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Abhandlungen

The Implied Equity Risk Premium – An Evaluation of Empirical Methods

By David Schröder, Bonn*

I. Introduction

The equity risk premium (hereafter ERP) is one of the most important concepts in financial economics. It is the reward that investors require to compensate the risk associated with holding equities compared to government securities. The equity premium[1] plays a key role in many cost-of-capital calculations, such as those based on the capital asset pricing model (CAPM) or the Fama-French three-factor model (Fama/French (1993)). Moreover, the magnitude of the ERP is critical for all investors since it substantiates decisions about asset allocation between equities and bonds.

Since the equity premium is essentially unobservable, it is also one of the most disputed concepts in finance. Not only is the magnitude of the ERP discussed controversially among economists, but the appropriate methodology to calculate meaningful estimates also lies at the core of the debate. Despite certain exceptions, e.g. Blanchard (1993), most academics used historical excess returns of stocks over bonds as provided by e.g. Ibbotson Associates (2005) as an appropriate proxy for the future ERP. More recently, several economists developed a new approach to estimate the market risk premium by calculating the so-called implied ERP with the help of present value (PV) formulas. The basic idea of this concept is to estimate the expected average future cost of capital in the market, and then to subtract the prevailing yield on treasury securities.

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1 In this study, the terms equity risk premium (ERP), risk premium, equity premium and market risk premium refer to the same concept and are used interchangeably.

Unfortunately, there are many different ways to estimate the implied risk premium. Whereas economists at first relied on the dividend discount model (DDM) to calculate the ERP, more recent studies opted for the residual income model (RIM), being increasingly considered to be the preferred approach. Surprisingly, a comprehensive comparison of the various approaches is still missing. The objective of this paper is thus to examine both methods employed in the implied ERP estimation in order to contribute to the search for the most reliable approach. This evaluation is done by applying the models to the same data set concurrently. Consequently, the paper is the first to allow a direct comparison of the ERP obtained from DDM and RIM.

In a first step, this study compares the magnitude of implied ERP estimates for various models across European markets. Although it is well known that infinite DDM and RIM are mathematically equivalent to each other and should therefore lead to identical ERP estimates, the empirical implementation causes the models to diverge. Hence, one focus of this study lies in examining whether and how this theoretical equivalence can be sustained in practice. To detect qualitative differences between both approches, we then present cross-sectional regression tests to determine key factors and variables that influence the cost of capital at the firm level. Finally, we compare the different models' ability to predict individual stock returns.

This work is related to several streams of research in the literature. First, this study extends earlier works on the implied ERP: Cornell (1999) and Claus/Thomas (2001) are two of the pioneering studies in this field. More recent studies on the implied cost of capital of individual firms include Easton et al. (2002), Lee et al. (2003), Daske et al. (2004), and Pástor et al. (2005). Second, it is related to the line of research investigating the ability of DDM, RIM and DCF (discounted cash flow) formulas to explain cross-sectional returns in the context of equity valuation (Penman/Sougiannis (1998), Courteau et al. (2001); Francis et al. (2000)). Finally, this paper takes up the analysis of the determinants of the implied cost of capital, as documented in Gebhardt et al. (2001), Lee et al. (2003) and Guay et al. (2003).

This paper presents evidence that specific versions of DDMs and RIMs lead to similar implied ERP estimates. In addition, it is shown that the underlying company-specific cost-of-capital estimates obtained from the dividend discount model can be better explained by standard asset pricing models (such as the CAPM or the Fama-French model) compared to the much more popular RIM approach[2]. In regressions of individual firm risk premia on country portfolio betas and firm characteristics, about 30% of its total cross-sectional variation can be explained. Finally, it is shown that the DDM performs better in predicting future stock returns than the RIM.

The paper proceeds as follows. The next section presents the methodology of the implied cost of capital in more detail. Section III describes the European data sample used in this study. The ERP estimates for several European markets are presented in section IV. Further examinations of the models using cross-sectional regressions on firm-level cost-of-capital estimates follow in section V. Section VI offers a short conclusion.

II. The Calculation of the Cost of Capital

1. The Implied Cost of Capital

In this study, the cost of capital of individual firms is calculated using the methodology of the so-called implied cost of capital. The basic idea of this concept is to estimate the future cost of capital with the help of PV models. More precisely, the cost of equity is computed as the internal rate of return that equates discounted payoffs per share to current price. In the literature, many different versions of the present value model are employed to calculate the implied cost of capital. The two most common formulas are the DDM, as used by e.g. Cornell (1999), and the RIM, employed by Claus/Thomas (2001) or Lee et al. (2003). The general DDM can be written as follows:

$$P_0 = \sum_{t=1}^{\infty} \frac{E[D_t]}{(1+k)^t} \tag{1}$$

where

P_0 = current share price, at the end of year 0,

$E[D_t]$ = expected dividends per share at the end of year t,

k = cost of capital or, equivalently, shareholders' expected rate of return.

When combined with the so-called *clean surplus* relation, the DDM can be transformed into the RIM (Feltham/Ohlson (1995)). This relation

[2] Most empirical studies on the implied cost of capital cited above rely on the RIM.

requires that all gains and losses affecting book value are also included in earnings[3]:

$$D_t = E_t - (B_t - B_{t-1}) \tag{2}$$

The RIM can be expressed as follows:

$$P_0 = B_0 + \sum_{t=1}^{\infty} \frac{E[R_t]}{(1+k)^t} \tag{3}$$

with

$$E[R_t] = E[E_t] - k(B_{t-1}) = (roe_t - k)B_{t-1} \tag{4}$$

where

B_t	=	book value of equity per share at the end of year t (B_0 being the current book value),
$E[R_t]$	=	expected residual income per share in year t,
$E[E_t]$	=	expected earnings per share in year t,
roe_t	=	(expected) return on equity in year t.

Equation (4) demonstrates the basic idea of residual income: only if a company generates higher returns on equity than its cost of capital, it can create positive residual incomes. Otherwise the company should be valued at its book value, or even below. Since the clean surplus relation can also be written as

$$B_t = B_{t-1} + E_t - D_t = B_{t-1} + (1 - p_t)E_t \tag{5}$$

where p_t is the payout ratio of year t, future book values of equity can consequently be calculated from future earnings and retention ratios using equation (5).

2. Employed Models

Since exact predictions of future dividends or residual incomes cannot be made to infinity, several versions of the DDM and RIM are usually used which implement different assumptions about expected cash-flows.

