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EMPIRICAL TESTS OF CAPITAL ASSET PRICING MODEL (CAPM) IN THE HUNGARIAN CAPITAL MARKET

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Abstract

The results of empirical tests of Capital Asset Pricing Model (CAPM) in the Hungarian capital market is presented in our paper. The outcomes are based on monthly data of 17 Hungarian companies listed in the Budapest Stock Exchange (BSE). The recently developing Hungarian capital market has required a meticulous care in the methods of examinations than that in case of international markets. Therefore a significant part of the article deals with the exploration and solution of these problems. The CAPM acceptably describes the Hungarian capital market, however, comparing the same results for capital markets with a great past ours shows a much weaker representation of the reality.

Keywords: CAPM, portfolio theory, structure of capital, empirical tests, Hungarian capital markets, MSCI

1. Introduction

Applying the portfolio theory of Herry Markowitz in practice, first of all the expected values of portfolio return and their standard deviation would have to be determined. The expected value of the portfolio returns can easily be estimated using the formula below (*Eq.* (1))

$$E[r_p] = \sum_{k=1}^{N} x_i E[r_i], \tag{1}$$

where

$E[r_P]$	represents the expected return of the portfolio,
$E[r_i]$	is the expected return of security i,
x_i	identifies the weight of security i in the given portfolio and
N	represents the number of securities in the portfolio.

Determination of standard deviation (or variance) of a portfolio requires the full knowledge of stochastic system of dependence of securities. The next relation (*Eq.* (2)) expresses this in a proper way

$$\sigma_P^2 = \sum_{k=1}^{N} x_i^2 \sigma_i^2 + \sum_{k=1}^{N} \sum_{l=1}^{N} x_k x_l \sigma_k \sigma_l k_{kl}, \tag{2}$$

where

σ_P represents the standard deviation of the portfolio,
σ_i is the standard deviation of security i, while
k_{ij} identifies the correlation coefficient between security i and security j.

One could feel that a lot of estimations of correlation coefficient are required, which in practice cannot be solved unless (with the use of computer simulation) correlation matrices of past data are projected to the future. The disadvantage of this method is that it does not tolerate any kinds of subjective element or correction, since impounding these data into the process the positive semidefinite criteria of correlation matrix, thus, a non-existing structure of correlation be yielded (ANDOR, 1994).

1.1. Market Models, Index Models, Capital Asset Pricing Model

One of the most important problems to solve in case of models aimed at using in practice are to avoid the estimation problems of correlation structure. Market models use only a supposition of linear relationship between returns of securities and returns of the whole market. This can be represented by *Eq.* (3)

$$r_i = \alpha_i + \beta_i r_M + \varepsilon_i, \tag{3}$$

where

r_i represents the return of a security or portfolio,
r_M is the return of the market,
r_M and ε_i are random variables with zero correlation coefficient, while
β_i represents the sensitivity of security returns to market returns.

In case of the most wide-spread one-factor capital asset pricing models there is another restriction usually stated, that the inclination of accompanied changes of security returns only caused by a general index. By the mathematical composition of the above mentioned restriction is that ε_i is independent of i and j for any arbitrary value, thus,

$$k_{ij} = 0. \tag{4}$$

It is well-known that the β of a well diversified portfolio in any case of one-factor model is equal to the β_i's of the included securities, thus,

$$\beta_P = \sum_{i=1}^{N} x_i \beta_i. \tag{5}$$

The multi-index models are worth to mention, they are usually mentioned as the more complex alternatives of one-factor models. In case of multi-index models there could be more than one factor cause the accompanied changes of security

returns. It is not a question that these models many times give a more realistic result than one-index models do. However, surprisingly there are occasions when the opposite situation can be noticed while the one-index models are much simpler (ELTON and GRUBER, 1995). In this paper we do not deal with multi-index models.

The Capital Asset Pricing Model is the most general form of one-factor equilibrium models. It demonstrates through the behaviour of investors to which equilibrium price the capital market tends. As a basis of this process it indicates the market portfolio as the only index, which demonstrates the whole market. This model beside the definition of relevant risk, defines the relationship between the expected return and risk (in case of market equilibrium). Above the previously mentioned – and this presents the most important practical worth – one could deduce from the model what is the most suitable way to design portfolios. Numerous subtypes of CAPM are known, however, beyond this point the article will only deal with the standard, one-factor CAPM. Its basic relationship can be expressed in the following way:

$$r_i = r_f + \beta_i (r_M - r_f) + e_i, \tag{6}$$

where

r_f represents the risk-free return of investment.

