 2007). On the other hand, as expected beta is not statistically significant variable for explanation of returns

Tab. 2: Correlation matrix

	R	IR	RM_1	RM_2	RM_3	RM_4
R	1.0000					
IR	-0.5037***	1.0000				
RM_1	-0.4957***	0.9963***	1.0000			
RM_2	0.0664	-0.0197	0.0589	1.0000		
RM_3	-0.5053***	0.9307***	0.9354***	0.0811	1.0000	
RM_4	-0.0416	0.2701***	0.3334***	0.7971***	0.3476	1.0000

Source: own

Note: IR – unsystematic risk, *** Correlation is significant at the level 0.01 (2-tailed).

Tab. 3:	Simple regression analysis: Full sample

$$R_i = y_0 + y_1 RV_i + \mu_i$$

RV_i	y_0	$t(y_0)$	y_1	$t(y_1)$	DW	R^2	$Adj\ R^2$
RM_1	0.0070	1.9388	-0.0045	-4.1025***	2.0647	0.2457	0.2411
RM_2	-0.0106	-3.8244***	0.0020	0.7513	2.0258	0.0044	0.0017
RM_3	0.0060	2.6324***	-0.0049	-6.4536***	2.0212	0.2553	0.2508
RM_4	-0.0070	-2.0644***	-0.0013	-0.5349	2.0273	0.0017	-0.0044

Source: own

Note: ***indicates statistical significance at the 0.01 level; ** indicates statistical significance at the 0.05 level; * indicates statistical significance at the 0.10 level.

and has low explanatory power, which supports work of Harvey (1995), Erb et al. (1996) and Estrada (2000).

Also, results show that downside beta is not statistically significant with mean returns and has relatively low explanatory power for selected markets, probably because returns in the full sample do not show departure from symmetry. It should be pointed out that although Estrada (2002; 2007) in his later work finds that risk measures based on total risk, beta, downside risk and downside beta are all significant for explaining of emerging markets' returns, he favors downside beta, but results of this study do not support his preference for selected capital markets.

It should be pointed out that beta is appropriate risk measure for completely integrated markets and total risk is appropriate risk measure for completely segmented markets (see Estrada, 2002; 2007). Therefore, research results one more time lead to conclusion that selected markets are in the stage of relatively low level of integration into the world capital markets, since obtained results indicate that level of unsystematic risk is high, level of systematic risk is low and only total risk and downside risk are significantly related to returns in selected markets.

Tab. 4 reports the results of stepwise regression, a procedure that enabled selection of the most important explanatory variables of mean returns out of a set of four offered risk measures. Results show that the combination of downside risk and downside beta has the highest explanatory power, while total risk and beta are removed from the regression.

In order to check relationship between the mean returns and four risk variables in selected markets, regression analysis is repeated for Slovenia, Croatia and Serbia. Tab. 5 reports that in all selected markets total risk and downside risk come out significant and have the highest explanatory power, which is in accordance with the results that are obtained for the full sample. It should be pointed out that downside beta is significant for Slovenian market, while that is not the case for Croatian and Serbian markets. The

Tab. 4:	Stepwise regression analysis: Full sample

Panel A: Stepwise regression								

$$R_i = y_0 + y_1 RV_{1i} + y_2 RV_{2i} + \mu_i$$

RV_{1i}/RV_{2i}	y_0	$t(y_0)$	y_1	$t(y_1)$	y_2	$t(y_2)$	DW	R^2	$Adj\ R^2$
RM_3/RM_4	0.0010	0.3254	-0.0054	-7.829***	0.0046	2.1374**	1.9965	0.2757	0.2668

Source: own

Note: Stopping criteria of the stepwise regression is 0.25. *** indicates statistical significance at the 0.01 level; ** indicates statistical significance at the 0.05 level; * indicates statistical significance at the 0.10 level.