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[3] This condition is not always met, of course. Stock options and capital increases, e.g. can affect the book value of equity while leaving earnings unchanged. Still, the relation is approximately fulfilled in most cases.

a) Dividend Discount Models

A simple and very common version of the DDM is the Gordon (1962) growth model, assuming a constant dividend growth rate in the future. However, the limitations of this formula are widely known, e. g. Damodaran ((1994) p. 100). For most companies, the assumption of a constant dividend growth overestimates future payments, especially when employing the long-term earnings growth rate obtained from analysts as a proxy for the dividend growth rate (see below). Still, e. g. Harris/Marston (2001) rely on this model to calculate the ERP, which is hence likely to be biased upwards. Multistage DDM overcome this limitation. The two most prominent examples are a two-stage DDM, as proposed by Damodaran (1999), and a three-stage version, as used by Cornell (1999). The two-stage DDM is given by:

(6) $$P_0 = \underbrace{\sum_{t=1}^{5} \frac{E[D_t]}{(1+k)^t}}_{\text{Growth period}} + \underbrace{\frac{E[D_5](1+g_l)}{(k-g_l)(1+k)^5}}_{\text{Stable growth}}$$

The three-stage DDM looks as follows:

(7) $$P_0 = \underbrace{\sum_{t=1}^{5} \frac{E[D_t]}{(1+k)^t}}_{\text{Growth period}} + \underbrace{\sum_{t=6}^{20} \frac{E[D_t]}{(1+k)^t}}_{\text{Transition period}} + \underbrace{\frac{E[D_{20}](1+g_l)}{(k-g_l)(1+k)^{20}}}_{\text{Stable growth}}$$

Both DDM versions assume an initial 5-year phase of high dividend growth. In the three-stage formula, this period is followed by a transition phase in which the growth rates decline linearly to a lower, stable growth rate g_l, which is then maintained ad infinitum. In equation (6), this stable growth phase follows directly after the growth phase. Thus, these equations combine the plausible conjecture of a strong growth in the first years with realistic growth rates in the long run.

In the initial phase, the dividend growth is usually assumed to equal the long-term consensus earnings growth rate g, obtained from equity analysts[4]. In the stable phase following year 5 and 20 respectively, the dividend growth rate usually equals the estimated long-term GDP growth of the economy (Cornell (1999)). Note that there are two different growth rates in this paper. The rate g refers to the consensus forecast of

[4] The findings of *Elton* et al. (1981) suggest that analysts' forecasts are a good surrogate for investor expectations.

the long-term earnings growth rate by analysts, and g_l refers to the long-term nominal GDP growth rate of the economy.

b) Residual Income Models

Similar to the DDM, several versions of the unrestricted model of equation (3) can be used. A two-stage version has been proposed by Claus/Thomas (2001):

$$P_0 = B_0 + \underbrace{\sum_{t=1}^{5} \frac{E[E_t] - k(B_{t-1})}{(1+k)^t}}_{\text{Growth period}} + \underbrace{\frac{E[R_5](1+g_l)}{(k-g_l)(1+k)^5}}_{\text{Stable growth}} \tag{8}$$

Analogous to the DDM, it is also possible to formulate a three-stage RIM:

$$P_0 = B_0 + \underbrace{\sum_{t=1}^{5} \frac{E[E_t] - k(B_{t-1})}{(1+k)^t}}_{\text{Growth period}} + \underbrace{\sum_{t=6}^{20} \frac{E[E_t] - k(B_{t-1})}{(1+k)^t}}_{\text{Transition period}} + \underbrace{\frac{E[R_{20}](1+g_l)}{(k-g_l)(1+k)^{20}}}_{\text{Stable growth}} \tag{9}$$

The two-stage model assumes an initial phase of high earnings growth rates, followed by a stable growth of residual incomes after year five. Following the practice of the DDM, earnings are expected to increase with g in the growth phase. The long-term growth rate is again presumed to equal the nominal growth of the overall economy g_l. In the three-stage version, similar to the DDM, a transition phase where the earnings growth declines to g_l, is included. All main conclusions of this work are based on these four PV formulas. Although one could think of relying on a more comprehensive set of models, we believe that the presented formulas set a reasonable frame for the objective of this paper: the evaluation of various techniques to estimate the implied ERP.

3. Assessment of the Models

In order to assess the empirical results of this study it is essential to have a closer look at the models and their underlying assumptions.

First, note that all formulas assume constant discount rates in the future. In the view of time-varying risk premia, this might not be an appropriate assumption. However, Claus/Thomas (2001) also estimate a RIM with a time-varying component that leads to quite similar results to the constant discount rate estimates. Moreover, the constant discount rate captures the fact that future changes in the risk premium and the risk-free rate are unknown today. Next, when comparing both DDM formulas, observe that due to the transition phase, the three-stage version implies higher expected cash-flows than the two-stage model by definition (in the usual case where $g > g_l$). The rather smooth transition towards the long run growth rate is probably a more realistic assumption than the sudden change in the two-stage model. In the case of the RIM, the implications for expected returns when introducing a transition period are less clear, since they depend on the relation of earnings and residual income in year 20. In some cases, the decrease of earnings in the transition phase causes very low residual incomes in year 20, which consequently lead to lower terminal values than in the two-stage version. When comparing the implicit growth assumptions of all four models it is interesting to note that the two-stage RIM and the three stage DDM implement rather similar assumptions about the expected future return on equity[5]. Consequently, the implied cost of capital derived from equations (7) and (8) should be very similar.

Moreover, two drawbacks of employing the RIM to estimate the cost of capital should be mentioned. First, applying the growth rates g and g_l to different variables (earnings and residual incomes) causes discontinuities in implied earnings growth rates in both RIMs. Such jumps, especially in the three-stage RIM, are not very plausible. Second, RIM formulas produce confusing results if the book value of equity exceeds its market capitalization. In such a case, the residual income is negative by definition. By applying g_l to negative R_t, not only is all future residual income expected to remain negative, but these abnormal losses will even increase over time. Thus, to obtain meaningful results, the RIM requires not only positive book values and earnings, but as well a book-to-market ratio smaller than one.

To conclude this section, we see that both approaches to value the cost of equity have their pros and cons. Hence, we leave the final evaluation to the empirical part of this study.

4. Empirical Implementation

For each company, the cost of capital k is calculated by applying the equations (6) to (9) to the data. Firms with an incomplete data set, i.e.

[5] Both models are functionally very different and not mathematically equivalent to each other, as compared to the unrestricted equations in (1) and (3).

one or more missing input variables, have been ignored[6]. The solution of the equations is straightforward. Since they are monotone in k, they can be solved easily by iteration.

III. Data Description

1. Data for the Cost of Capital Calculation

In this study, we focus on companies that are members of major European stock markets indices: for the Eurozone, the Euro Stoxx and the Euro Stoxx-50 are used as surrogates for the market. In the U.K., the FTSE-100 is used as a market proxy[7]. All data is as of 18. March 2003.

Most of the data is taken from the Bloomberg database, such as current share prices, the companies' market capitalizations, last cash dividends, expected earnings and the book values of equity capital.

The data obtained from any database is usually not ready to be employed in empirical studies: dividend payout dates differ across companies, or some information on book values of equity is outdated by several months. Hence, adjustments are carried out in order to improve the consistency of the data (see similar issues in Lee/Swaminathan (1999) or Gebhardt et al. (2001)).

