The Return Of Tradeable Securities On The Romanian Stock Market.

The Applicability Of Multifactor Models

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Abstract

This paper analyzes the explanatory power of multifactor models for the variations in the profitability of company stocks listed on the Bucharest Stock Exchange. For this purpose, OLS models used to compute the influence of multiple factors mentioned in the literature. The results show that a significant statistical influence is attributed to the return on equity, volume and market – to – book factors. These results coincide with those of other studies (Karlsson, 2004), but there are differences in the respect to the market capitalization factor. When using this model, one should take into consideration the numerous shortcomings of the Romanian capital market. Except the blue chip companies included in the BET-XT index, many companies exhibit financial and economic abnormalities that affect the accuracy of a multifactor model.

Introduction

Capital market in Romania is considered an emerging market by analysts but also by specialized publications listed in Chapter I of this paper , given that Romania is on the list of emerging economies published in 2012 by the International Monetary Fund. In these circumstances , BSE has grown both in terms of visible growth of its statistical indicators and the occurrence of events such as to enhance market development . Value exchange transactions increased by more than 100 % in the period 2010-2013 , while total market capitalization reached a historic high in 2013 to a value of RON 133.829.707.065 . Also, 2013 was marked by several important events like major listings that SN Nuclearelectrica S. A. and S.N.G.N. ROMGAZ S. A. Moreover, they observed signs of development listed issuers : OMV Petrom announced a profit history for a company in Romania , were issued new corporate bonds by Raiffeisen Bank and Transelectrica , and getting a Moody's rating of the Alba Iulia City Hall , the most important issuer of municipal bonds.

Literature review

As most studies agree , we can say that there is a constant tendency of development of capital market in Romania and thus increase the efficiency of information . Although the market still presents malfunction , with titles (considered significant) whose returns do not follow a random walk (Dragotă and mitral , 2013) and is still affected by turbulence (Dima and Milos, 2009) , the weak form of market efficiency can not be rejected. It is not enough to know the historical data on asset returns to formulate a strategy to provide systematic returns .
Thus, we can investigate whether there are other determinants of profitability titles , and they are. In this sense , the literature presents models using a variety of factors.

One of the first models explanatorii well known in the literature is the CAPM (capital asset pricing model) introduced by Jack Treynor and William Sharpe (1961). Basically model attempts to determine the appropriate rate of return given the undiversified risk of an asset. The model uses an indicator of the asset's sensitivity to stock market movements generally represented by an index or a benchmark indicator. Formula adequate return on an asset is defined as the risk-free return (risk-free) plus a market risk premium multiplied by the sensitivity indicator:

$$E(R)=Rf+\beta_i(E(Rm)-Rf)$$

Obviously there are a multitude of microeconomic factors that can be analyzed, so it is appropriate to group them into classes. This allows a more comprehensive analysis as the probability that two or more factors of the same class to be correlated with each other. Haugen and Baker (1996) have grouped the factors into the following classes : risk factors (beta , volatility, debt to equity, etc.) liquidity factors , price factors , factors that indicate the potential for growth and technical factors (excess returns) . They studied a total of 28 factors using a sample of 3000 companies located in several European countries and selected 12 of them as the most relevant . These include additional profitability factors (excess returns) , book to market ratio, price to earnings ratio , and indicators of financial statements and ROE and capital structure indicators such as leverage.

Most variables used in these studies are indices (capitalization , book to market ratios type , price earnings , etc. .) . This can be a starting point for identifying a market equilibrium model for localized and BSE . Moreover, given that the capital market in Romania can not be considered ineffective as shown by the studies mentioned above, such a model may be considered appropriate

Case study

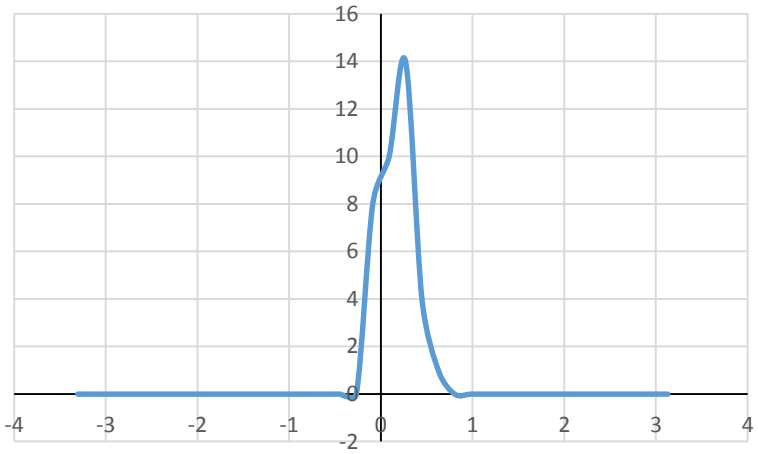
To build the database we considered statistical significance of the symbols selected, because the selection of symbols insignificant affect the model . The main criterion was relevant liquidity, since it is mentioned in several studies on market efficiency . In some of these illiquidity is considered the main cause of reduction of market efficiency . Basically , how a symbol is less traded , the data set used to test the RWH , variance and covariance / correlation with the market is restricted , so the results will be affected.

Based on this premise , we started with actions that are part of BET- XT index of the 25 most liquid companies. Regarding market benchmark test we started BET - XT index BET- C and BET . BET -C composite index includes all companies listed in the category I and category II , less the SIFs , and BET is composed of the 10 most liquid listed companies.

The time horizon chosen for analysis is 04.01.2010 - 21.01.2014 because I believe that is a time when the influence caused by the economic recession that began in 2008 is lower

Analyzing their returns , it is noted that their average is equal to 0.11249 , similar to the return value recorded by BET during the period. Continuing the analysis , we found that ARTS symbol shows a much higher return than any other selected assets . Moreover, calculating the probability distribution of returns , we find that profitability ARTE alone is four standard deviations from the mean to all the other symbols that are found within two standard deviations of the mean. It can thus be said that, except that symbol returns to other approaches a normal distribution , which is beneficial in terms of the model search. Therefore , we decided to analyze the data set does not include the symbol ARTE. It is immediately apparent that the values of skewness and kurtosis indicators are significantly closer to 0, caracateristica normal distributions . Skewness decreases from 3.82 to -0.01 , and the kurtosis of 1.41 to 0.37 .

Figura: Probability distribution for the dependent variable



From these results we applied a test Grubbs (1969) Identification of outlier-OF THE. This indicator calculates a G for the most extreme value in a set of data and then compares with a G critic. The indicator is calculated as (Ymax - Ymed) / σ, and if ARTE, it has a value of 3.6792 which exceeds the critical value of 3.0141. Although it was identified an outlier, I decided that for now, do not remove this remark due to small sample size.

After analyzing the dependent variable we gathered data on categories of factors as they were classified by Haugen and Baker (1996). Thus we obtained data on liquidity, profitability, capital structure, and information exchange on selected symbols such as market capitalization or market to book ratio. Factors that we tested were: market capitalization (logarithmic), dividend yield, earnigs per share, price - earnings ratio, market to book ratio, financial leverage, leverage, liquidity rapidly, ROE, ROA, net income change the variation vazarilor and volume. Dividend policy has been used a variable which takes values between 0 and 4, depending on the number of years they have been granted dividends during 2010-2013.

Table: Analyzed factors

Denumire	Simbol utilizat	Statistica t	Semnificatie*
Market to Book Ratio	MtB	2,4189	0,0212
Return on equity	ROE	1,7803	0,0842
Volum (as a percentage of total market capitalization)	VOL%	-1,9236	0,0633
Volum (as a number of traded shares)	VOL	-1,7334	0,0923
Return on assetes	ROA	1,8621	0,0954
Financial leverage	Leverage	-0.6725	0,5091
Capitalization	log cap	0,6516	0,5192
Dividend yield	DivY	-0.9041	0,2012
Quick ratio	Quick Ratio	0,2847	0,7788
Debt to assets	Debt/Assets	-1,0828	0,2863
Sales to assets	Sales/Assets	0,8411	0,4065
Sales growth	ΔVz	0,8466	0,5493
Net result growth	ΔNet	0,9818	0,3329
Earnings per share	EPS	0.0975	0,8415

*p-value as recorded within the most significant models

The initial model that returned that have emerged included the variables listed above that had inicatorul p -value higher . The ROE were tested factors , volume , rapid liquidity indicator sales / assets. Init , we ran a linear regression that included all of these variables calculated as follows :

ROE has been calculated that the variation observed values over the reporting period based on the values available in the annual reports of companies in the sample. Volume was used a

calculation that takes into account its average daily viewed as a percentage of total capitalization . Basically, these values were used to achieve a daily average amount for a year on which the change was then calculated . Quick Liquidity similar ROE was calculated using the values of annual accounting reports for the late review , namely from 2010 to 2013 . This was also the indicator sales / assets.

It will form the INIT mode quantification of indicators , and these four were tested initiate the same model. We considered that the number of observations is quite low , which is why I set the maximum number of variables included in the same model to four. We also examined selected variables before inserting them into the model (see Appendix 3). Thus, a correlation matrix was performed to test for the presence of significant correlations between two of these variables could thus affect the results of the regression model .

Figure: Correlation matrix for the initial model

	Correlations (Spreadsheet2.sta) Marked correlations are significant at p < .05000 N=37 (Casewise deletion of missing data)			
Variable	ROE ini	**VOL%**	Quick Ratio	Sales/Assets
ROE ini	1.000000	-0.064475	0.241020	0.089294
VOL%	-0.064475	1.000000	-0.193098	-0.124465
Quick Ratio	0.241020	-0.193098	1.000000	0.187307
Sales/Assets	0.089294	-0.124465	0.187307	1.000000

No such correlations were identified, the largest being the quick liquidity variables and ROE, which is why all four variables were entered simultaneously in the same model of the form:

$$RENT = \beta_0 + \beta_{ROEini} * ROEini + \beta_{VOL\%} * VOL\% + \beta_{QR} * QR + \beta_{SA} * SA + \varepsilon$$

where:

RENT = dependent variable, the average change in the price of the asset

β0 = constant term (intercept)

ROEini = ROE factor

VOL% = volume factor as a percentage of market capitalization

QR = Quick liquidity factor (quick ratio)

SA = factor sales / assets (Sales / Assets)

βROEini = coefficient for ROE

βVOL% = coefficient for VOL%

βQR = coefficient for QR

βSA = coefficient for SA

ε = error term

The structured returned a coefficient of determination R2 of 0.3198, but the quick ratio and sales variables / Assets have been determined to be insignificant statistically by considering p-value associated.

The resulting equation has the form:

$$RENT = 0.0124 + 0.0044 * ROEini - 61.0108 * VOL\% + 0.0001 * QR + 0.0597 * SA$$

The orders of magnitude for different coefficients visible, especially if QR vol%, and can be explained by the different orders of magnitude of the variable. We believe that this is not an issue of statistical significance of variables given that QR media is 95.017, while the average volume is 0.005, which is a percentage of market capitalization. The P-value is the one who is sounding the alarm on this model if the variables. For quick liquidity it was 77% and 40% volume. These are very high values can not reject the null hypothesis. Also, statistics Durbin - Watson recorded a value of 2.43, relatively close to the critical value 2 (Durbin and Watson, 1950), but shows no conclusive results, especially given the discrepancy between indicators p-values of regression.

Table: Regression output

	Regression Summary for Dependent Variable: RENT (Spreadsheet2.sta) R= .56559495 R²= .31989765 Adjusted R²= .23488485 F(4,32)=3.7629 p<.01282 Std.Error of estimate: .15633					
N=37	b*	Std.Err. of b*	b	Std.Err. of b	t(32)	**p-value**
Intercept			0.1024	0.04197	2.43908	0.020451
ROE ini	0.413036	0.150391	0.0044	0.00160	2.74642	0.009807
VOL%	-0.287059	0.149225	-61.0108	31.71587	-1.92367	0.063331
Quick Ratio	0.043988	0.154630	0.0001	0.00018	0.28447	0.777883
Sales/Assets	0.125487	0.149188	0.0597	0.07093	0.84113	0.406515

A possible explanation for some unusual values recorded variables have emerged in earlier models to run is how they are measured against how the dependent variable , cost shares is quantified and incorporated in the model. While profitability is calculated as a daily average multiplied by the number of trading days in a year , the variation indicator variables are calculated over the period analyzed

An alternative method for measuring and quantifying the factors used is the calculation of the average variation over the period. Another reason for this approach is the realization of a correlation between how it is measured in the dependent variable and the variables that are measured explanatorii . Profitability was calculated as an average value of stock price changes during the period, similar to this way of quantifying the variables explanatorii . Thus, for the three variables identified as most significant in previous models we have used these methods of measurement :

Basically , although the sample is quite small , there are outlier in the series of observations that may affect the model results . On the other hand, the application type winsorizare or trimming processes will reduce the amount of data in the series reflect reality. Datortia small sample size , data not shown trimming , which is why we used winsorizare process , and it was applied only to

the extreme values of observation.Figura 2.8: Situaţia statisticilor descriptive înainte (sus) şi după aplicarea winsorizarii (jos)

It should be noted that the value for the critical G for a sample of 37 observations is 3.01 . A statistic G whose value exceeds this threshold indicates the presence of an outlier (Grubbs , 1969). However, even after the application process winsorizare the comments above, the remaining values are identified as outlier by Grubbs test light , but not as blatant as they were in the original .

Before running the model is necessary to analyze these three data sets (see Appendix 4). First, the correlation matrix shows that the highest correlation between ROE and MTB with a coefficient of 0.3476 .

Running a t-test on the three variables align with rezutlatul correlation matrix , ROE and MTB are closest variables statistically (Brooks , 2008). The other two pairs , ROE - Volume and Volume - MTB statistical p values are respectively 0.070 t 0.002 to 0.121 for ROE - MTB (see Appendix 5) .

However, no significant abnormalities may be identified in the three analyzed variables .

In order to test a model that includes these three factors, we used a method of OLS regression where the dependent variable, profitability was defined as the average daily variation of asset prices and variables explanatorii - ROE, volume and market to book ratio are calculated according to the information above.

Basically the model is:

$$RENT = \beta_0 + \beta_{ROE} * ROE + \beta_{MTB} * MTB + \beta_{VOL} * VOL + \varepsilon$$

Running the regression returns the following:

$$RENT = 0.1171 + 0.0007 * ROE + 0.2781 * MTB - 0.0085 * VOL$$

The model has a coefficient of determination value R 2 of 0.3284, and analysis of variance shows that the model explains 0.377 1.149 Total sum of squares, while the waste is 0.772. Meanwhile, the average squared error for the regression is 0.125 and 0.023 for the residual. The F statistic has a value of 5.3792 with a P-value of 0.0039 associated.

Table: Regression output for the robust model

N=37	Regression Summary for Dependent Variable: RENT (Spreadsheet2.sta) R= .57307883 R²= .32841934 Adjusted R²= .26736655 F(3,33)=5.3793 p<.00398 Std.Error of estimate: .15297					
	b*	Std.Err. of b*	b	Std.Err. of b	t(33)	p-value
Intercept			0.117153	0.029346	3.99217	0.000344
ROE	0.272068	0.152817	0.000787	0.000442	1.78035	0.084228
VOL	-0.250317	0.144404	-0.008573	0.004945	-1.73345	0.092351
MTB	0.372180	0.153863	0.278143	0.114987	2.41891	0.021244

Thus, at the end of these models have identified three factors with high statistical significance : ROE, volume and market - to - book ratio. They were included in a model with three variables. In order to increase the relevance of the multifactorial model , they have been quantified , not change during the period, but the average variation from one year to the next during the period. The reason was to achieve consistency between the measurement mode of the dependent variable and the variables explanatorii . This method of measurement was likely to generate extreme values of observations due to abnormalities economic - financial companies in the sample , where some symbols very little liquid . These observations were winsorizate not to affect the results of the model. Here it is worth mentioning that this method of data processing has been applied to all identified outlier but for the extreme , so these data sets have become close in terms of the statistical model used initially .

Conclusions

We have established that the model is statistically robust, as it explains a rather large share of the variation in profitability. The most important aspect that affected the pattern was the presence of abnormalities in the population . Capital market in Romania is still hampered by a lack of liquidity and the presence of companies whose characteristics make it difficult statistical analysis. During the analysis , we found numerous outlier observations, some of them quite extreme . Basically, this means that the sample is divided into two subcategories: blue chip, very " healthy" companies and illiquid companies where the economic abnormalities are capable of interfering with the results provided by the analysis of liquid companies. Basically, there is a possibility for the existence of radically different correlations for a sample composed exclusively of illiquid companies not included in the benchmark indices such as BET -XT .

The results of the present study is in line with other studies in that the factors identified as significant are the same: ROE, MTB and volume are present in many similar studies analyzed. Differences appear at the capitalization factor that was not significant in this work , and the volume variable wich has a negative correlation with profitability.

A possible future direction of study is to analyze companies not included in the reference indices . They are characterized by different correlations between selected factors and return than blue chip companies .

In conclusion, the model is explained a significant part of the variation in profitability actions , but inherent abnormalities of companies listed on BSE are likely to affect the accuracy of the model.

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