Firm-specific factors as predictors of future returns for Romanian common stocks: empirical evidence

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Abstract: This paper examines the relationship between stock returns and firm-specific ratios on the Romanian stock market for the period 2002 to 2008. We investigate the explanatory power on future stock returns of market beta, financial leverage, book-to-market equity, size, the earnings-to-price ratio, ROA and ROE. We find that size has the most significant effect in capturing variations in stock returns over the whole period. The negative relationship between size and returns is persistent and the size effect is present on Bucharest Stock Exchange. E/P ratio has a strong positive impact on stock returns and it remains statistically significant through different regression models. Most of the variation in stock returns is captured by size and E/P ratio together. B/M ratio has a significant positive relationship with returns in the univariate regression, but loses its significance in the multivariate setting. Results indicate that beta lacks explanatory power even when its impact is examined alone in the regression analysis and therefore the use of beta as a measure of systematic risk on the Romanian market is unsupported.

Key-Words: pooled regressions; Firm factors; CAPM; Romanian stock market

1 Introduction and related literature

This paper investigates the efficiency of the Romanian stock market by analyzing the explanatory power of firm specific ratios on future stock returns. If we find significant risk sources for returns, this implies that a portfolio selection model based on fundamental analysis may help in identifying those stocks that will bring a significant above-market rate of return, which in turn constitutes an indication that the Romanian stock market is inefficient.

Many empirical studies have been preoccupied with discovering and documenting inconsistencies of the CAPM. Amongst them, many have documented the existence of other risk factors on stock returns, in addition or instead of the systematic risk.

One of the pioneer finding was the size-effect documented by Banz (1981). He found that average returns of stocks with low market equity (ME) are too high given their beta and returns of stock with high ME are too low given their beta. The negative relationship between firm size and stock returns was also found to be present in other markets. Ziemba (1991) in Japan, Levis (1985) in U. K. and Brown et. al. (1983) in Australia found that small capitalization stocks outperform large capitalization stocks. Bhandari (1988) found a positive linear relationship between return and financial leverage. Leverage is a proxy of financial risk, and therefore, it is conceivable that it is related to the expected stock return. Nonetheless, under the CAPM, the market beta would incorporate financial risk as well.

Basu (1977) sorted common stocks after their E/P ratio (Earning per Share/ Price per share) and showed that future returns for stocks with higher E/P exceed expected returns computed with CAPM. Subsequent studies show that high E/P (low P/E) stocks still explain stock returns when size and market beta are included in the tests (Basu, 1983; Peavy and Goodman, 1983).

Fama and French (1992) show that size and B/M ratio combine to capture the cross-sectional variation in the average stock returns associated with market beta, size, leverage, BE/ME and E/P ratios. Moreover, their study shows that beta does not help explain the cross-section of average stock returns for the 1963-2000 time period.
In the same study, leverage and P/E ratio are significant by themselves or with size, but they become insignificant when both size and B/M ratio are considered. Fama and French (1993) also try a multifactor model, with the following three factors: the market return, the return on a portfolio of small stocks minus the return of a portfolio of big stocks (SMB), and the return on a portfolio with high BE/ME minus the return on a portfolio with low BE/ME (HML). The three factor model is rejected at traditional significance levels, but it can still capture a fair amount of the variation of expected returns.


Lau, Lee and McInish found a conditional relationship between beta and stock returns for Singapore and Malaysia for the period 1988–1996 (a significant positive relationship during months with positive market excess returns and a negative relationship between beta and stock returns during months with negative market excess returns). Pandey (2001) examined the Malaysian stock market and reported that size (market capitalization) plays a dominant role in the expected stock return while the significance of B/M ratio disappears in the fixed firm effects multivariate regressions that also include size and E/P ratio or dividend yield.

Wang and DiIorio investigated the Chinese A-share market for the period 1994 to 2002 and found size and book-to-market ratio to be risk factors, while the explanatory power of beta remained unsupported.

This paper analyzes all common stocks traded on the Bucharest Stock Exchange during 2002-2008 (fulfilling some stated criteria) and employs panel data regressions to investigate the explanatory power of market beta, size, the earnings-to-price ratio, financial leverage, the B/M ratio, return on assets and return on equity.