All presented DDM require the annual dividend D_0, which has just been paid out to the shareholders. Based on D_0, it is then possible to calculate the series of future payments, beginning with D_1. In this paper, D_0 is calculated as follows: Bloomberg reports the payout date of the last dividend and offers a function that provides the sum of all dividends paid out in the last 12 months. This aggregate is used as a proxy when a company pays semi-annual or quarterly dividends. To overcome the problem resulting from different payout dates, the obtained PV of each projected dividend stream is compounded up to the date of this study, depending on the months that have passed since the last payment. Expressed in mathematical terms: $D_0 = D_r * (1+k)(m/12)$, where D_r is the

6 This applies also to companies which did not pay any dividends in the 12 month prior to the date of this study.

7 Because of missing data, the data sample is reduced quite significantly. The resulting sample selection bias could be considerable. For example, only 226 companies out of 306 Euro Stoxx member firms are included in the study. However, these companies still represent about 85% of the Euro Stoxx's market capitalization.

last reported annual dividend paid out m months before the survey date. In the case of quarterly and semi-annual dividends, a fictional pay date between the actual pay dates is used[8].

Similarly, the construction of a meaningful B_0 imposes difficulties in RIM calculations. Similar to Gebhardt et al. (2001) for instance, this study captures the problem of outdated figures by creating first a synthetic book value that updates reported book values by one year using equation (5). Unreported earnings since the last financial report are obtained from analysts' forecasts. The payout ratio related to past year's earnings (p_0) – generally unknown at the time of the data capture – is assumed to converge towards 50 % over time. This ratio has been the average payout over the last decades in the U.S. (Claus/Thomas (2001), p. 1638). More formally: $p_0 = (p_{-1} + 0.5)/2$, where p_{-1} is the payout rate one year before. Payout ratios above 1 are set to 1 in the subsequent year, negative ratios to 0, in line with Gebhardt et al. (2001). Future book values are also constructed using equation (5). Future payout ratios are assumed to decline geometrically towards 50 % over the years, using the same equation as above. Regarding expected earnings, only E_1 (i.e. the earnings of the first year) are directly estimated by analysts in this study. Earnings E_2 to E_5 are approximated by projecting the growth rate g on the earnings of the year before: $E_t = E_{t-1}(1+g)$.[9]

The consensus forecast of long-term earnings growth g is provided by First Call. It is the arithmetic average of the expected annual increase in operating earnings of the contributing sell-side analysts. Expected nominal long-term GDP growth rates g_l are regularly published by economic consultant firms. Consensus Economics Inc. (2002) provides predictions

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[8] There is some controversy in the literature about how to construct the right D_0 or D_1, see for example *Harris/Marston* (1992). Moreover, the treatment of dividend taxation can have a large impact on cost-of-capital estimates. Interestingly, important empirical studies such as *Dimson* et al. (2002) or *Cornell* (1999) do not analyze the distortions caused by fiscal redistribution. *Siegel* ((2002), p. 58) is a notable exception, stating that "the difference between before- and after tax total returns is striking". Over 200 years, the return of equity investment after taxes attains only 1/20 of the return when abstracting from taxes. This paper follows the standard approach of valuation in corporate finance, which uses cash dividends (*Copeland* et al. (2000)). The cash dividend is the payment of the company to its shareholders after all corporate taxes, but before any personal taxes or tax credits. For a detailed study on taxation and implied cost of capital, see *Dhaliwal* et al. (2005).

[9] Although analysts usually forecast earnings beyond year 1, we had not any access to this data. *Claus/Thomas* (2001) use the same approach to generate missing data in their study.

of the estimated real GDP growth and inflation rate for all mayor European countries over a ten-year horizon. To obtain a forecast for the European Monetary Union (EMU), for which no estimates are directly available by Consensus Economics, a GDP-weighted average of the EMU member countries is calculated.

The equity risk premium is estimated with respect to government bonds with a term of 30 years, since these securities match the usual long-term horizon of equity investments much better than short-term bills (Dimson et al. (2002), p. 169). The ERP for the EMU is calculated using German government bonds. The yield to maturity of these securities is also provided by Bloomberg.

If quoted in deviant currencies, all company-specific data is converted into the two basic currencies of the analysis, the British Pound (GBP) in the U.K. and the Euro in the EMU. The conversion is accomplished by using the exchange rates as of 18. March 2003. Table 1 summarizes the aggregated data for the cost-of-capital calculation.

2. Data for Regression Tests

The additional data used in the cross-sectional regression tests of the implied cost of capital is presented in the next subsections. Following Lee et al. (2003), these include a measure of the historical systematic risk (market beta), the volatility of historical stock returns to account for total risk, and specific fundamental firm characteristics that have been identified as risk factors by empirical studies. Since the regressions are only carried out for the companies of the Euro Stoxx, the data has been collected for the relevant firms only.

a) Betas

Despite the international context, this study refrains from employing an international capital asset pricing model with separate world and local betas, as proposed by Bodnar et al. (2003). Instead, a single beta factor CAPM has been chosen. The increasingly integrated capital market of the EMU suggest this step. This approach is in line with Stulz (1999), who argues that in sufficient integrated markets, there would be a tendency toward a "global CAPM". In such a setting, the covariance with the return of a European market portfolio should be the only priced risk factor. This gives following relation of systematic risk:

(10) $$r_{it} - r_{ft} = \alpha_i + \beta_i(r_{mt} - r_{ft}) + \varepsilon_{it} \qquad t = 1, 2, ..., T \qquad \forall i$$

where

r_{it} = monthly stock return of company i at time t,

r_{ft} = monthly return on the risk-free asset at time t,

α_i = intercept of company i,

β_i = beta of company i,

r_{mt} = monthly return on the market portfolio at time t,

ε_{it} = error disturbance of company i at time t.

The Euro Stoxx index has been chosen as surrogate for the market portfolio. Again, the return on 30-year German government bonds is used as a proxy for a European risk-free asset[10]. The factor model of equation (10) has been estimated for each company over the 60 months prior to the date of this study. The data for these regressions is taken from Datastream.

b) Volatility

As an additional measure of total risk, this study includes the standard deviation of monthly stock returns over the last 60 months.

c) Firm Characteristics

The use of specific firm characteristics as explanatory variables for the expected cost of capital has been motivated by many different empirical studies. Book-to-market ratio (BM-ratio) and firm size are detected by Fama/French (1992). To reduce the impact of outliers, both market capitalization and book-to-market ratio have been transformed into natural logs, similar to the work of Lee et al. (2003). In addition, two other characteristic variables have been included: The dividend yield and the

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10 In the literature, many different government securities are used to calculate excess returns. Some studies rely on short-term bills (*Lee* et al. (2003)), others use gross returns (*Fama/French* (1992)). To be consistent with the implied risk premia, that are calculated with respect to long-term bonds, we opted for excess returns over long-term bonds in the beta regressions. However, the results are generally not much affected by the chosen risk-free rate, see also *Grinblatt/Titman* (2001). The beta estimates have a mean of 0.867, and a median of 0.829. The min of the betas is 0.250, their max is 1.685. The beta regressions have an average R^2 of 35,6% and were carried out for 224 companies.

price-earnings ratio (PE-ratio). The dividend yield, i.e. last cash dividend divided by share price, and the price-earnings ratio (calculated on the basis of next year's expected earnings) are often used as indicators for simple fundamental share price analysis. Again, the log of the PE-ratio has been used in the regression analysis instead of the actual ratio in order to avoid the impact of outliers.