Tab. 5: Simple regression analysis: Slovenia, Croatia and Serbia

$$R_i = y_0 + y_1 RV_{1i} + \mu_i$$

			Panel A: Slovenia				
RV_1	y_0	$t(y_0)$	y_1	$t(y_1)$	DW	R^2	$Adj\ R^2$
RM_1	-0.0003	-0.0908	-0.0032	-3.6737***	1.7418	0.4875	0.4661
RM_2	-0.0109	-2.2449**	-0.0015	-0.2778	1.9546	0.0026	-0.0390
RM_3	0.0005	0.1585	-0.0040	-3.5700***	1.8338	0.4637	0.4414
RM_4	0.0012	0.2080	-0.0116	-2.3468**	1.8312	0.1387	0.1028
			Panel B: Croatia				
RV_1	y_0	$t(y_0)$	y_1	$t(y_1)$	DW	R^2	$Adj\ R^2$
RM_1	0.0137	3.3629***	-0.0060	-4.7049***	2.2464	0.2756	0.2680
RM_2	-0.0098	-2.5781**	0.0023	0.6336	2.0829	0.0055	-0.0049
RM_3	0.0093	3.9483***	-0.0054	-7.0713***	2.1592	0.2795	0.2720
RM_4	-0.0082	-1.6342	0.0004	0.1268	2.1034	0.0002	-0.0102
			Panel C: Serbia				
RV_1	y_0	$t(y_0)$	y_1	$t(y_1)$	DW	R^2	$Adj\ R^2$
RM_1	0.0201	3.1716***	-0.0078	-3.7062***	1.9072	0.1517	0.1299
RM_2	-0.0064	-1.3182	0.0017	0.3220	1.9263	0.0027	-0.0228
RM_3	0.0176	3.6944***	-0.0090	-4.4893***	1.9367	0.1610	0.1395
RM_4	-0.0061	-0.8539	0.0006	0.1252	1.9148	0.0004	-0.0253

Source: own

Note: ***indicates statistical significance at the 0.01 level; ** indicates statistical significance at the 0.05 level; * indicates statistical significance at the 0.10 level

significance of the downside beta for Slovenian market could be explained with the fact that only Slovenian returns for selected period have high and negative standardized skewness, while that is not the case for other selected markets.

Tab. 6 reports stepwise regression results for Slovenian, Croatian and Serbian markets. Table shows that the variables selected by the stepwise regression procedure for Slovenian market are downside risk and beta. On the other hand, the combination of variables with the highest explanatory power for Croatian and Serbian markets include downside risk and downside beta. As it can be seen, in all markets downside risk is statisticaly significant and important for explaining returns, while additional downside risk measure of systematic risk (downside beta) figures in two out of three regressions for selected markets.

From Tab. 6, it can be noticed that the combination of variables that was selected on the basis of stepwise regression for each market explains 46.95% of variations in mean returns in Slovenian market, 31.08% of variations in Croatian market and only 14.77% of variations in Serbian market.

4.1 The Cost of Equity

Tab. 7 shows the cost of equity calculated on the basis of four different risk measures for all selected markets. The lowest cost of equity for all markets is calculated on the basis of beta as a risk measure and classical CAPM model, because average beta for each market is below one and it is the lowest risk measure out of four used measures. A downside beta and Estrada's D-CAPM cost of equity model results in a little bit higher value of the cost of equity for each

Tab. 6: **Slovenia, Croatia and Serbia: Stepwise regression analysis**

$$R_i = y_0 + y_1 RV_{1i} + y_2 RV_{2i} + y_3 RV_{3i} + y_4 RV_{4i} + \mu_i$$

Panel A: Slovenia

RV_1	y_0	$t(y_0)$	y_1	$t(y_1)$	y_2	$t(y_2)$	DW	R^2	Adj R^2
RV_2/RV_3	0.0058	1.1835	-0.0068	-1.5078	-0.0043	-4.8996***	1.6308	0.5120	0.4695

Panel B: Croatia

RV_1	y_0	$t(y_0)$	y_1	$t(y_1)$	y_2	$t(y_2)$	DW	R^2	Adj R^2
RV_3/RV_4	0.0012	0.2646	-0.0063	-6.7612***	0.0074	2.5296***	2.0672	0.3250	0.3108

Panel C: Serbia

RV_1	y_0	$t(y_0)$	y_1	$t(y_1)$	y_2	$t(y_2)$	DW	R^2	Adj R^2
RM_3/RM_4	0.0142	1.5615	-0.0104	-2.9859***	0.0058	1.1727	2.0147	0.1903	0.1477

Source: own

Note: Stopping criteria of the stepwise regression is 0.25. *** indicates statistical significance at the 0.01 level; ** indicates statistical significance at the 0.05 level; * indicates statistical significance at the 0.10 level.

market. Tab. 7 shows that risk measures based on total risk and downside risk are significantly larger than beta and downside beta, as well as the corresponding costs of equity.

As it was stressed earlier, the low results of correlation coefficient with the respect to the world market and low betas are in accordance with the claim of relatively low level of examined markets' integration into the world markets, which implies that a real cost of equity should be closer to the cost of equity based on total risk as a risk measure than to the cost of equity based on beta as the risk measure. Obtained research results are in accordance with this conclusion, because they favor downside risk, since it explains the majority of the return variability and figures as the statistically significant variable with the highest explanatory power.

Research results show that the average cost of equity based on downside risk for full sample amounts to 20.16%. It is known that liberalization of financial markets leads to decline in the cost of equity (Henry, 2000; Bekaert & Harvey, 2000; Collins & Abrahamson, 2006). Therefore, one would expect that Slovenia and Croatia have lower costs of equity compared to Serbia, since they are members of the European Union (EU) and have started liberalization process earlier and have gone further with this process than Serbia. The results of the research are in accordance with such expectation. From Tab. 7 it can be seen that Serbia has the highest average cost of equity (20.77%), while Slovenia and Croatia have lower and similar average level of costs of equity (19.91% and 19.80%, respectively).

Tab. 7: **Risk measures and corresponding average cost of equity for selected markets**

	RM_1	RM_2	RM_3	RM_4	CE_1	CE_2	CE_3	CE_4
Slovenia	3.6662	0.6331	3.1201	1.1247	22.3678	8.7188	19.9105	10.9310
Croatia	3.5485	0.9567	3.0961	1.4468	21.8384	10.1750	19.8023	12.3804
Serbia	3.2473	0.6505	2.6436	1.2309	23.4829	11.7971	20.7664	14.4093
Average	3.4873	0.7467	2.9533	1.2675	22.5630	10.2303	20.1597	12.5736

Source: own

Note: CE_1 – cost of equity based on risk measure RM_1, CE_2 – cost of equity based on risk measure RM_2, CE_3 – cost of equity based on risk measure RM_3, CE_4 – cost of equity based on risk measure RM_4. Costs of equity are given as annual figures in %.

Conclusion

The conducted study and its results show that total risk and the downside risk are statistically significant variables for explanation of mean returns of the full sample. The variable that best explains full sample mean returns is downside risk (25.08%). When considering multiple regressions, results indicate that the combination of statistically significant risk variables that best explain full sample mean returns includes the combination of downside risk and downside beta (26.68%).

On the other hand, when considering Slovenian, Croatian and Serbian markets separately, the results of the research indicate that statistically significant relationship exists between mean returns and total risk, as well as between mean returns and downside risk on each selected market, while statistically significant relationship exists between mean returns and downside beta just in Slovenian market. Although the total risk best explains the cross section of returns in Slovenia (46.61%), the explanation power of downside risk in Slovenia is almost as high (44.14%). It has to be stressed that since investors prefer upward swings of the stock prices and returns and they want to avoid only downside volatility, downside risk intuitively seems to be more appropriate risk measure compared to the total risk. Also, the downside risk best explains the cross section of returns in Croatia (27.20%) and Serbia (13.95%). Stepwise regressions for each selected market contain downside risk variable and beta or downside beta as additional systematic risk measure.

The obtained results give advantage to downside risk measure over the risk measures based on the total risk, beta and downside beta for selected markets and they support Estrada's (2000) recommendation to use downside risk as appropriate risk measure and corresponding asset pricing model in emerging markets.

Also, the obtained research results show that the average cost of equity based on downside risk as an adequate asset pricing risk measure for full sample amounts 20.16%. Results reveal that Serbia has the highest average cost of equity (20.77%), while Slovenia and Croatia have lower and similar average cost of equity.

References

Artavanis, N., Diacogiannis, G., & Mylonakis, J. (2010). The D-CAPM: The Case of Great Britain and France. *International Journal of Economics and Finance*, *2*(3), 25-38. doi:10.5539/ijef.v2n3p25.

Bekaert, G., Erb, C., Harvey, C., & Viskanta, E. (1998). Distributional Characteristics of Emerging Market Returns and Asset Allocation. *Journal of Portfolio Management*, *24*(2), 102-116. doi:10.3905/jpm.24.2.102.

Bekaert, G., & Harvey, C. (2000). Foreign Speculators and Emerging Equity Markets. *Journal of Finance*, *55*(2), 565-613. doi:10.1111/0022-1082.00220.

Bekaert, G., & Harvey, C. (2002). Research in Emerging Markets Finance: Looking to the future. *Emerging Markets Review*, *3*(4), 429-448. doi:10.1016/S1566-0141(02)00045-6.

Bekaert, G., Harvey, C., & Lundblad, C. (2007). Liquidity and Expected Returns: Lessons from Emerging Markets. *The Review of Financial Studies*, *20*(5), 1783-1831. doi:10.1093/rfs/hhm030.

Bekaert, G., Harvey, C., Lundblad, C., & Siegel, S. (2011). What Segments Equity Markets. *Review of Financial Studies*, *24*(12), 3841-3890. doi:10.1093/rfs/hhr082.

Bekaert, G., & Harvey, C. (2014). Emerging equity markets in a globalizing world. Tilburg: Netspar. Retrieved February 3, 2015, from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2344817.

Borys, M. (2011). Testing Multi-Factor Asset Pricing Models in the Visegrad Countries. *Czech Journal of Economics and Finance*, *61*(2), 118-139.

Chen, N. F., Roll, R., & Ross, S. A., (1986). Economic Forces and the Stock Market. *Journal of Business*, *59*(3), 383-403.

Collins, D., & Abrahamson, M. (2006). Measuring the Cost of Equity in African Financial Markets. *Emerging Markets Review*, *7*(1), 67-81. doi:10.1016/j.ememar.2005.06.003.

Damodaran, A. (2009). *Volatility Rules: Valuing Emerging Market Companies*. Retrieved February 3, 2015, from http://people.stern.nyu.edu/adamodar/pdfiles/papers/emergmkts.pdf.

Damodaran, A. (2015). *Country Default Spreads and Risk Premiums*. Retrieved February 3, 2015, from http://pages.stern.nyu.edu/~adamodar/.

Dimson, E., Marsh, P., & Staunton, M. (2011). *Equity Premiums Around the World,*

Rethinking the Equity Risk Premium. CFA Institute. Retrieved February 3, 2015, from www.academicwebpages.com/preview/mehra/pdf/CFA%20RM.pdf.

Erb, C. B., Harvey, C., & Viskanta, T. E. (1996). Expected Returns and Volatility in 135 Countries. *Journal of Portfolio Management*, *22*(3), 46-58. doi:10.2139/ssrn.871253.

Estrada, J. (2000). The Cost of Equity in Emerging Markets: A Downside Risk Approach. *Emerging Markets Quarterly*, *4*(Fall), 19-30.

Estrada, J. (2002). Systematic Risk in Emerging Markets: the D-CAPM. *Emerging Markets Review*, *3*(4), 365-379. doi:10.1016/S1566-0141(02)00042-0.

Estrada, J. (2007). Mean-semivariance Behavior: Downside Risk and Capital Asset Pricing. *International Review of Economics and Finance*, *16*(2), 169-185. doi:10.1016/j.iref.2005.03.003.

Fama, E. F., & French, K. R. (1992). The Cross-section of Expected Stock Returns. *Journal of Finance*, *47*(2), 427-465. doi:10.1111/j.1540-6261.1992.tb04398.x

Fama, E. F., & French, K. R. (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics*, *33*(1), 3-56. doi:10.1016/0304-405X(93)90023-5.

Galagedera, D., & Brooks, R. (2007). Is Co-skewness a Better Measure of Risk in the Downside than Downside Beta? Evidence in Emerging Market Data. *Journal of Multinational Financial Management*, *17*(3), 214-230. doi:10.1016/j.mulfin.2006.10.001.

Galagedera, D. (2009). Economic Significance of Downside Risk in Developed and Emerging Markets. *Applied Economic Letters*, *16*(16), 1627-1632. doi:10.1080/13504850701604060.

Godfrey, S., & Ramon, E. (1996). A Practical Approach to Calculating Costs of Equity for Investment in Emerging Markets. *Journal of Applied Corporate Finance*, *9*(3), 80-89. doi:10.1111/j.1745-6622.1996.tb00300.x.

Grandes, M., Panigo, D., & Pasquini, R. (2010). On the estimation of the cost of equity in Latin America. *Emerging Markets Review*, *11*(4), 373-389. doi:10.1016/j.ememar.2010.08.001.

Harvey, C. (1995). The Risk Exposure of Emerging Equity Markets. *World Bank Economic Review*, *9*(1), 19-50. doi:10.1093/wber/9.1.19.

Hearn, B., & Piesse, J. (2009). Sector Level Cost of Equity in African Financial Markets.

Emerging Market Review, *10*(4), 257-278. doi:10.1016/j.ememar.2009.09.002.

Henry, P. B. (2000). Stock Market Liberalization, Economic Reform and Emerging Market Equity Prices. *Journal of Finance*, *55*(2), 529-564. doi:10.1111/0022-1082.00219.

Klernkosky, R. C., & Martin, J. D. (1975). The Effect of Market Risk on Portfolio Diversification. *Journal of Finance*, *30*(1), 147-154. doi:10.1111/j.1540-6261.1975.tb03166.x.

Litner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budget. *Review of Economics and Statistics*, *47*(1), 13-37. doi:10.2307/1924119.

Liu, E. (2006). A Liquidity-augmented Capital Asset Pricing Model. *Journal of Financial Economics*, *82*(3), 631-671. doi:10.1016/j.jfineco.2005.10.001.

Minovic, J., & Zivkovic, B. (2012). The Impact of Liquidity and Size Premium on Equity Price Formation in Serbia. *Economic Annals*, *57*(195), 43-78. doi:10.2298/EKA1295043M.

Minovic, J., & Zivkovic, B. (2014). CAPM Augmented with Liquidity and Size Premium in the Croatian Stock Market. *Economic Research*, *27*(1), 191-206. doi:10.1080/1331677X.2014.952107.

MSCI. (2015). MSCI World Index. Retrieved February 3, 2015, from http://www.msci.com/products/indexes/size/standard/performance.html.

Momcilovic, M., Vlaovic Begovic, S., & Zivkov, D. (2015). Cost of equity: the case of Serbian food industry. *Custos e @gronegocio on line*, *11*(1), 184-197.

Newey, W. K., & West, K. D. (1987). A Positive Semi-definite, Heteroskedasticity and Autocorrelation-consistent Covariance Matrix. *Econometrica*, *55*(3), 703-708. doi:10.2307/1913610.

Picerno, J. (2014). *Risk Premia Forecasts*. Retrieved February 3, 2015, from http://www.capitalspectator.com/risk-premia-forecasts-4-november-2014/.

Ross, S. (1976). The Arbitrage Theory of Capital Asset Pricing. *Journal of Economic Theory*, *13*(3), 341-360. doi:10.1016/0022-0531(76)90046-6.

Sharpe, W. F. (1964). Capital Asset Prices – A Theory of Market Equilibrium under Condition of Risk. *Journal of Finance*, *19*(3), 425-442. doi:10.1111/j.1540-6261.1964.tb02865.x.

US Treasury. (2015). Retrieved February 3, 2015, from http://www.treasury.gov/resource-

center/data-chart-center/interest-rates/Pages/
TextView.aspx?data=yieldYear&year=2015.

Wagner, W. H., & Lau, S. C. (1971). The Effect of Diversification on Risk. *Financial Analysts Journal*, *27*(6), 48-53.

Mirela Momcilovic, M.B.A.
University of Novi Sad
Novi Sad Business School
Department of Finance
bizniscentar@gmail.com

Dejan Zivkov, M.Sc.
University of Novi Sad
Novi Sad Business School
Department of Finance
deja.zivkov@vps.ns.ac.rs

Sanja Vlaovic Begovic, M.Sc.
University of Novi Sad
Novi Sad Business School
Department of Finance
sanja.vbegovic@vps.ns.ac.rs

Abstract

THE DOWNSIDE RISK APPROACH TO COST OF EQUITY DETERMINATION FOR SLOVENIAN, CROATIAN AND SERBIAN CAPITAL MARKETS

Mirela Momcilovic, Dejan Zivkov, Sanja Vlaovic Begovic

In developed countries Capital Asset Pricing Model (CAPM) is the most frequently used model for determination of the cost of equity. On the other hand, there is no consensus about which model would be the most appropriate and easy to use for the estimation of cost of equity in emerging markets.

The aim of this research is to analyze on the basis of Estrada's work (2000; 2007) four different risk measures based on standard deviation, beta, downside risk and downside beta, as well as corresponding asset pricing models for capital markets of Slovenia, Croatia and Serbia in order to determine the most appropriate asset pricing model and to estimate the costs of equity for selected markets. It should be pointed out that asset pricing research in general is scarce for selected markets and that similar research was not done for them.

Results of the research show that for total selected market the most appropriate risk measure out of four proposed is downside risk, while the model that best explains full sample mean returns contains combination of downside risk and downside beta. Results of the research favor downside risk measure for each selected market. When considering multiple regressions with the highest explanatory power for each selected market, results show that all multiple regressions contain downside risk as a risk variable and beta or downside beta as additional systematic risk variable, indicating one more time importance of downside risk for Slovenian, Croatian and Serbian capital markets.

The results show that the average cost of equity estimated on the basis of asset pricing model with downside risk as a risk measure amounts to 20.16% for full sample. The results also indicate that Serbia has the highest cost of equity and that the cost of equity for Slovenian and Croatian capital markets is lower and rather similar.