2. Data and methodology

We include in our analysis all companies that have been listed on Bucharest Stock Exchange (BSE) during the period January 2002 - March 2008. De-listed companies (whether as a cause of bankruptcy or by own choice) have not been excluded from the study, trying to avoid in this way survivorship bias. The newly listed stocks during the considered period (by IPO or by transfer from another market) are included in the analysis from the time they entered the market. In this way, we have included 62 stocks in the analysis. Annual returns are logarithmic and computed as a change in capitalization or market value of the company from year t to year t+1, reflecting in this way all capital adjustments during this period. All financial ratios are also computed annually, after all companies publish their annual financial results, as requested by law. Future returns are logarithmic returns computed as the future annual change in market value, from the moment of current financial data release, till before the moment when new information is published the following year. In this way, we investigate the relationship between financial ratios in year t and stock returns in year t+1. The methodology is repeated each year, ratios are actualized when new information is released and the market value of each stock from that moment till the publication of new annual information is followed. We investigate the explanatory power of beta, financial leverage (Total Assets/Book equity, or A/B), size (ln of market capitalization), the earnings-to-price ratio (E/P), the book-to-market equity ratio (B/M), the return-on-assets ratio (ROA) and return-on-equity ratio (ROE). In the case of leverage and B/M ratios, the risk factors consist in fact in the logarithmic growth during year t of the respective ratio. E/P ratio is zero for negative values and in exchange a dummy E/P is employed which takes the value zero when E/P is positive and value 1 when E/P is zero.

For earnings-to-price ratio, leverage, book-to-market equity ratio and roa and roe, the smallest and the highest 5% of the observations are equalized with the next smallest/highest observation, in order to remove the influence of extreme values.

The impact of the considered risk factors is investigated by conducting pooled-data regressions.

We use Eviews software package for all estimation in this paper.

3. The impact of firm-specific risk factors on the Romanian common stocks
3.1. The two-way fixed effects model: The intercept varies across time and companies, but slope coefficients constant

Since our data set is short and wide (many N and short T) intuitively we should focus on cross-sectional variation, or heterogeneity (Green, p 284). In addition, as we use all companies listed on Bucharest Stock Exchange that are meeting some established criteria, the random effect is not suitable in our pool regression, but rather the fixed-effect should be used.

After we have seen that individual company effects are not significant, while year-effects are indeed present (not shown here), we prevent the situation where our model could be misspecified due to the fact that both individual and time-effects are not taken into account together.

This is the two-way fixed effects model, specified as:

\[ Y_{it} = \alpha_1 D_{1i} + \alpha_2 D_{2i} + \ldots + \alpha_{62} D_{62i} + \lambda_1 D_1 + \lambda_2 D_2 + \ldots + \lambda_5 D_5 + \beta_2 X_{2it} + \beta_3 X_{3it} + \ldots + \beta_9 X_{9it} + u_{it} \]  

(1)

We must nonetheless keep in mind that our estimators may be inefficient in the presence of heteroskedasticity. In addition, the standard errors of the estimates and therefore their t-statistics would be incorrect. These relationships between residuals can be exploited to obtain more efficient estimators. We correct for possible heteroskedasticity by estimating the correct standard errors and t-ratios with HCCM (White’s Heteroskedasticity-Consistent Covariance Matrix). We prefer this approach instead of using the weighted least squares procedure.

This will be the model specification we employ in the investigation of risk factors on Bucharest Stock Exchange common stocks (Table 1).

### Table 1: Results of the two-way fixed effect model with HCCM

<table>
<thead>
<tr>
<th>A/B</th>
<th>BETA</th>
<th>B/M</th>
<th>Size</th>
<th>E/P</th>
<th>E/P Dummy</th>
<th>ROA</th>
<th>ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coef</td>
<td>0.144949</td>
<td>-0.08287</td>
<td>0.03974</td>
<td>-0.44105</td>
<td>0.653053</td>
<td>-0.15607</td>
<td>0.012826</td>
</tr>
<tr>
<td>std error</td>
<td>0.035592</td>
<td>0.041083</td>
<td>0.032260</td>
<td>0.039062</td>
<td>0.266875</td>
<td>0.051149</td>
<td>0.004790</td>
</tr>
<tr>
<td>t-stat</td>
<td>4.072511***</td>
<td>-2.017187**</td>
<td>1.231847</td>
<td>-11.29114*</td>
<td>2.447043**</td>
<td>-3.051280*</td>
<td>2.67556*</td>
</tr>
</tbody>
</table>

| R² | 0.643253 |
| Adjusted-R² | 0.464880 |
| S.E. regression | 0.386435 |
| F | 3.606216* |
| DW | 2.06923 |
| AIC | 1.199234 |
| SC | 2.92969 |