3. Data for Return Forecast Regressions

Historical share prices for calculating the stock returns in the 12 months following the estimation of expected returns are also taken from Datastream.

IV. The Implied Equity Risk Premium

The equity risk premium is calculated directly from the cost-of-capital estimates of individual firms. First, the yield on government bonds is deducted to obtain the required excess return of each firm. These projected excess returns are then weighted with the companies' current market capitalization to obtain the market risk premium.

Table 2 summarizes the estimated implied equity premia for different European markets. The results from the two-stage DDM described by equation (6), and the three-stage DDM of equation (7) are displayed in panel A of the table. Standard errors of the weighted mean estimators are given in parenthesis[11]. The results for the two-stage DDM lie at around 5 %. Not surprisingly, the inclusion of a transition phase in equation (7) increases the estimates slightly to 6.3 %.

In panel B of table 2, the results of the RIM analysis are presented. The estimated premia derived from the two-stage RIM (equation 8) following Claus/Thomas (2001) lie between 6.5 % in the U.K. and 7.2 % for the broad Euro Stoxx index. When calculating the ERP using the three-stage RIM of equation (9), the results for the Eurozone are roughly 50 basis points higher. In the U.K. however, the estimates decrease when a tran-

[11] The standard errors are calculated as the square root of the weighted variance of the expected excess returns of each company. The formula for the weighted variance is: $s^2 = \frac{n}{n-1}\sum_{i=1}^{n} w_i(e_i - erp)^2$ where e_i is the estimated excess return of company i, erp is the ERP of the index (the weighted average), n is the number of firms included in the study, s^2 is the weighted variance of the ERP and w_i is the weight of company i of the total market capitalization.

sition phase is included in the model. Low earnings at the end of this phase cause very low residual incomes in year 20 (R_{20}), which consequently lead to low terminal values.

The risk premium estimates present some evidence that the three-stage DDM (equation 7) and the two-stage RIM (equation 8) lead to similar results, as hypothesized in section II 3. Especially in the U.K., both estimates deviate by a small amount only. In the Euro area, the difference is somewhat larger, with the two-stage RIM yielding an estimate that is around 70 basis points higher compared to the three-stage DDM. Still, the estimates of both PV formulas lead to estimates in the fairly small range from 6.3 % and 7.2 %.

This rather close association between the two different approaches can also be found at the individual firm-level data. Table 3 presents the correlations of the estimated company-specific cost-of-capital estimates obtained from the different valuation models. As expected, the correlations between structurally similar models, i. e. within one of the two classes of models, are well above 90 %. But the correlation between three-stage DDM and two-stage RIM estimates is rather high as well, attaining 0.73 in the U.K. and 0.60 in the Euro area.

Note that the standard errors of the estimates are rather large, resulting in large confidence intervals for the point estimates. This is a common problem of implied ERP studies, since the variation of the individual implied cost of capital for the individual companies is usually large[12]. Moreover, it should be mentioned that the estimated risk premia lie above the long-year averages of the implied ERP of similar studies which are at around 3 % (e. g. Claus/Thomas (2001) or Gebhardt et al. (2001)). This fact can be explained by the timing of this study. According to Siegel ((2002), p. 124), rising terrorism and the economic downturn at the beginning of this century have increased the overall uncertainty of the business environment. He concludes that this rising level of uncertainty has led to a surge in the equity premium.

12 Since the deletion of outliers would reduce the sample size significantly in terms of the represented market capitalization, a large variation seemed to be the lesser evil. Most other studies do not report standard errors or t-statistics of risk premium estimates.

V. Analysis of Company-specific Implied Cost of Capital Estimates

After the quantitative comparison of different models to estimate an implied market risk premium, this part aims to detect qualitative differences between the models by investigating the underlying company-specific implied cost-of-capital estimates. The relatively small data set of the Euro Stoxx-50 and FTSE-100 are the reason why we focus in the remainder of the study on the rather broad Euro Stoxx index.

1. Cross-Sectional Regression Tests

This section analyzes empirically the ability of betas and firm characteristics to explain the cross-sectional variation of the European implied risk premium on the firm level. Since the implied return is essentially an expected return estimate, its magnitude should be related to common risk measures and firm characteristics, such as the market beta of the CAPM, or BM-ratio and firm size that have been identified as risk factors by Fama/French (1992, 1993).

Whereas other studies only examine the implied risk premia for firms obtained from the residual income approach, this work also analyzes the implied risk premia calculated with the help of the DDM formula. Hence, this study is the first to draw comparisons between the determinants of the implied risk premium of both models.

a) The Regression Setup

The relation between implied risk premia (i.e. the difference between cost of capital and the risk-free rate), betas and firm characteristics is examined using a cross-sectional regression across all companies:

$$(11) \qquad k_i - r_f = \gamma_0 + \gamma_1\beta_i + \sum_{j=1}^{J}\delta_j C_{ij} + u_i \qquad i = 1, 2, \ldots, N$$

where $k_i - r_f$ is the implied risk premium estimate of firm i, β_i is its market beta estimate, C_{ij} are the characteristics j for firm i, and γ_1 and δ_j are the respective slope coefficients.

The betas that enter the cross-sectional regression (11) are however not the true betas, but only noisy estimates thereof, obtained from the times series regressions as displayed in (10). This causes an errors-in-variables (EIV) problem, leading to biased coefficients and standard errors. To correct for this bias, we employ the standard EIV regression approach as presented e.g. by Greene (2002) or Fuller (1987) by applying the so-called reliability ratio for the beta estimates. For a detailed exposition of the procedure, please see the appendix.

The implied expected returns are regressed on the most recent available data of firm characteristics. Such a specification raises the question about spurious correlation between the dependent variable and the firm characteristics such as the book value of equity, since the latter are used to calculate the implied cost of capital. To deal with this potential problem, we employ only those firm characteristics that are not contributing to the dependent variable as regressors. The advantage of this procedure is that it allows to detect the (almost) instantaneous relation between firm risk premia and firm characteristics without any time lag. This compares to related studies (Gebhardt et al. (2001); Lee et al. (2003)), that handle this issue by introducing a one-year gap between the date of implied risk premium and firm characteristics in the regression equations[13]. Consequently, they examine the relationship between the expected cost of capital and prior year's fundamentals only. The sometimes sudden changes of expectations in the financial markets due to new information of the fundamental situation of the company cannot be captured in such a setting.

The cross-sectional regressions are estimated using three different specifications of the model displayed in equation (11). In the simplest model (S1), the risk premia are regressed on the betas only. The next specification (S2) adds the historical standard deviation of monthly returns and specific firm characteristics that are not used to calculate the risk premia to the regressors. More precisely, the DDM estimates are additionally regressed on the Fama-French risk factors size ($lnMC$, the log of the market capitalization), and the BM-ratio ($lnBM$) as well as the PE-ratio ($lnPE$). In turn, the RIM estimates are regressed on firm size and dividend yield (Yld). Since total risk should not be a priced risk factor according to any theory, finally specification (S3) omits this variable from the regressors.

[13] Another reason put forward in other studies for introducing a one-year gap are possible publication lags, that is to ensure that the regressions are based on publicly available information only. Since this study relies on the most recent published data, this issue does not pose a problem.

Table 4 shows the correlations of the different risk measures and firm characteristics employed in the regression tests to explain the company-specific implied risk premia. Besides the correlation between beta and volatility whose strong relation is no surprise, we see that the PE-ratio is negatively related to both BM-ratio and dividend yield. The usual strong negative relation between BM-ratio and firm size is less pronounced in our data sample.

The empirical study of Fama/French (1992), based on average realized returns presents evidence of a positive relation between cost of capital and BM-ratio, and a negative relation with firm size. The study of Gebhardt et al. (2001), analyzing the relation between implied cost of capital and firm characteristics confirms a positive relationship with BM-ratio, but a rather weak relation to firm size. Regarding the other firm characteristics, Dhaliwal et al. (2005) detect a positive relation between the implied cost of equity and the dividend yield, and Easton (2004) findings suggest a negative relation between the implied cost of equity and the PE-ratio. The study of Gebhardt et al. (2001) also detects a positive correlation between volatility and expected stock returns.

b) Individual Firm Regressions with Firm Betas

Table 5 presents the EIV estimation results when regressing individual firm risk premia on individual firm betas and individual firm characteristics. In the pure beta specification (S1) following the CAPM, only the beta coefficients in the DDM3 regression are significantly related to firm risk[14]. The R^2 of this regression is however very low. After controlling in addition for return volatility and other firm characteristics (S2), neither beta nor volatility is significant. This contrasts to the firm fundamentals, which exhibit significant effects on the risk premia. The PE-ratio is significantly negatively related to the implied risk premia, the BM-ratio has a positive relationship (DDM2), and the dividend yield is positively related to firm risk (RIM2). In the regression of the DDM2 risk premia, R^2 attains 28%. When omitting return volatility (S3), the beta coefficients of the DDM regressions are (again) significant. Firm size is not significant in any specification.

When looking at the DDM-results, these findings provide a mixed picture in view of standard asset pricing theory: On the on hand, the mainly

[14] To simplify notation, two-stage DDM is abbreviated by DDM2, three-stage DDM by DDM3, etc.

positive beta coefficient is in line with the CAPM. Moreover, the Fama-French risk factor BM-ratio is positively priced as well. On the other hand, firm size is not significant related to size (in contrast to the three-factor model), but PE-ratio is instead a priced risk factor. However, other studies as cited above detect similar relationships. The RIM analysis is disappointing from the point of view of betas and firm size. Moreover, the F-stat rejects the hypothesis of all variables being jointly significant at the 5% level in many RIM specifications. The strong explanatory power of the dividend yield in RIM2 confirms the findings of Dhaliwal et al. (2005). The rather poor performance of the standard regression tests for expected returns raises the question what variables determine the implied risk premium calculated from the RIM approach. Although a final answer cannot be given here, these findings suggest at least that the cost of capital obtained from the DDM method proves to be more in accordance with the CAPM or the Fama-French model.

c) Individual Firm Regressions with Country Betas

To further reduce the impact of noisy beta estimates, the regressions are also carried out using country betas. These country betas are calculated as the arithmetic average of the companies' betas belonging to the same out of the eleven countries in this study[15]. The results are reported in table 6.

Now, all DDM regressions indicate a positive relation between beta and firm risk premia. Moreover, the coefficient is in many cases even highly significant. Return volatility also contributes to explain the risk premia (S2). As far as other firm characteristics are concerned, PE-ratio is significantly related to firm risk. This contrasts to the RIM regressions, where beta is now negatively related to the expected implied return (RIM2). Size and BM-ratio are not related to expected returns in almost any regression.

Regarding the DDMs, this regression approach seems to fit the data better than the previous specification (R^2 increases slightly to 30% in S2, F-stat are higher). However, return volatility is, in contrast to the CAPM, a priced risk variable. In this framework, it is interesting to note that both Fama-French factors, size and BM-ratio, are only weakly related to

[15] *Lee* et al. (2003) carry out similar regressions using industry-country portfolios. The usual portfolio approach of the *Fama/MacBeth* (1973) regressions did not yield any meaningful results.

the implied returns. This rather unusual result might be due to the timing of the study, since share prices – close to their record lows – deviated from their usual pricing pattern. In the RIM specifications, the detected negative relationship between beta and firm risk is very clearly opposed to any theory. Together with relatively low R^2, this finding indicates the poor explanatory power of common risk factors for the cost of capital obtained from the RIM methodology.

2. Return Prediction

In this section, we finally test the ability of the implied cost of capital to predict actual stock returns. In the regression setup, subsequent returns over 1 to 4 quarters (q) are regressed on the expected returns k_i as calculated in previous sections[16]. The regression equation looks as follows:

$$\frac{4}{q} r_{i,q} = a_0 + a_1 k_i + \varepsilon_i \tag{12}$$

where $r_{i,q}$ is the return of company i over the quarters 1 to q, k_i is the estimated cost of capital of firm i using the different DCF formulas. Note that if the estimates were perfect forecasts of stock returns and assuming constant risk premia and risk-free rates, the intercept a_0 should be zero, and the coefficient a_1 should equal 1. Again, this analysis is based on all Euro Stoxx companies with a complete data set[17].

Table 7 presents the forecasting regression results. There are two main conclusions one can draw from the estimation outcome. First, the regressions present evidence that the implied cost of capital has indeed a predictive power for future stock returns. The R^2 which attain up to 21% indicate that a considerable part of the total variation of actual stock returns can be explained by the implied cost of capital, although the interrelation weakens over time. The slope coefficients in almost all regression specifications are significantly positive[18]. Second, the dividend dis-

[16] *Lee/Swaminathan* (1999) carry out similar regressions. However, they take the cost of capital as given and examine the ability of value to price ratios to explain stock returns.

[17] Compared to previous regressions, the sample size is reduced by several companies since not all firms existed 12 months after the data used for the cost of capital estimation.

[18] In many regressions, the slope coefficients are significantly higher than one (as suggested), reaching up to 7.88 in the regression of the Q1 return on the

count models seem to perform better in predicting future stock returns than the residual income models. Expected returns from both DDMs can explain more than twice of the variation in actual returns compared to the estimates from the RIM. Moreover, the cost of capital estimated from the popular RIM2 equation has no explanatory power for stock returns over more than two quarters, with the coefficient not being significantly different from zero. In these regressions, R^2 declines down to 1%. However, one must notice that the DDM2 is likely to underestimate the overall stock returns, with the slope coefficient being almost twice as high as the other models.

The better performance of dividend discount models to predict future stock returns can be explained by its informational advantage. Dividend policy seems to be a signalling process that conveys information on future profits (e.g. Nissim/Ziv (2001)), that appears to be crucial for accurately estimating the implied cost of capital. Very clearly, the RIM cannot capture this additional information included in dividend payments.

VI. Conclusion

Because of the lack of alternative methods, Freeman/Davidson (1999) concluded only a few years ago that "the [traditional] excess return approach will continue to be the favored method for estimating the equity premium". With the development of forward-looking models to estimate the implied risk premium, the situation has changed discernibly in the past few years. Today there is a variety of possibilities to estimate a meaningful prospective ERP.

In contrast most other empirical works who rarely investigate the plausibility of their models to estimate the implied ERP, this study carries out an analysis of several common formulas currently used and applied them to a pan-European sample. We show that the market risk premium obtained from a two-stage RIM and a three-stage DDM are rather similar and deviate by a small amount only. The subsequent cross-sectional analysis on the underlying firm-specific risk premia however de-

DDM2-cost of capital. In addition, the intercept is in most regressions significantly different from zero, except for the regressions over one single quarter. These high estimates can be explained by the extraordinary recovery of share prices following the record-lows in mid-March 2003. This is of course an indication that the risk premium is *not* constant.

tected some qualitative differences between both approaches. Surprisingly, the individual firm risk premia obtained from the RIM cannot be explained by common asset pricing models. In contrast, firm characteristics and betas explain up to 30% of the variation of the DDM risk premia. In line with the CAPM, beta is positively related to firm risk in most regressions. In terms of firm characteristics, PE-ratio and, to a lesser extent, the BM-ratio, contribute to the explanation of implied firm risk. The Fama-French factor size is not relevant for expected firm risk. Taken together, the presented evidence casts doubt on the CAPM's ability to explain cross-sectional differences in expected stock returns. Whether such a conformity with asset pricing models is crucial for predicting actual stock returns is an empirical question. Such forecasting regressions are carried out in the last section of this paper. It is shown that DDMs perform better in predicting future stock returns than RIMs. This result can be explained by the signalling nature of dividend payments for future earnings – an important information which the residual income model cannot make use of. Although this study reflects only the market conditions and expectations as of March 2003, the findings suggest that multistage DDMs are preferable models to estimate the implied cost of capital.

The recently developed concept of the implied equity risk premium offers a powerful tool to investors for estimating the future cost of capital. Since it is completely forward-looking, it avoids the problems related to employing historical data for future use. The practical implications of this study are straightforward: First, this work demonstrates that the selection of appropriate PV models is crucial to ensure the reliability of this instrument, given the partly large differences across the analyzed approaches. Since all models have their advantages, a sound analysis of the implied risk premium should at minimum include DDM-based approaches as well. Second, the results of other empirical studies on the implied cost of capital relying on the RIM only should be interpreted with caution. The so-obtained findings may only hold for RIM based cost-of-capital estimates, but not for the implied cost-of-capital concept in general.

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Appendix

Since the betas that enter the cross-sectional regression (11) are not the true betas, but only noisy estimates thereof (obtained from the times series regressions as displayed in (10)), we face a potential errors-in-variables (EIV) problem in the second pass of the regression approach.

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) + \varepsilon_{it} \qquad t = 1, 2, ..., T \qquad \forall i \tag{10}$$

To correct for this possible bias, we employ the standard EIV regression approach as presented e.g. by Greene (2002) or Fuller (1987): we know that the betas, one of the explanatory variables in the subsequent regressions, are measured with error, since the true value of the variables cannot be observed directly. Instead of observing β, one can only observe the sum:

$$\hat{\beta} = \beta + u \tag{13}$$

where u is a normally distributed random variable with $cov(\beta, u) = 0$, and $\hat{\beta}$ are the estimates obtained from (10). One can adjust for the bias caused by the measurement error in the second pass with the help of its reliability ratio, which is defined as follows:

$$r = 1 - \frac{var(u)}{var(\hat{\beta})} \tag{14}$$

The (empirical) variance of the estimated variable $\hat{\beta}$ is easily calculated. The variance of the error u is more difficult to estimate, since the true values of beta (β) and the variance thereof are unknown. However, we can make use of the information we have about the variance of each individual $\hat{\beta}_i$ in the first pass, which is given by:

$$var(\hat{\beta}_i) = \sigma_i^2 [(X'X)^{-1}]_{22} \qquad \forall i \tag{15}$$

where X is the matrix of explaining variables in (10), i. e. the combination of a ones vector (for the intercept α_i) and the vector of market excess returns $(r_{mt} - r_{ft})$. Since we have for each observation i the relation $\hat{\beta}_i = \beta_i + u_i$, this gives (the true β_i are fixed):

$$var(u_i) = var(\hat{\beta}_i) = \sigma_i^2 [(X'X)^{-1}]_{22} \qquad \forall i \tag{16}$$

Note that the term $[(X'X)^{-1}]_{22}$ is identical for each i. Hence, all what we need for estimating $var(u)$ is an estimate of σ^2. For large N, a consistent estimator of σ^2 is given by the average σ_i^2:

$$\hat{\sigma}^2 = \bar{\sigma}^2 = \frac{1}{N} \sum_N \hat{\sigma}_i^2 \tag{17}$$

Under the assumption of independence, and existence of the fourth moment of the error terms, this average converges by WLLN in the limit to the true value of σ^2. This gives us finally:

$$\begin{aligned} var(u) &\approx \bar{\sigma}^2 [(X'X)^{-1}]_{22} \\ &= \left(\frac{1}{N} \sum_{n=1}^{N} \hat{\sigma}_i^2 \right) [(X'X)^{-1}]_{22} \end{aligned} \tag{18}$$

In other words, we use the average variance of the individual errors $\hat{\sigma}_i^2$ together with the similar structure of our N times series regressions to estimate the variance of the disturbance u. Calculating and inserting in (18), we get:

$$var(u) = 0.00944 \cdot 2.614 = 0.0247$$

Since the empirical variance of $\hat{\beta}$ is 0.0906, we obtain a reliability ratio of

$$r = 1 - \frac{0.0247}{0.0906} = 0.728$$

The cross-sectional regressions are hence carried out using a reliability ratio 0.728 for the beta estimates.

Table 1

Summary Statistics

		Markets and Indices		
		U.K.[a]	Euro Area	
		FTSE-100	Euro Stoxx-50	Euro Stoxx
Yield on 30-year Gvt. Securities		4.56%	4.82%	4.82%
Long-Term Nominal GDP Growth[b]		4.6%	4.4%	4.4%
DDM	Number of Firms	85	48	228
Calculation	Market Cap. (bn)	869.2	1,216.5	1,996.8
	Dividends D_0 (bn)[c]	33.5	47.8	70.7
	Growth Forecast g[d]	9.2%	9.8%	11.0%
RIM	Number of Firms	80	45	223
Calculation	Market Cap. (bn)	759.7	1,129.1	1,907.6
	Book Values B_0 (bn)	374.2	739.6	1267.0
	Earnings E_1 (bn)	61.5	101.3	172.6
	Payout Ratio p_{-1}[e]	65.3%	48.82%	44.43%
	Growth Forecast g[f]	9.0%	9.8%	11.0%

Source: Bloomberg, Consensus Economics Inc.

a In the U.K., all figures are expressed in GBP.
b Sum of the projected long-term inflation rate and real GDP growth.
c Unadjusted reported dividends in the year prior to 18/03/03.
d Weighted average.
e Since the payout ratio is meaningless for loss firms, only companies with positive earnings are included to calculate the ratio.
f Weighted average.

Annotations to Table 1

In the first row of the *table 1* summarizing the data used in this study, the yields to maturity on 30-year government securities are depicted. In the next row, the expected long-term nominal GDP growth rates as provided by Consensus Economic Inc. are given. The aggregated raw data of both DDM and RIM calculations is shown in the middle and lower section of the table. For both models, first the number of companies included in the calculation and their combined market capitalization is reported. The third row of the DDM section presents the aggregated reported (unadjusted) cash dividends in the 12 months prior to 18/03/2003. The last row contains the value-weighted average of the consensus growth forecast of earnings. The third row of the RIM section displays the aggregated half-year adjusted book values of equity of the respective indices. The sum of forecasted earnings for year 1 (E_1) are presented in the next row, followed by prevailing payout ratios. Payout ratios are only calculated for companies with positive earnings, since for loss firms the ratio is meaningless. Finally, the value-weighted average of the consensus growth forecast is presented.

Out of the 228 Euro Stoxx companies included in the DDM calculation, 61 are of French origin, 44 are German, 29 Dutch, 27 Italian, 24 Spanish, and the remaining 43 are from other member states of the EMU. In terms of size, 57 companies had a market capitalization over 10 billion Euro, 153 had a market capitalization between 1 and 10 billion Euro, and 18 were valued less than 1 billion Euro. The composition of the firm sample for the RIM calculation does not differ much.

All amounts are in billions, except for payout ratios, growth rates, and number of firms. In the EMU, the base currency is Euro, whereas in the U.K., all figures are expressed in GBP.

Table 2

Implied Equity Risk Premium Obtained from DDM and RIM

	Method	Countries and Indices		
		United Kingdom	Euro Area	
		FTSE-100	Euro Stoxx-50	Euro Stoxx
	Observations	84	48	228
A	2-stage DDM	5.21 %	5.08 %	4.83 %
	from equation (6)	(2.45 %)	(3.62 %)	(3.69 %)
	3-stage DDM	6.31 %	6.35 %	6.43 %
	from equation (7)	(3.22 %)	(4.20 %)	(5.46 %)
	Observations	80	45	223
B	2-stage RIM	6.46 %	6.78 %	7.19 %
	from equation (8)	(2.64 %)	(3.10 %)	(4.05 %)
	3-stage RIM	6.41 %	7.05 %	7.75 %
	from equation (9)	(3.09 %)	(3.47 %)	(5.23 %)

Note: Standard errors are reported in parenthesis below the estimate.

Table 3

Correlations of Cost-of-Capital Estimates

This table reports the correlations of the estimated company-specific cost-of-capital estimates across the different valuation models. Panel A reports the correlation estimates for the United Kingdom, panel B contains the correlation coefficients for the Euro Area.

Panel A: United Kingdom (FTSE-100)

	2-stage DDM	3-stage DDM	2-stage RIM	3-stage RIM
2-stage DDM	1.000	0.923	0.609	0.598
3-stage DDM		1.000	0.726	0.803
2-stage RIM			1.000	0.933
3-stage RIM				1.000
Observations				80

Panel B: Euro Area (Euro Stoxx)

	2-stage DDM	3-stage DDM	2-stage RIM	3-stage RIM
2-stage DDM	1.000	0.923	0.455	0.469
3-stage DDM		1.000	0.605	0.709
2-stage RIM			1.000	0.921
3-stage RIM				1.000
Observations				223

Table 4

Correlations of Firm Characteristics

This table reports the correlations of firm characteristics and risk variables used as explanatory variables for the implied return. Data sample: EuroStoxx index.

	Beta (β)	Volatility	Size	PE-ratio	BM-ratio	Div. yield
Beta (β)	1.000	0.800	0.032	0.145	0.033	0.039
Return volatility		1.000	–0.133	0.059	0.063	0.177
Size ($lnMC$)			1.000	0.216	–0.199	–0.170
PE-ratio ($lnPE$)				1.000	–0.566	–0.445
BM-ratio ($lnBM$)					1.000	0.441
Dividend yield						1.000
Observations						218

Table 5

EIV Regressions of Individual Firm Data

	S1				S2				S3			
	DDM2	DDM3	RIM2	RIM3	DDM2	DDM3	RIM2	RIM3	DDM2	DDM3	RIM2	RIM3
Intercept	0.03**	0.03*	0.08***	0.06***	0.06	0.20	0.08	0.20*	0.17***	0.19**	0.15**	0.16**
	(2.51)	(1.90)	(5.53)	(3.88)	(0.56)	(1.44)	(0.87)	(1.66)	(2.81)	(2.30)	(2.27)	(2.08)
Beta (β)	0.02	0.04**	0.00	0.03	–0.08	0.07	–0.08	0.06	0.03**	0.06***	0.00	0.03
	(1.52)	(2.21)	(0.22)	(1.42)	(–0.92)	(0.52)	(–0.82)	(0.48)	(2.35)	(2.99)	(0.12)	(1.40)
Return volatility					0.99	–0.07	0.72	–0.29				
					(1.40)	(–0.07)	(0.91)	(–0.30)				
Size ($lnMC$)					0.00	–0.00	–0.00	–0.01	–0.00	–0.00	–0.00	–0.01
					(0.12)	(–0.50)	(–0.21)	(–1.16)	(–0.90)	(–0.69)	(–1.37)	(–1.45)
PE-ratio ($lnPE$)					−0.03***	−0.05***			−0.04***	−0.05***		
					(–2.88)	(–3.30)			(–4.46)	(–4.13)		
BM-ratio ($lnBM$)					0.02***	0.01			0.01**	0.01		
					(2.74)	(1.20)			(2.44)	(1.38)		
Dividend yield (Yld)							0.31**	0.28*			0.39***	0.25*
							(2.27)	(1.68)			(3.67)	(1.92)
R^2	0.01	0.03	0.00	0.01	0.28	0.19	0.09	0.05	0.24	0.19	0.08	0.04
$F-stat$	2.30	4.89	0.05	2.02	15.40	9.76	4.77	2.30	16.48	11.66	5.88	3.02
n	222	222	218	218	218	218	218	218	218	218	218	218

Note: t-statistics are reported in parenthesis below the estimate. – Reliability for β: 0.728

*** = significant at the 1% level
** = significant at the 5% level
* = significant at the 10% level

Table 6

EIV Regressions of Individual Firm Data with Country Betas

	S1				S2				S3			
	DDM2	DDM3	RIM2	RIM3	DDM2	DDM3	RIM2	RIM3	DDM2	DDM3	RIM2	RIM3
Intercept	−0.03	−0.04	0.12***	0.09**	0.09	0.09	0.17**	0.17*	0.13**	0.13	0.19***	0.19**
	(–0.78)	(–1.02)	(3.78)	(2.33)	(1.49)	(1.06)	(2.47)	(1.96)	(2.04)	(1.54)	(2.75)	(2.26)
Beta (β)	0.09**	0.13***	−0.05	0.01	0.11***	0.16***	−0.08**	–0.03	0.13***	0.18***	−0.07*	–0.01
	(2.43)	(2.70)	(–1.42)	(–0.19)	(2.83)	(3.05)	(–1.98)	(–0.60)	(3.51)	(3.67)	(–1.76)	(–0.27)
Return volatility					0.26**	0.31**	0.14	0.20				
					(2.67)	(2.31)	(1.32)	(1.50)				
Size ($lnMC$)					–0.00	–0.00	–0.00	–0.00	–0.00	–0.00	–0.00	–0.00
					(–0.88)	(–0.73)	(–0.84)	(–1.06)	(–1.35)	(–1.14)	(–1.05)	(–1.30)
PE-ratio ($lnPE$)					−0.04***	−0.05***			−0.04***	−0.05***		
					(–5.24)	(–4.73)			(–5.02)	(–4.55)		
BM-ratio ($lnBM$)					0.01	0.00			0.01*	0.00		
					(1.64)	(0.65)			(1.70)	(0.71)		
Dividend yield (Yld)							0.40***	0.24*			0.42***	0.26**
							(3.80)	(1.83)			(3.97)	(2.02)
R^2	0.04	0.01	0.01	0.00	0.30	0.23	0.10	0.04	0.27	0.21	0.09	0.03
$F - stat$	5.90	7.27	2.01	0.04	17.32	12.12	5.63	2.32	18.83	13.08	7.03	2.36
n	222	222	218	218	218	218	218	218	218	218	218	218

Note: t-statistics are reported in parenthesis below the estimate. – Reliability for β: 0.728

*** = significant at the 1% level
** = significant at the 5% level
* = significant at the 10% level

Table 7

Forecasting Regressions

DCF Formula	2-stage DDM	3-stage DDM	2-stage RIM	3-stage RIM
1Q				
Intercept	–0.01	0.15	0.18	0.23
	(–0.06)	(0.77)	(0.65)	(1.21)
Expected Return k_i	7.88***	5.31***	4.73**	4.05***
	(3.23)	(2.93)	(2.09)	(2.64)
R^2	0.21	0.17	0.08	0.08
2Q				
Intercept	0.10	0.23*	0.29	0.31**
	(0.73)	(1.86)	(1.59)	(2.44)
Expected Return k_i	5.18***	3.32***	2.61*	2.30**
	(3.43)	(2.90)	(1.81)	(2.38)
R^2	0.16	0.12	0.05	0.05
3Q				
Intercept	0.14	0.20***	0.34***	0.29***
	(1.52)	(2.78)	(2.96)	(3.83)
Expected Return k_i	3.17***	2.16***	0.83	1.21**
	(3.23)	(3.30)	(0.94)	(2.28)
R^2	0.10	0.08	0.01	0.02
4Q				
Intercept	0.13	0.18***	0.24**	0.23***
	(1.54)	(2.64)	(2.58)	(3.45)
Expected Return k_i	2.66***	1.77***	1.10	1.13
	(3.16)	(2.89)	(1.46)	(2.23)
R^2	0.10	0.08	0.02	0.03
Observations (n)	216	216	211	211

Note: White (1980) heteroskadasticity-consistent t-statistics are reported in parenthesis below the estimate.
*** = significant at the 1% level
** = significant at the 5% level
* = significant at the 10% level

Summary

The Implied Equity Risk Premium – An Evaluation of Empirical Methods

A new approach of estimating a forward-looking equity risk premium (ERP) is to calculate an implied risk premium using present value (PV) formulas. This paper compares implied risk premia obtained from different PV models and evaluates them by analyzing their underlying firm-specific cost-of-capital estimates. It is shown that specific versions of dividend discount models (DDM) and residual income models (RIM) lead to similar ERP estimates. However, cross-sectional regression tests of individual firm risk suggest that there are qualitative differences between both approaches. Expected firm risk obtained from the DDM is more in line with standard asset pricing models and performs better in predicting future stock returns than estimates from the RIM. (JEL G12)

Zusammenfassung

Die Implizite Risikoprämie – Ein Vergleich Empirischer Methoden

Die implizite Risikoprämie ist ein neuartiges Konzept, um eine erwartete Marktrisikoprämie zu schätzen. Hierbei wird die zukünftige Risikoprämie mittels Barwertformeln aus erwarteten Aktienerträgen errechnet. Die vorliegende Arbeit vergleicht unterschiedliche Barwertverfahren zur Berechnung der impliziten Risikoprämie und untersucht die den jeweiligen Risikoprämien zugrunde liegenden geschätzten Kapitalkosten einzelner Unternehmen. Es wird gezeigt, dass ausgewählte Varianten sogenannter „Dividend Discount“-Modelle und „Residual Income“-Modelle zu vergleichbaren erwarteten Marktrisikoprämien führen. Allerdings deuten Querschnittsregressionen der unternehmensspezifischen Kapitalkosten auf qualitative Unterschiede zwischen beiden Verfahren hin. Kapitalkosten, die aus „Dividend Discount“-Modellen ermittelt werden, stehen mehr im Einklang mit gängigen Kapitalmarktgleichgewichtsmodellen und prognostizieren zukünftige Aktienrenditen besser als Kapitalkosten, die auf „Residual Income“-Modellen basieren.