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TESTING CAPM MODEL ON THE EMERGING MARKETS OF THE EUROPE

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Abstract: The paper examines if the Capital Asset Pricing Model (CAPM) is sufficient for capital asset valuation on the European emerging markets using monthly stock returns for five countries for the period of January 2008 to December 2013. To be more exact, it is tested if beta, as the systematic risk measure, is valid on observed markets by analyzing are high expected returns associated with high levels of risk, i.e. beta. My intention is to find if the relationship between expected return and risk is linear, if beta is a complete measure of the risk and if a higher risk is compensated by a higher expected return

Keywords: CAPM, European emerging markets, Coefficient Beta, Securities market portfolio, Systematic risk, Unsystematic risk..

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Introduction

CAPM (Capital Asset Pricing Model) was established on the basis of the modern theory of Markowitz portfolios. This model was developed through a theory F.Sharp William (1963 and 1964) and John Linter, is based on the theory of modern portfolios. Over the years, he was awarded the Nobel Prize.

Capital asset pricing model is a linear model of sustainable income through investment of evolving, it shows the expected return on investment through the use of covariance of the overall market. To calculate the level of risk of the securities, as well as the level of risk portfolios towards a overall market CAPM systematic risk is checking the level of influence changes in income assets associated with changes in income combined with a portfolio of securities and units of measurement referred to as the estimated value of beta. This model shows the expected return assets associated with non-diversification risk beta value of expected return and risk-free interest rate shows that between its beta versions have a mutual relationship positive line. Although theoretically the CAPM model is simple and rational, there are some significant limitations to the model which make it not work in practice, as it has been highlighted in many empirical studies. Studying the causes of these restrictions were conducted empirical studies that have found their confirmation.

In particular, for the first time in studies of Black, Scholes and Jens (1972) showed positive interrelated lines of expected revenues and beta. According to the content model securities having a high coefficient beta bring high income. But later research, as well as the most recent one, has shown that the relationship between systemic risk and expected return is not always significant. Therefore

Michailidis, Tsopoglou, Papanastasiou, Mariola (2006) tested this model on the stock market in Greece, which is considered emerging markets and showed that in contrast to the basic hypothetical models expected high income does not expect a high level of risk. Kapil and Sakshi Choudhary (2010) also came to this conclusion by examining the stock market in India. There is an example that confirms the main settings of the model in particular on the basis of research carried out on the stock market in Italy (Canegrati, 2008). Trifan A.L. (2009), an experiment conducted in the stock market A.L. Trifanom Romania in 2009 showed that the regression model has no statistical significance, but despite the results of this test do not give specific facts against the CAPM. Because this experiment was carried out during the global financial crisis, which affected the stock market in Romania. As for Croatia, there is a small number of tests conducted. Fruk and Huljak (2004) tested Sharpe-Lintner model on the Zagreb Stock Exchange and found a positive correlation between income and the beta coefficient, but no results were obtained by using an investment decision beta coefficient. Perković (2011) proving these views revealed that the regression model is not an indicator, so the relationship between beta and income proves nothing. Proceeding from this, given the originality of rapidly growing markets of Europe and a small amount of evaluating the effectiveness of CAPM interesting is the idea that beta is a measure of determining the level of systemic risk in these markets. These studies paved the CAPM stability in the stock markets of developing countries in Europe and in the calculation of the level of systemic risk in these markets has determined that beta is the appropriate units. Below are the countries where the survey was conducted.

This paper explores the viability of the CAPM model in the emerging markets of the European countries and examines whether beta is a suitable measure of risk in these markets. Countries included in the survey were: the Czech Republic, Portugal, Greece, Poland, Italy.

Results and Discussion

2. CAPM MODEL

William F. Sharpe in 1964 and 1965 John Linter developed CAPM (Capital Asset Pricing Model), similar to the risk and expected income ratio being the most simple and easy by providing a definition of efficient portfolio securities, which has the same value as the Markowitz model. This model has proven that there is a positive linear relationship between the amount of income required by the Securities and the contest portfolio. The volume of expected income equal to the amount of income without the risk and the risk premium reflecting diversification.

In determining the risk to the total risk CAPM is divided into two parts:

- **Systematic risk**
- **Unsystematic risk**

Systematic risk is that associated with the market (purchasing power risk, interest rate risk, liquidity risk, etc.).

Unsystematic risk is unique to an individual asset (business risk, financial risk, other risks, related to investment into particular asset).

Unsystematic risk can be diversified away by holding many different assets in the portfolio, however systematic risk can't be diversified (see **Figure 1**). In CAPM investors are compensated for taking only systematic risk. Though, CAPM only links investments via the market as a whole.

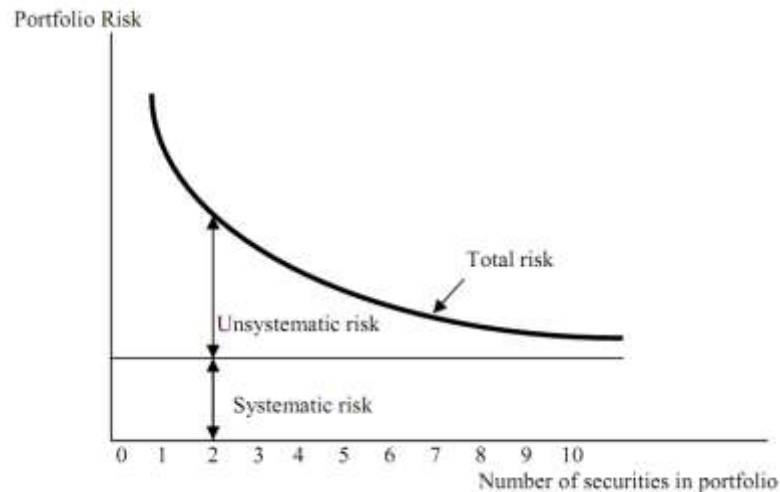


Figure.1. Portfolio risk and the level of diversification

The essence of the CAPM: the more systematic risk the investor carry, the greater is his / her expected return.

The CAPM being theoretical model is based on some important assumptions:

1. All investors look only one)period expectations about the future;
2. Investors are price takers and they can't influence the market individually;
3. There is risk free rate at which an investors may either lend (invest) or borrow money investors are risk) averse;
4. Taxes and transaction costs are irrelevant;
5. Information is freely and instantly available to all investors;

All investors common objective to the volume of income, standard deviation and covariance of the securities. Not only independent risk securities, but also keeping the overall market portfolio CAPM incorporates measurement of systemic risk called beta value. This unit is used to determine the influence of variable yield on the securities markets, changes in income market portfolio. Beta securities considered to be associated controls (system assets), financial resources (capital system) and industry (capital system), or of the company. The equation used for calculating beta for each individual security β_j is as follows

$$\beta_j = \frac{Cov(R_j, R_m)}{\sigma_m^2}$$

$$\text{i.e. } \beta_j = \frac{Cor(R_i, R_m) \sigma_j \sigma_m}{\sigma_m^2}$$

Where R_j is the rate return of security j , R_m the rate of return on the market (rate of return of the market portfolio). Therefore, a stock's beta depends on the “stock’s correlation with market”, own variability – standard deviation (σ_j) as well as on the variability of the market (σ_m)

For the securities for which: (see **Table 1**)

Table 1

Interpretation of coefficient Beta (β)

Beta	Direction of changes in security's return in comparison to the changes in market's return	Interpretation of β meaning
2,0	The same as market	Risk of security is twice higher than market risk
1,0	The same as market	Security's risk is equal to market risk
0,5	The same as market	Security's risk twice lower than market risk
0	There is no relationship	Security's risk are not influenced by market risk
Minus 0,5	The opposite from the market	Security's risk twice lower than market risk, but in opposite direction
Minus 1,0	The opposite from the market	Security's risk is equal to market risk but in opposite direction
Minus 2,0	The opposite from the market	Risk of security is twice higher than market risk, but in opposite direction

The fundamental equation defines the relationship between securities or portfolios, as well as the expected amount of income from the expected market risk. $E(R)$ the number of expected income exactly the amount of risk-free interest rate (R_f), they are made through premium risk (RP) shown in this article.

$$E(R) = R_f + RP$$

or the equation

$$E(R) = R_f + (R_m - R_f) \beta$$

here:

$E(R)$ - expected return on stock;

R_f - risk free rate of return;

R_m - expected rate of return on the market

β -coefficient Beta, measuring undiversified risk of security

Several of the assumptions of CAPM seem unrealistic. Investors really are concerned about taxes and are paying the commissions to the broker when buying or selling their securities. And the investors usually do look ahead more than one period. Large institutional investors managing their portfolios sometimes can influence market by buying or selling big amounts of the securities. All things considered, the assumptions of the CAPM constitute only a modest gap between the theory and reality. But the empirical studies and especially wide use of the CAPM by practitioners show that it is useful instrument for investment analysis and decision making in reality.

3. CAPM TESTING

3.1. Testing the relation between beta and return

Stocks are selected in the sample according to their share in the official stock exchange indices of the observed countries. 8 most liquid stocks will be considered for each market, taking into account the weight of stocks within a particular stock market index. The data were taken from the investing.com website for the period from 1st January 2008 to 31st December 2013. The sample of shares for selected countries is shown in **Table 2**. For the Czech Republic the sample is reduced due to insufficient number of shares in the official stock index traded in the last six years.

Cross section testing using MS Excel spreadsheet program will be used in testing the CAPM model in particular stock market, where, based on the return on 5 stocks, the expected yields and the betas of the corresponding stocks will be calculated. As a substitute for the market portfolio, official stock market index will be used. After that, the regression analysis of expected returns on stocks and their betas will be carried out using the software package SPSS.

Table 2: Share sample for each of the observed markets

Czech Republic (PX)	Greece (Athens General-Composite)	Poland (WIG20)	Portugal (PSI 20)	Italy (FTSE MIB)
VIGR	OLTr	ACPP	ALSS	ATL
CETV	HDFr	PEO	BBPI	BAPO
ORCO	MTKr	BZW	EDP	BZU
ERST	DEHr	EUR	ESF	DIAS

SPTT	SRSr	LTSP	GALP	ENI
BKOM	OLPr	KGH	IMPA	GASI
PGSN	HRMr	LPPP	JMT	GTCH
UNPE	FRIr	MBK	NOS	LUX

In order to test the validity of the CAPM model on each stock market it is necessary to calculate the expected rate of return and beta of each stock. The following equation is used for calculating the expected rate of return of the stock X:

$$E(R_X) = \frac{\sum_{t=1}^M R_X(t)}{M}$$

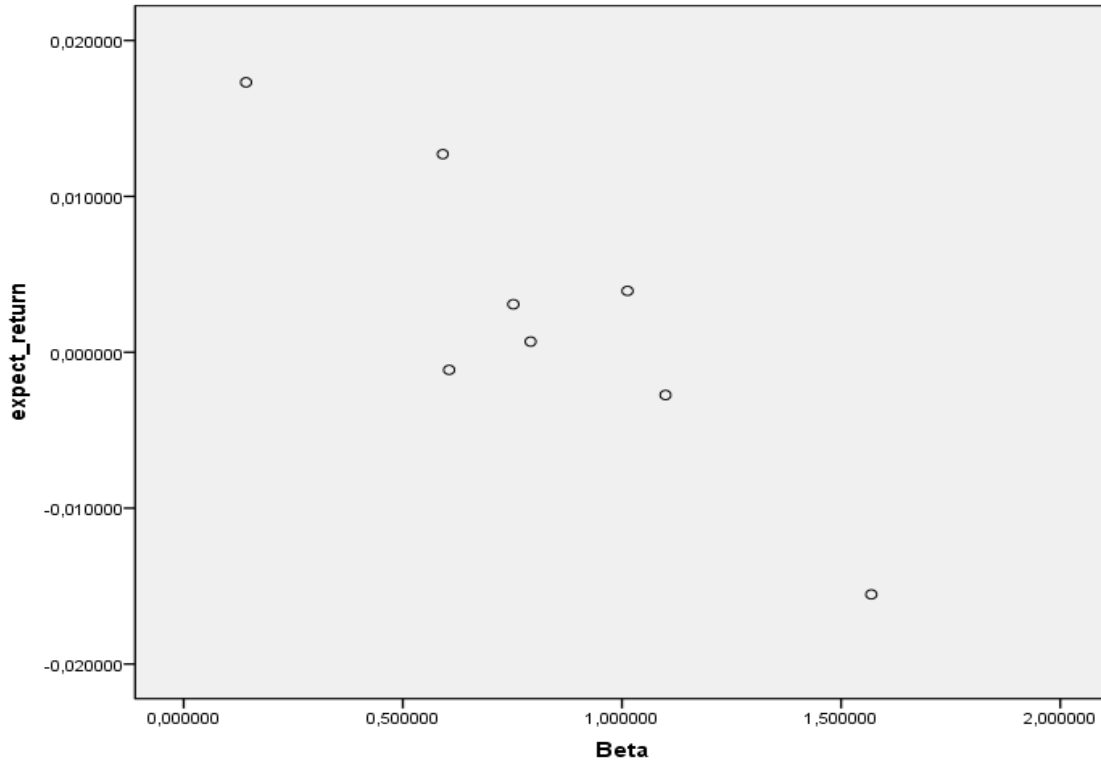
where M is the number of observed data, in this case number of monthly rates of return of the security X. Equation for calculating beta is:

$$\beta_x = \frac{Cov(x, M)}{\sigma_m^2}$$

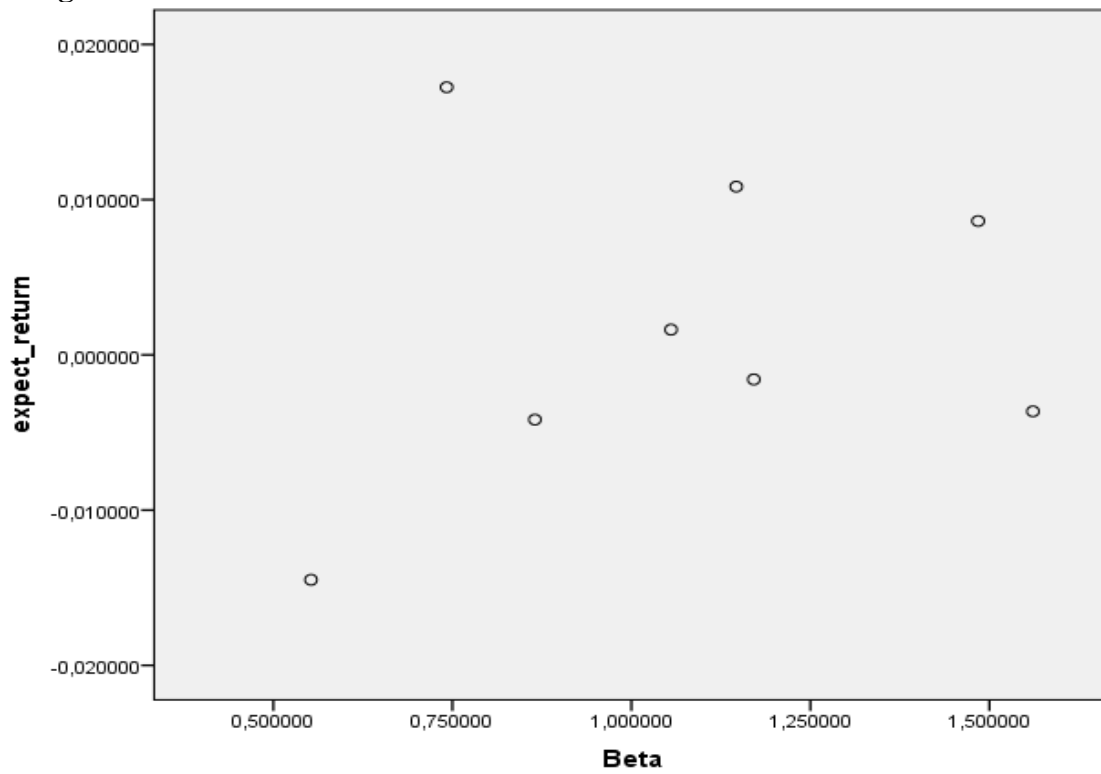
Where Cov (x, M) is the covariance of the security x and the market portfolio and σ^2 is variance of the market portfolio.

After the expected return and beta have been calculated, in order to test the relatedness, i.e. analytical mathematical form of relationship between beta and expected returns, regression analysis is carried out of the expected return as the dependent variable of the regression line and beta as the independent variable. Scatter diagrams for all nine countries show that there is no correlation between the observed variables, which can be seen in **Figure.2**.

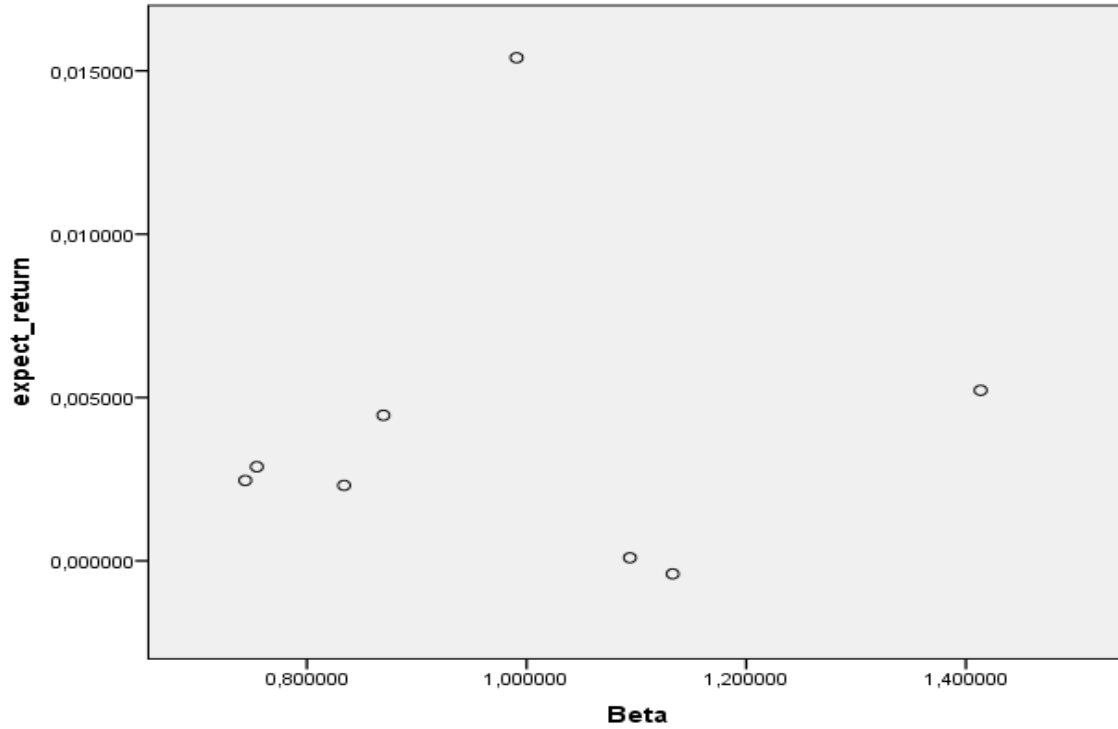
Italy



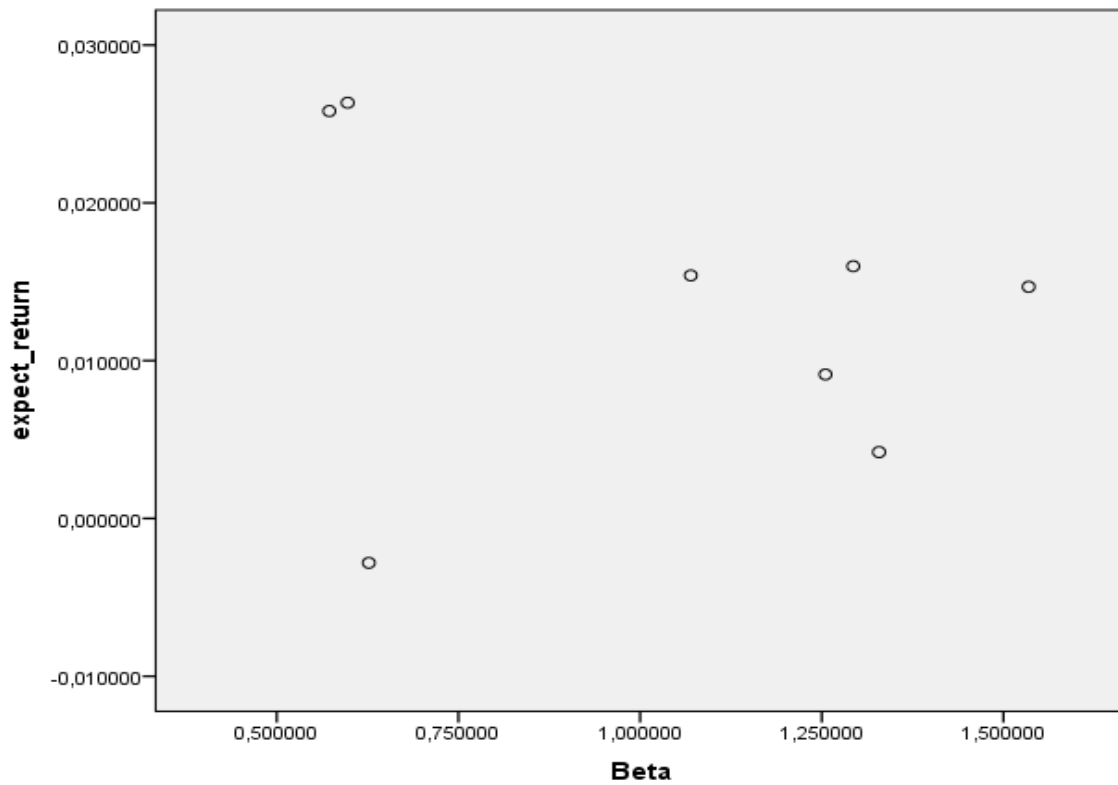
Portugal



Greece



Poland



Czech Republic

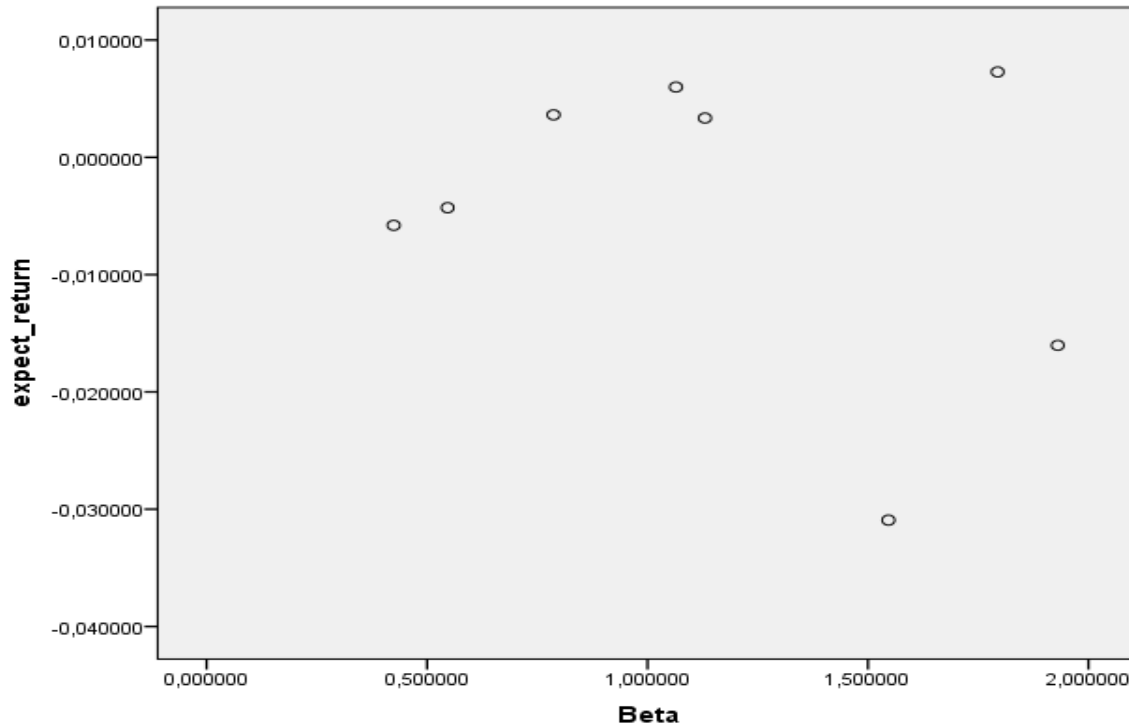


Figure 2: Scatter diagrams of the expected return and betas in the observed markets

Since the scatter diagram suggests that there is correlation between the observed phenomena because there is imaginary line that runs between the points on this graph, we can conclude that there is correlation between the observed variables because one can define whether the increase in one variable follows the growth observed variables. **Table 3** shows the basic data in the evaluated model for all nine markets.

Table 3. Basic data for the evaluated model

	Italy	Portugal	Greece	Poland	CzechRepublic
R	0,6433	0,5961	0,6844	0,6323	0,6618
r^2	0,4570	0,3665	0,4713	0,4235	0,4565

We can see that the relationship between beta and expected return measured by the linear correlation coefficient is not positive and not weak in all countries the coefficient of determination has shown that the model is representative.

Conclusion

In conclusion we can say that after checking all the six countries regression model was an example, as well as giving the opportunity to appeal to the CAPM in these markets are considered problematic became a model, except that we can come to the conclusion that the possibility of an

appeal to the CAPM in distressed markets has statistical value. Test results showed that in the rapidly developing European stock markets stock market valuation of assets is considered appropriate. At a cost of using beta regression analysis on risk measurement, it became clear, high income is not high beta. They may not be appropriate means when measuring risk markets.

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