** Significant at 1%  
*** Significant at 10%  

While the slope coefficients remain the same, their standard errors decrease significantly after correcting for heteroskedasticity. As a consequence, the statistical significance of all explanatory variables increases and all but one factors (all except B/M ratio) help explain returns on the Romanian stock market. The statistical significance of the firm size is the highest, followed by financial leverage. On the other hand, E/P ratio has the most powerful impact on stock returns (0.65), significant at 5%, followed by size (there is a negative relationship between company size and future stock returns of -0.44). ROA and ROE have only a small influence on stock returns (0.012 and -0.003), although this relationship between the two ratios and stock returns has statistical significance. Surprisingly, the relationship between beta and returns is not only negative (-0.08), but also significant at 5%.
Further, we continue our general-to-simple strategy by successively eliminating factors with the least impact on stock returns, while keeping unchanged all specifications in the pooled regression model (See Table 2).

Table 2: Results of multiple regression models where the least significant explanatory variable is successively dropped

<table>
<thead>
<tr>
<th></th>
<th>A/B</th>
<th>BETA</th>
<th>B/M</th>
<th>Size</th>
<th>E/P</th>
<th>E/P Dummy</th>
<th>ROA</th>
<th>ROE</th>
<th>R-sq</th>
<th>Adjusted R-sq</th>
<th>F</th>
<th>AIC</th>
<th>SIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coeff</td>
<td>0.12</td>
<td>-0.07</td>
<td>-0.46</td>
<td>0.84</td>
<td>-0.16</td>
<td>0.013</td>
<td>-0.005</td>
<td>0.6426</td>
<td>0.4681</td>
<td>3.68*</td>
<td>1.19</td>
<td>2.26</td>
<td></td>
</tr>
<tr>
<td>t-stat</td>
<td>4.14*</td>
<td>-1.82***</td>
<td>-13.69*</td>
<td>3.82*</td>
<td>-3.26*</td>
<td>2.73*</td>
<td>-3.10*</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Coeff</td>
<td>0.10</td>
<td>-0.53</td>
<td>0.78</td>
<td>-0.22</td>
<td>0.02</td>
<td>-0.004</td>
<td>0.6254</td>
<td>0.4759</td>
<td>4.18*</td>
<td>1.31</td>
<td>2.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-stat</td>
<td>3.94*</td>
<td>-18.83*</td>
<td>4.33*</td>
<td>-4.65*</td>
<td>4.29*</td>
<td>-2.09**</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Coeff</td>
<td>0.10</td>
<td>-0.53</td>
<td>0.69</td>
<td>-0.21</td>
<td>0.01</td>
<td></td>
<td>0.6243</td>
<td>0.4774</td>
<td>4.24*</td>
<td>1.31</td>
<td>2.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-stat</td>
<td>4.03*</td>
<td>-19.00*</td>
<td>3.94*</td>
<td>-4.54*</td>
<td>3.81*</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Coeff</td>
<td>0.12</td>
<td>-0.51</td>
<td>1.10</td>
<td>-0.22</td>
<td></td>
<td>0.6206</td>
<td>0.4751</td>
<td>4.26*</td>
<td>1.31</td>
<td>2.30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-stat</td>
<td>4.44*</td>
<td>-18.46*</td>
<td>8.20*</td>
<td>-4.60*</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Coeff</td>
<td></td>
<td>-0.50</td>
<td>1.06</td>
<td>-0.20</td>
<td></td>
<td>0.6152</td>
<td>0.4706</td>
<td>4.25*</td>
<td>1.32</td>
<td>2.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-stat</td>
<td>-18.03*</td>
<td>7.77*</td>
<td>-4.19*</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coeff</td>
<td></td>
<td>-0.46</td>
<td>1.18</td>
<td></td>
<td></td>
<td>0.6104</td>
<td>0.4671</td>
<td>4.25</td>
<td>1.32</td>
<td>2.28</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>t-stat</td>
<td>-17.67*</td>
<td>8.70*</td>
<td></td>
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</tr>
</tbody>
</table>

* Significant at 1%
** Significant at 5%
*** Significant at 10%

The explanatory power of the regression when all eight explanatory variables are included together is 64.32% (with the adjusted R squared = 46.48%). After the book-to-market equity ratio is excluded, the decrease of the R^2 is minor and the adjusted R^2 even improves (to 46.81%). In addition, the coefficients and t-statistics of the two most important risk factors (size and E/P ratio) become more important when we eliminate B/M ratio from the model. The relationship between size and future returns is negative and equals -0.46, while E/P ratio has a strong positive impact on stock returns (0.84), both coefficients being significant at 1%. Thus, E/P and size appear to capture the effect of B/M ratio.