Finally, the CAPM expresses a relationship between expectations, therefore the expression relating to expected values:

$$E[r_i] = r_f + \beta_i (E[r_M] - r_f). \tag{7}$$

The above equations could be deduced from the one-index model if the boundary conditions of the "CAPM-world" are fulfilled. These boundary conditions are:

1. Risk aversion, rational and at the same time utility maximising behaviour of investors (in a way of Neumann – Morgenstern).
2. Returns of securities are normally distributed.
3. All securities (or financial assets) are marketable, so they can be sold and bought on the market.
4. Assets are infinitely divisible.
5. There are no transaction costs.
6. The absence of personal income tax (the major results of the model would hold if income tax and capital gains taxes were of equal size). I.e. The taxes and legal regulations have no influence on investor preferences.
7. An individual cannot influence the price of a stock by his selling or buying action.
8. Investors are expected to make decisions solely in terms of expected values and standard deviations of the returns on their portfolios.
9. Assumption of unlimited lending and borrowing at the risk-free rate.
10. Homogeneity of expectation. Investors have identical expectations with respect to the assets.

2. Empirical Tests of CAPM

The validity of standard CAPM on the Hungarian capital market is investigated in this paper in the period from 1st of June 1994 to 31st of June 1999. When the model is examined of course the simplified reality is estimated, therefore it looks obvious to merge practice and theory. In case of testing the CAPM the forecasts of the model compared to actual prices return while the model formulates the relationship of expectations, all variables involved are related to the future. Since large-scale systematic data on expectations do not exist, almost all tests of the CAPM have been performed using ex-post or observed values for the variables. This raises the question of how one justifies testing an expectational model in terms of realisation. The ex-post testing of ex-ante expectations is based on the argument, which states that the expectations on average are correct. Consequently, the actual data of a longer time interval has to get closer to the (previous) expectations. Furthermore, it has to be assumed that the Beta's of the securities are stable in time, and that the attitude of investors to risk is again steady in time.

There are different levels at which the relation between the model and reality can be tested in case of CAPM. In the first level the hypothesis of that higher risk (Beta) should be associated with a higher level of return tested. The second hypothesis is that returns are linearly related to Beta; that is , for every unit of Beta increase, there is the same increase in return. The third is that there should be no added return bearing nonmarket risk.

3. Questions of CAPM Tests in the Hungarian Capital Market

3.1. Requirements for Data Correction

The biggest problem of model testing is the lack of huge amount of data. From the ten years old Hungarian capital market just too few useful data are available. In this ten years the whole system of market had to be developed, so-forth the data obtained in the early years contain many distortion factors of the improving political, financial and market era.

Most tests relating to scientific literatures examine monthly returns in an interval of 60 months back. Usually more portfolios are investigated processing 40–50 securities per portfolio. The securities should be selected from more sectors, paying attention to the company behind the security should (activity, structure if capital) not change through the investigated period of time, and at last if there were any changes occurred then these changes must extinguish each other inside the portfolio. The required database cannot be collected form the Hungarian market, therefore the reliability of our analyses lag behind the international ones.

Because of the "weakness" of our database a much more meticulous correction of data is required than can be found in the literatures. Besides the usual data corrections of (dividend yield, split of nominal value) the strong change of capital

structure in case of domestic companies has to be examined. These variations have to be filtered out. It has to be mentioned that this process is unnecessary in case of properly large portfolios.

3.2. Corrections of Capital Structure Changing

The annual reports – prescribed by Generally Accepted Accounting Principles/Practices (in Hungary the Law of Accounting) or – give the opportunity to follow the structure of company capital structure. Although it is compulsory to publish these annual reports, the used accounting standards for the determination of different data show significant differences in many extents. Most of the companies use the international standard (International Accounting Principles: IAS) based calculations and the balance sheet and income statement are derived and published using the mentioned accounting system. However, we can frequently meet company data published based on the Hungarian Accounting Standard (HAS). In the latter case further problems occur because of non-systematic changes of the Hungarian accounting regulations in the examined time interval, however, it has to be mentioned that these regulation changes were motivated by the efforts of joining the European Union, which has take our regulation closer to the 4th Directive of the EU (which states the accounting regulations inside the EU). The different types of accounting systems are resulted in different numbers in the balance sheets and income statements. The differences are presented in *Table 1*, which summarises the disagreements between the international and Hungarian Standards.

Table 1. Some of the differences found between the accounting standards (Price Waterhouse, 1997, KPMG, 1998 in Részvények könyve)

Subject	IAS	US GAAP	UK GAAP	MSZSZ
Contents of financial statements	Two years' balance sheets, income, comprehensive income and cash flow statements, changes in equity, accounting policies and notes.	Comparable to IAS, except three years required by SEC for all statements except balance sheet.	Comparable to IAS.	Two years' balance sheets, income statements, cash flow statement, supplementary notes, business report.
Accounting convention	Historical cost, but some assets may be revalued.	No revaluation, except some securities at fair value.	Comparable to IAS.	Historical cost, a restricted number of assets may be revalued.
Changes in accounting policies	Either restate comparatives (and prior year opening retained earnings) or effect in current year income.	Account for in current year income statement.	Restate comparatives and prior year opening retained earnings.	Two years to step back. Restate comparatives.
Definition of associate	Based on significant influence: presumed if 20% interest or participation in entity's affairs.	Broadly comparable to IAS.	Based on actual exercise of significant influence.	Broadly comparable to IAS
Presentation of associate result	Use equity method. Show share of post-tax result.	Comparable to IAS.	Use equity method. Pre-tax result and tax shown separately.	Broadly comparable to IAS.
Equity method or proportional consolidation for joint ventures	Depends on from of JV-both equity method and proportional consolidation permitted for jointly controlled entities.	Generally use equity method; use proportional consolidation in very limited circumstances, such as oil and gas ventures.	From 1998 comparable to US GAAP.	Use equity method, but only loss can be accounted (form the investor). Use of equity method or at first consolidation book value (consolidated annual report)

Purchase method – fair values on acquisition	Fair value assets and liabilities of acquired entity. Certain closure costs considered in fair value exercise; recent proposals would restrict this.	Broadly comparable to IAS but must allocate value to all intangibles. Certain plant closure and restructuring costs of acquired entity may be provided in fair value exercise.	Broadly comparable to IAS except take no account of acquirer's intentions in determining asset values or provisions.	Cost centred valuation with restricted possibility for revaluation
Goodwill	Capitalise and amortise over useful life, normally not longer than 5 years, with maximum of 20 years, Recent proposals include reputable presumption of 20 year useful life.	Capitalise and amortise over useful life, with maximum of 40 years.	Usually eliminated against reserves. From 1998 must capitalise and amortise over useful life, normally up to 20 years, but very exceptionally longer or indefinite life.	Capitalise and amortise over useful life, with minimum of 5 years and maximum of 15 years.
Negative goodwill	Allocate to non-current, non-monetary assets. Defer excess; amortise as for goodwill. Alternatively defer full amount and amortise. Proposals under discussion.	Generally similar to first treatment under IAS: amortises excess over no longer than 40 years.	Currently credit directly to reserves. From 1998 amortise to match deprecation of non-monetary assets; any balance is amortised over period likely to benefit.	Allocate to the purchased assets, amortise as for goodwill.
Foreign entities within consolidated financial statements	Use closing rates for balance sheets; average rate for income statements. Track exchange differences in equity and include in gain on disposal of subsidiary.	Comparable to IAS.	Use closing rate for balance sheets; either average or closing rate for income statements. Take exchange differences to STRGL; not included in gains on disposal.	Use closing rates for balance sheets, revaluation only in case of loss .
Intangible assets	Current rules minimal. Recent proposal is to capitalise if definition of an asset met; intangible assets must be amortised over useful life, normally no longer than 20 years.	Capitalise purchased intangible assets and amortise over useful life, no longer than 40 years.	Current rules minimal. From 1998 capitalise if definition of an asset met. Amortise over useful life, normally no longer than 20 years, but very exceptionally longer or indefinite life.	Capitalise purchased intangible assets and amortise over useful life, no longer than 15. years of goodwill, R&D maximum of 5 years etc..

Inventories and long-term contracts	Carry at lower of cost and NRV; FIFO, LIFO or weighted average method to determine cost. Recognise long-term contract revenues/profits using percentage of completion method.	Broadly comparable to IAS-more common use of LIFO. Use completed contract method for long-term contract accounting in limited circumstances.	Comparable to IAS, except that LIFO method not permitted.	Broadly comparable to IAS
Contingencies	Accrue probable losses; disclose probable gains. Recent proposals to disclose possible gains.	Broadly comparable to IAS.	Comparable to IAS.	The possibilities are taxatively enumerated in the standard.

For the companies where it was available the consolidated annual reports based on the IAS have been used (most of the companies in Hungary publish this type). In case of some companies (Dunaholding, Egis, Human, Ibusz) the MSZSZ based annual report was only available therefore these have been used for our analyses.

The detailedness of company reports is found to be significantly different from each other. Besides the well-detailed balance sheets sometimes a "four-row" combined account could have been found. The main problem occurred when the short and long term liabilities were not detailed.

The essence of our correction process was the correction of company stock returns according to the capital structure presented in the 1997 annual reports. The process is based on the constancy of Weighted Average Cost of Capital: WACC in a way that for first the returns were recalculated for 100% equity (like financing all activities of the company fully from the shareholder's equity) – on the basis of capital structure of the given time interval. Then the results of recalculation were used to compute the stock returns on the basis of the equity-debt ratio presented in the 1997 annual reports (using 8% cost of debt in US Dollar (USD)).

It can be seen that the correct determination of equity-debt ratio was a crucial point in the correction process. Another problem can be identified dealing with the debt. Both short and long term debt classes include elements (accounts) which have no costs associated with or only with a superficial look could be grouped to an equal cost associated class of debts. This is especially true for short term debt, where the accounts payable deposit is received from buyers (most cases these have a very high weight in the liabilities) which have a zero cost of debt - no interest is paid in consequence of these accounts. If the short and long term debt were not divisible in terms of cost bearing and non-cost bearing debt then the weighting of debt and equity would not fully have been reflecting (modelling) the reality, thus, could have given only an approximating solution.

The question of contingencies has to be separately mentioned. The contingencies are liabilities, which are created in charge if the Earnings Before Interest

and Tax (EBIT) by definition, so it formulates the transformation between shareholder's equity and debt. From the definition one can (easily) derive that the cost of contingencies has to be equal to the cost of equity, therefore the weight of equity (in the WACC) was increased by the value of contingencies. (It has to be mentioned that the creation of contingencies is more strictly regulated by the IAS than that in the MSZSZ. However, analysing the published balance sheets of companies the contingencies are heavily examined in case of IAS used firms, while in most cases they are not represented on an individual account only in a combined row.)

The weighted average cost of capital would bring hardly acceptable results in case of banks. This is caused by their operation, since the equity debt ratio represents a totally other thing than that in case of an industrial or commercial company. The bank deposits (passives) are presented in the liabilities, while the bank credits (actives) among the assets. The bank deposits have a distinct cost (unlike the account payables). The question of short and long term debt makes it more complicated, since their costs are far from equal. The equity debt ratio means a totally different thing than in case of other type of companies, because the debts insure the safe operation of a credit institution. By the above mentioned in case of banks (OTP, Inter Európa Bank) the corrections connected to the capital structure were not applied.

In the correction process the equity-debt ratio in every year was corrected on the basis of the annual report of the previous year and it was considered to be constant through the year. Obviously the possibility was given to apply a linear change in the capital structure year by year, however, by our opinion the equity debt ratio is more likely changing suddenly stepwise than in a continuous linear way. This is why the second solution was accepted. Another reason for the stepwise changing of the ratio is that the accounting standards give one year valuation period, and by the regulation of the BET require consolidated statements only once a year, therefore the published quarterly reports are not acceptable for our analyses.

3.3. Choosing Market Portfolio

The other main problem comes from choosing the proper market index. Theoretically, with the chosen index the market portfolio – which aggregates the whole market – should be approximated. However, the suggestion of literature frequently does not point towards this. The analyses covering mainly the American market mostly are satisfied with acceptation of S&P500, Dow Jones Industrial Average (DJIA), New York Stock Exchange (NYSE) or other stock exchange indices as market portfolio. However, they had a good reason to do so, since the capitalisation of the American capital market is about one third of the whole world, and in addition a typical American investor avoids to invest into foreign financial asset. This is not true for the Hungarian capital market, therefore applying the BUX as market portfolio would be far from a well-established practice.

Surmounting of the market portfolio difficulties three different variations were

examined. Besides the obvious solution of the application of BUX, the most general US stock index the NYSE was applied (as it is usual in scientific papers). In the third approach a "world-portfolio" was chosen to represent the market: this is the aggregate world index created by the Morgen Stanley Capital International (MSCI).

3.4. MSCI World-Index as "World Portfolio"

The theoretical background of the CAPM is market portfolio which includes all securities, financial and other assets with their weight on the market. A practical approximation of the theory is the MSCI world-index. The world portfolio represents the total market value of all stocks (or bonds or any financial or non-financial instruments) that an investor would own if he or she bought the total of all marketable stocks on all the major stock exchanges, and as it was mentioned the MSCI gives a good approximation to this theory. In the methodology of aggregate index calculation of the 1969 established Morgen Stanley Capital International one can discover the above mentioned aims.

The represented number of national capital market in the MSCI Indices in 1969 was 16 whereas this number increased for today to 51 countries. The MSCI Indices are calculated using the Laspeyres' concept of a weighted arithmetic average together with the concept of chain-linking. The MSCI calculates individual indices for all represented countries and the average of these by a weighting factor of their market share gives the aggregate world-index. The general index calculation formula can be seen in *Eq.* (8)

$$\text{Index level}_{\text{at time } t} = \text{Index level}_{\text{at time } t-1} * \frac{\sum_{i=1}^{n} \text{Price}(i)_t * \text{number of shares}(i)_{t-1} * ADJ(i)_t}{\sum_{i=1}^{n} \text{Price}(i)_t * \text{number of shares}(i)_{t-1}}. \quad (8)$$

This formula shows the previous period's index value multiplied by the change in (adjusted) market capitalisation, where,

t	time of calculation
n	number of securities in index at time t
ADJ_t	adjustment factor ADJ_t adjusts the market capitalisation of each security for corporate actions such as stock splits, stock dividends, cross-ownership (keiritsus) and rights issues. Of course, the local indices are available in local currencies as well as in USD.

Table 2 presents the percentage that each nation's equity securities represented in the world portfolio in 1998, in terms of market capitalisation.

The reasonability to hold the world portfolio (i.e. the international diversification) can be deduced from *Table 3* where the correlation between returns on local capital markets are summarised. It can be seen that by international diversification the risk can be reduced by a significant amount.

In connection to the regional capital markets the problems caused by the national currencies have to be mentioned. The conversion is based on the next relationship (*Eq.* (9))

$$(1 + r_{\mathrm{USD}}) = (1 + r_x)(1 + r_{x/\mathrm{USD}}), \tag{9}$$

where

r_{USD}	represents the return in USD,
r_x	is the return in other currency,
$r_{\mathrm{USD}/X}$	represents the variation of exchange rate of the local currency with respect to USD.

Analysing the above expression it can be seen that the return of foreign (from point of the US) investment is determined commonly by the change of currency of the given country together with the change of the "equivalent" currency (USD).

With the acceptation that of the exchange is sufficient we have to accept the existence of purchasing power parity, thus, we accept the identity of real returns. The doctrine of purchasing power parity expresses that the exchange rate corrected price of goods and financial instruments has to be equal on the competing markets (taking into consideration the cost of information and transaction). Accepting this approach the problem caused by the different inflation rates of currencies is filtered out (i.e. solved), or to be more precise the inflation rates of different currencies are corrected to the inflation rate of USD. Following the theory of purchasing power parity the next expression can be formulated (*Eq.* (10))

$$1 + r_{x/\mathrm{USD}} = \frac{X_0/\mathrm{USD}_0}{X_1/\mathrm{USD}_1} = \frac{P_{\mathrm{USD}_1}/P_{\mathrm{USD}_0}}{P_{X1}/P_{x0}} = \frac{1 + r_{\mathrm{USD\,inf}}}{1 + r_{X\,\mathrm{inf}}}. \tag{10}$$

Eq. (9) was written in terms of nominal values, resolving this based on the Fischer-relation, and substituting into *Eq.* (10):

$$\begin{aligned}
(1 + r_{\mathrm{USD\,real}})(1 + r_{\mathrm{USD\,inf}}) &= (1 + r_{x\,\mathrm{real}})(1 + r_{x\,\mathrm{inf}})(1 + r_{x/\mathrm{USD}}), \\
(1 + r_{\mathrm{USD\,real}})(1 + r_{\mathrm{USD\,inf}}) &= (1 + r_{x\,\mathrm{real}})(1 + r_{x\,\mathrm{inf}})\frac{1 + r_{\mathrm{Usd\,inf}}}{1 + r_{x\,\mathrm{inf}}}, \\
(1 + r_{\mathrm{USD\,real}}) &= (1 + r_{x\,\mathrm{real}}).
\end{aligned} \tag{11}$$

Thus, holding (investing into) the world-index i.e. considering the world-index as the market portfolio of CAPM seems to be obvious. The theoretical boundaries of the world-index application have to be declared. In general, it can be stated that there does not exist yet a fully liberalised and unsegmented capital market. There are several explanations why (in detail see EITMAN et al., 1998), only some examples are mentioned like the information barriers (caused by lingual, accounting differences etc.), additional transaction costs (additional expenses caused by taxation, subscribing costs, etc.), regulation barriers (protection of national markets renders the simple flow foreign capital through frontiers), political risk (differentiation in legal regulation for domestic and foreign investors), etc.

Returns of the Hungarian capital markets expressed in Hungarian Forint (HUF) exchanged the USD using the exchange rate published by the Hungarian National Bank (MNB). This has given an insignificantly small (1–5‰) deviation from the exchange rate used by Morgen Stanley Capital International.

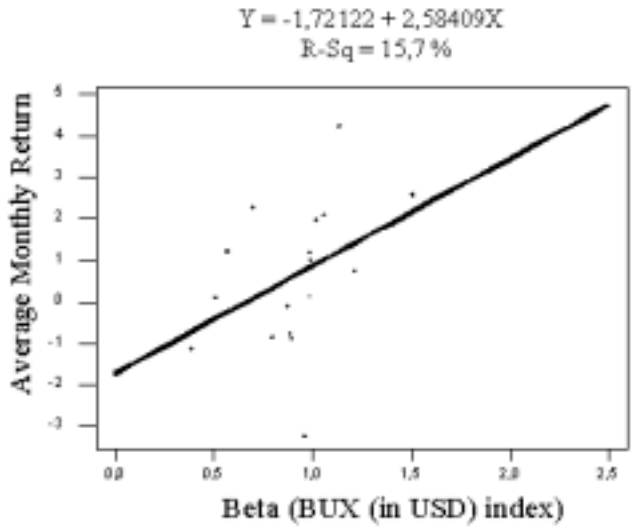

Fig. 1. Empirical CAPM with Beta's determined by the regression relation to the BUX

4. The Data

Our analyses are based on the data collected in the period of 31st of July 1991 to 1st of June 1999. The database of the study was the *Andor-Ormos-Szabó: International and Hungarian Capital Market Database (Technical University of Budapest, 1999)*. This database in addition to the full Budapest Stock Exchange Price Index (BUX) data set contains the daily and monthly price and volume data for 17 Hungarian companies (BorsodChem, Danubius, Egis, Fotex, GraboPlast, Humán, Ibusz, InterEurópaBank, MOL, OTP, Pick, PannonPlast, Prímagáz, Richter, TVK, Zalakerámia, Zwack). These data were available by the Fornax and by the Journal of Hungarian Capital Markets. The major part of the international database was built on the collection of American public data. For the representation of the "world-economy" the aggregate world-index of Morgen Stanley Capital International (MSCI) was chosen. The database of the world-index was also a result of

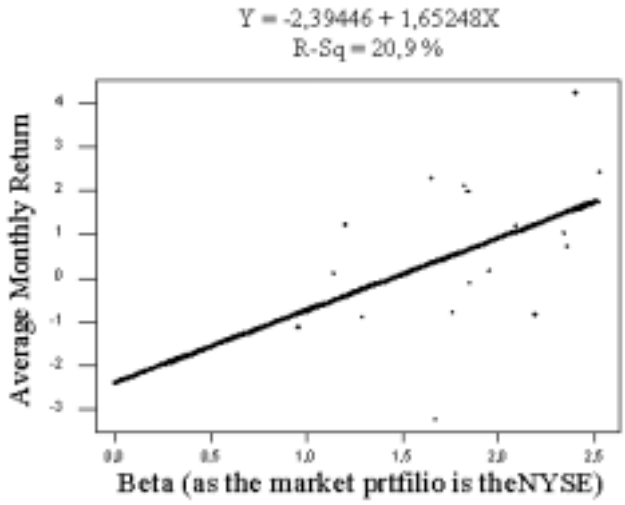

Fig. 2. Empirical CAPM with Beta's determined by the regression relation to the NYSE

independent collection of public data. The database also contains daily foreign exchange rates, which were partly individual collection, partly granted by the Reuters.

All data in the database on Hungarian companies were corrected by dividend paid and by the splits of nominal value and in this way they give the basis of our analyses. The returns of the shares and indices (on the base of corrected data) were determined for the above-mentioned period in Hungarian Forint (HUF) as well as in USA dollar (USD). The returns were calculated by continuous compound interest (ANDOR, 1999).

5. Results of the Empirical Tests of CAPM

After the preparation of data (using the above mentioned method) the regression analyses can easily be completed. First the ex-post relationship between the company Beta's and their average returns were analysed, in this case the company Beta's were calculated using monthly returns of the BUX (in USD) as the market portfolio. This is represented in *Fig. 1*.

Fig. 2 represents the empirical CAPM relation determined on the basis of the stochastic relation with the NYSE:

At last *Fig. 3* represents the same relationship using MSCI world-index as

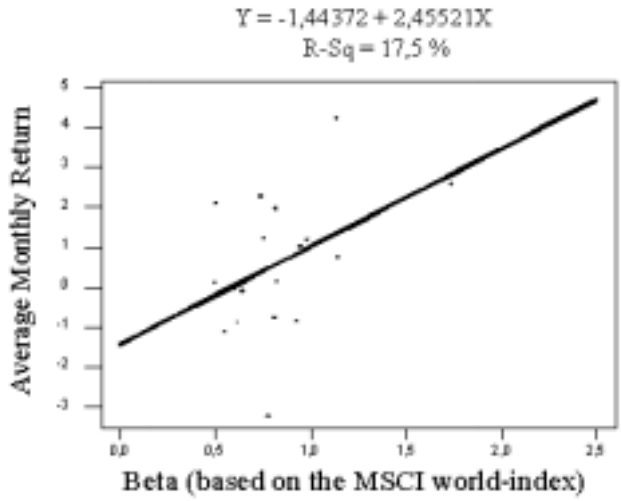

Fig. 3. Empirical CAPM with Beta's determined by the regression relation to the MSCI world-index

market portfolio.

The three figures above show a relatively uniform (similar) behaviour. In all the three cases one can easily discover the positively correlated relationship between the Beta's and (ex-post) returns. Thus, the CAPM seems to be appropriate.

The three results are not as obvious in sense of the Beta feature of absolute explaining (together with the question of linearity) as they were in the previously mentioned case. In our case the value of determination coefficient (R-Sq on the figures) was about 15–20% which cannot be stated as high. The literature reports for the same kind of analyses (DAMODARAN, A., 1998.; ELTON and GRUBER, 1995, etc.) much higher value of determination coefficient (the 90% is not rare), although the database in their case is much bigger. In our opinion the results obtained are not only caused by the "weakness" of the database. A considerable reason could be that the holders of securities are very heterogeneous from the point of view of portfolio creation. The securities of the Hungarian companies are held approximately 50% by Hungarian and 50% by foreign investors. It seems to be possible that an exact "order" could not be shaped according to any index associated with different groups of investors. The pricing of the international investors together with the domestic investors (on a world scale they have a very segmented investing behaviour) could

be the cause of the strange results.

Only to reflect on those declarations, which state that the Hungarian capital market is “chaotic”, that none of our results can establish these statements. Rather our results show that the effects of operation of other capital markets in the world could be felt.

6. Conclusions

The “reality explaining” ability of the CAPM in Hungary stays behind than that could have been experienced on the capital markets of developed countries. Although most of the features could have been measured on the Hungarian capital market as well. It is hard to determine whether the presence of too few data, the application of data correction, the effect of definitely divided investors or only the generally undeveloped domestic capital market cause the moderate results obtained by the CAPM. It is a question whether it is a moderate result or not that the simplest market model, where numerous theoretical boundary conditions had to be satisfied, gives a final result so close to reality even in this tiny region of the world.

Table 2. Comparative Size of World Equity markets in USD (from Morgen Stanley Capital International: Methodology and Index policy, 1998)

MARKET	Total Est. Mkt Cap USD MM	Weight in the Total Market	Weight in the developed market	MSCI Index Mkt Cap USD MM	Weight in the Total MSCI Market	Weight in the developed MSCI market
AUSTRALIA	322134	1.48%	1.64%	177637	1.29%	1.40%
AUSTRIA	38224	0.18%	0.19%	25254	0.18%	0.20%
BELGIUM	134419	0.62%	0.68%	72729	0.53%	0.57%
CANADA	554724	2.55%	2.82%	323258	2.35%	2.54%
DENMARK	89343	0.41%	0.45%	64721	0.47%	0.51%
FINLAND	87550	0.40%	0.45%	53519	0.39%	0.42%
FRANCE	649363	2.99%	3.30%	449793	3.27%	3.54%
GERMANY	821893	3.78%	4.18%	583541	4.24%	4.59%
HONG KONG	448728	2.06%	2.28%	235982	1.72%	1.86%
IRELAND	47727	0.22%	0.24%	23652	0.17%	0.19%
ITALY	321045	1.48%	1.63%	229699	1.67%	1.81%
JAPAN	2834178	13.04%	14.41%	1864205	13.55%	14.66%
MALAYSIA	150193	0.69%	0.76%	79577	0.58%	0.63%
NETHERLANDS	484718	2.23%	2.46%	342566	2.49%	2.69%
NEW ZEALAND	36821	0.17%	0.19%	21747	0.16%	0.17%
NORWAY	72266	0.33%	0.37%	37800	0.27%	0.30%
SINGAPORE	124329	0.57%	0.63%	66895	0.49%	0.53%
SPAIN	232597	1.07%	1.18%	161909	1.18%	1.27%
SWEDEN	296483	1.36%	1.51%	173311	1.26%	1.36%
SWITZERLAND	540427	2.49%	2.75%	421006	3.06%	3.31%
UNITED KINGDOM	2103076	9.67%	10.69%	1297646	9.43%	10.21%
USA	9275445	42.67%	47.17%	6006638	43.67%	47.25%
THE WORLD INDEX	19665683	90.46%	100.00%	12713085	92.43%	100.00%
ARGENTINA	60734	0.28%		40786	0.30%	
BRAZIL	305961	1.41%		160975	1.17%	
CHILE	82345	0.38%		40396	0.29%	
COLOMBIA	17464	0.08%		8808	0.06%	
CZECH REPUBLIC	16786	0.08%		9587	0.07%	
GREECE	38459	0.18%		26737	0.19%	
HUNGARY	8658	0.04%		6198	0.05%	
INDIA	150668	0.69%		60503	0.44%	
INDONESIA	69969	0.32%		34286	0.25%	
ISRAEL	46096	0.21%		23919	0.17%	
JORDAN	5180	0.02%		1235	0.01%	
KOREA	131537	0.61%		71775	0.52%	
MALAYSIA	150194	0.69%		79577	0.58%	
MEXICO	159008	0.73%		116596	0.85%	
PAKISTAN	14137	0.07%		7754	0.06%	
PERU	18693	0.09%		11141	0.08%	
PHILIPPINES	43019	0.20%		18464	0.13%	
POLAND	12632	0.06%		6170	0.04%	
PORTUGAL	41889	0.19%		31463	0.23%	
RUSSIA	123623	0.57%		52686	0.38%	
SOUTH AFRICA	266774	1.23%		107958	0.78%	
SRI LANKA	2415	0.01%		880	0.01%	
TAIWAN	298051	1.37%		187578	1.36%	
THAILAND	43610	0.20%		25213	0.18%	
TURKEY	53834	0.25%		21316	0.15%	
VENEZUELA	21300	0.10%		15718	0.11%	
EMERGING MARKETS	2224123	10.23%		1120975	8.15%	
AC WORLD INDEX	21739612	100.00%		13754483	100.00%	

Table 3: Correlation between returns of local capital markets (from Morgen Stanley Capital International: Methodology and Index policy, 1998)

INDEX NAME	Austria	Canada	France	Germany	Hong-K	Italy	Japan	Malaysia	Netherl.	Norway	Spain	Sweden	Switzerland	UK	USA	Europe	MSCI
Austria	1.00																
Canada	0.00	1.00															
France	0.39	0.87	1.00														
Germany	0.56	0.57	0.77	1.00													
Hong Kong	0.71	0.55	0.73	0.64	1.00												
Italy	0.59	0.19	0.46	0.52	0.64	1.00											
Japan	0.58	(0.29)	(0.05)	0.11	0.37	0.48	1.00										
Malaysia	0.74	0.10	0.39	0.37	0.75	0.48	0.57	1.00									
Netherlands	0.34	0.79	0.87	0.89	0.59	0.39	0.00	0.29	1.00								
Norway	0.69	0.44	0.70	0.86	0.65	0.66	0.19	0.57	0.79	1.00							
Spain	0.24	0.88	0.90	0.71	0.73	0.54	(0.05)	0.25	0.79	0.57	1.00						
Sweden	0.44	0.75	0.84	0.85	0.75	0.51	0.13	0.49	0.91	0.79	0.81	1.00					
Switzerland	0.61	0.50	0.67	0.80	0.75	0.37	0.34	0.48	0.76	0.63	0.61	0.83	1.00				
United Kingdom	0.24	0.91	0.90	0.79	0.62	0.29	(0.24)	0.24	0.88	0.69	0.85	0.85	0.64	1.00			
United States	(0.23)	0.88	0.67	0.50	0.26	(0.07)	(0.37)	(0.21)	0.73	0.23	0.72	0.64	0.50	0.78	1.00		
Europe	0.45	0.82	0.92	0.92	0.75	0.49	0.01	0.38	0.95	0.81	0.88	0.94	0.81	0.94	0.69	1.00	
The World Index	0.37	0.80	0.84	0.79	0.73	0.48	0.26	0.35	0.88	0.63	0.87	0.89	0.82	0.82	0.73	0.90	1.00