The coefficients of financial leverage (A/B ratio) and beta are the only ones that slightly reduce when B/M is removed, but they keep their statistical significance unchanged. All coefficients are significantly different from zero at 1% significance level factors except for beta, whose slope coefficient is significant at 5%.

Further, beta is dropped from the equation and the adjusted-R squared continues to improve (47.59%). The elimination of beta also brings a significant increase in both the coefficient and t-statistic of the company size factor (t = -18.83), while the slope coefficient of the E/P ratio reduces to 0.78, but its t-stat also increases. The positive relationship between A/B and returns continues to reduce with the elimination of another factor (now equals 0.10), while the negative impact of E/P dummy on returns increases. Even though still significant at 1%, respectively 5%, the explanatory power of both ROA and ROE is unimportant (slope coefficients close to zero in both cases). At this point, all slope coefficients, even those whose value has decreased, keep their statistical significance unchanged.
significance at 1%, except for ROE, whose coefficient is now significant at 5%. Dropping ROE from the regression does not change $R^2$, improves adjusted $R^2$ and the impact and t-ratio of size continues to increase (-0.53 with a t-stat of -19.00). The slope coefficients of the other remaining explanatory factors remain unchanged or decrease, but their impact on returns is significantly different from zero at 1% in all cases. With the further elimination of ROA, the increase of the coefficient and t-stat of E/P ratio is remarkable (the slope increases from 0.69 to 1.10, while t stat increases from 3.94 to 8.20). This is not surprising, since ROA and E/P ratio contain indeed similar information. Also, both the coefficient and t-stat of the financial leverage ratio improve, whilst the impact and t-stat of size slightly reduce, but still remain important. All remaining factors have explanatory power on returns. Financial leverage continues to have the least important impact on returns and is dropped next from the model. At this point the explanatory power of the regression reduces, as well as the slope coefficients and t-ratios off the three remaining explanatory variables. Finally, size and E/P ratio, the two most important risk factors on returns combine to capture 61.04% of the variation in stock returns and their coefficients are significantly different from zero at 1% significance level; t-statistics are, respectively, -17.67 and 8.70. There is hardly any impact on the explanatory power of the regression between the model that includes all eight risk factors and the final step when only company size and E/P help explain stock returns. $R^2$ reduces from 64.32% to 61.04%, whilst the Adjusted $R^2$ which corrects for degrees of freedom even improves from 46.48% to 46.71%.

4. Conclusions

The two-way fixed effects multiple regression model with HCCM reveals that all but one of the eight risk factors presumed to explain future stock returns (all except B/M ratio) have indeed explanatory power on returns on the Romanian stock market. The statistical significance of the firm size is the highest, and persistently remains the highest when variables are dropped from the regression, even in the univariate setting. The negative relationship between size and returns varies in the interval [-0.53; -0.44], depending on the different number of variables used in the model. The small-firm effect seems therefore to be present on Bucharest Stock Exchange. E/P ratio has the most powerful impact on stock returns (ranging from a minimum of 0.65 in the multivariate model to a maximum of 1.24 when E/P is the only risk factor) and the positive relationship between E/P and returns remains statistically significant through different regression models. Most of the variation in stock returns is captured by size and E/P ratio together. B/M ratio, although significant in the univariate regression, loses its significance in the multivariate setting. There does not exist a significant simple relation between stock returns beta. The slope coefficient of beta is always slightly negative, but statistically not different from zero. Market beta, alone or together with other explanatory variables, does not help explain stock returns on the Romanian stock exchange. ROA and ROE have also little impact on returns and their information is captured by the E/P ratio.

We conclude that our finding rejects Fama’s efficient market hypothesis and an informed investor could identify significant risk sources for returns and achieve superior returns on Bucharest Stock Exchange. In conclusion, we can state that for the analyzed period the Romanian stock market was not efficient. Nevertheless, as all emerging markets, BSE has a very short history and we must draw attention on the short set of trading data available to financial analysts.

References:


