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The Implied Equity Risk Premium - An Evaluation of Empirical Methods

by

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Abstract

A new approach of estimating a forward-looking equity risk premium (ERP) is to calculate the 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, the results of 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 Classification: G12

Keywords: equity risk premium, cost of capital, expected stock returns

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1 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 and 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 controversial 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 the historical excess returns of stocks over bonds as provided by *Ibbotson Associates* (2004) 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 is to estimate the expected future cost of capital in the market, and to subtract the prevailing yield on treasury securities.

Unfortunately, there are many different ways to estimate the implied risk premium. Whereas economists at first relied on the dividend discount model (DDM), more recent studies opted for the residual income model (RIM) to calculate the ERP. Moreover, the RIM is increasingly considered to be the preferred model. It is important to note that up to now, a comprehensive comparison of the various approaches is still missing. Hence, the objective of this paper is to examine both techniques used

[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.

in the implied ERP calculation 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 of the models is another issue. Hence, one focus of this study lies in examining whether the theoretical equivalence can be sustained in practice. To detect qualitative differences, we then present cross-sectional regression tests to determine key factors and variables that influence the implied cost of capital at the firm level. In contrast to other studies, the combination of different PV models allows to regress the expected equity cost on fundamentals of the same year. This procedures avoids the usual one-year gap between the implied cost of capital and firm characteristics in the regression equations.

This work is related to several streams of research in the literature. First, this study extends earlier works on the implied ERP, such as *Cornell* (1999) and *Claus and Thomas* (2001), that were two of the pioneering studies in this area[2]. 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 and Sougiannis*, 1998; *Courteau et al.*, 2000; *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) and *Lee 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 cost of capital estimates obtained from the dividend discount model can be better explained by standard asset pricing models compared to the much more popular RIM approach[3]. In regressions of individual firm risk premia on country portfolio betas

[2]Both studies do not compare different methods to obtain the implied ERP. Other important studies include *Harris and Marston* (2001), *Easton et al.* (2002), and *Lee et al.* (2003).

[3]Most empirical studies on the implied cost of capital rely on the RIM.

and specific firm characteristics, about 28% of the 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 3 describes the data sample used in this study. The ERP estimates for several European markets are presented in section 4. Further qualitative examinations of the models using cross-sectional regressions follow in section 5. Section 6 concludes.

2 The Calculation of the Cost of Capital

2.1 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 and 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 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 and Ohlson*, 1995). This relation requires that all gains and losses affecting book value are also included in earnings[4]:

[4]This condition is not always met, of course. Stock options and capital increases, e.g. can affect

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

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 at the end of year t (B_0 being the current book value),
$E[R_t]$	$=$	expected residual income in year t,
$E[E_t]$	$=$	expected earnings 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

$$B_t = B_{t-1} + E_t - D_t = B_{t-1} + r_t E_t \tag{5}$$

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

2.2 Employed Models

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

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*

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the book value of equity while leaving earnings unchanged. Still, the relation is approximately fulfilled in most cases.

(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 from analysts as a proxy for the dividend growth rate (see below). Still, e.g. *Harris and Marston* (2001) rely on this model to calculate the ERP, which is hence likely to 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:

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

The three-stage DDM looks as follows:

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

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 g_l, which is then maintained ad infinitum. In equation (6), this stable growth phase follows directly after the growth phase.

In the initial phase, the dividend growth is usually assumed to equal the long-term consensus earnings growth rate g, obtained from equity analysts[5]. 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). Thus, these equations combine the plausible conjecture of a strong growth in the first years with realistic growth rates in the long run. Note that there are two different growth rates in this paper. The rate g refers to the consensus forecast of the long-term earnings growth rate by analysts, and g_l refers to the long-term nominal GDP growth rate of the economy.

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

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 and 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, a three-stage formula is also thinkable:

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

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 think that the presented formulas set a reasonable frame for the objective of this paper: the evaluation of various techniques to estimate the implied ERP.

2.3 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[6]. Next, when comparing both DDM formulas, observe that due to the transition phase, the

[6]In the view of time-varying risk premia, this might not be an appropriate assumption. However, *Claus and 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.

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 rates 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 it depends on the relation of earnings and residual income in year 20. In some cases, decreasing earnings in the transition phase can cause 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, there is an interesting point to note: although the two-stage RIM and the three-stage DDM are functionally very different, and definitely not mathematically equivalent to each other[7], both models implement rather similar assumptions about the expected future return on equity. 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.

A final remark about the often stated superiority of RIM calculations over those using the DDM. In the RIM, the argument follows in the literature, a significant part of the total value is captured and fixed by currently accessible information, such as the current book value or the earnings in the first years. Hence, the estimate for k is less affected by assumptions of the researcher in the form of the GDP growth rate g_l compared to the DDM, heavily depending on the assumed dividend growth rates. Thus, the estimated ERP would be more reliable (*Claus and Thomas*, 2001). This

[7] Only the unrestricted equations (1) and (3) are mathematically identical.

common belief originates from a misleading interpretation of the residual income model. First, in the growth (and transition) phase of the RIM, future residual income are calculated on the basis of expected earnings E_t and retention ratios r_t (see the definition of residual income in equation (4) and the transformed *clean-surplus* relation in equation (5)). However, E_t and r_t constitute, similar to the DDM, a series of future dividend payments. Second, the current book values B_0 employed in the RIM are totally irrelevant for the valuation of equity, as can be seen by means of a transformed version of the unrestricted RIM[8]:

$$\begin{aligned} P_0 &= B_0 + \sum_{t=1}^{\infty} \frac{E_t - k(B_{t-1})}{(1+k)^t} \\ &= B_0 + \sum_{t=1}^{\infty} \frac{E_t}{(1+k)^t} - B_0 - \frac{k}{1+k} \sum_{t=1}^{\infty} \frac{\sum_{s=1}^{t} r_s E_s}{(1+k)^t} \\ &= \sum_{t=1}^{\infty} \frac{E_t}{(1+k)^t} - \frac{k}{1+k} \sum_{t=1}^{\infty} \frac{\sum_{s=1}^{t} r_s E_s}{(1+k)^t} \end{aligned} \tag{10}$$

In other words, book values of equity do not *explain* its market value, but they only *illustrate* a part of it. As can be seen from expression (10), future *earnings* are the key determinant for the value of equity.

In the restricted models of equations (8) and (9), current book value has of course an influence on the valuation of equity. This is due to the application of the GDP growth rate to residual income instead of dividends (or earnings), causing the earlier mentioned discontinuities in earnings growth rates. One could avoid these probably unrealistic jumps by adjusting the assumed GDP growth rate by this (theoretically unjustified) influence of current book value. In fact, the g_l of the RIM could then be interpreted as a function of the current book value B_0 and the g_l employed in the DDM. When correcting the *RIM* g_l by the distortion caused by the influence of B_0, current book value would cease to influence k. The effect of growth assumptions by the researcher would be identical in such a setting. For a more detailed discussion on theoretical equivalence and empirical difference between both models and the role of book values of equity valuation, see *Lundholm and O'Keefe* (2001b,a) and *Penman* (2001).

To conclude this section, we see that both approaches to value the cost of equity

[8]For a detailed transformation, see the Appendix.

have their pros and cons. Hence, we leave the final evaluation to the empirical part of this study.

2.4 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. one or more missing input variables, have been ignored[9]. The solution of the equations is not straightforward, representing a polynomial in k. Hence, the value for k is solved iteratively.

3 Data Description

3.1 Data for Cost of Capital Calculation

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 outdates by several months. Hence, adjustments are carried out in order to improve the consistency of the data (see similar issues in *Lee and 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 last reported annual dividend paid out m

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

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[10].

Similarly, the construction of a meaningful B_0 imposes difficulties in RIM calculations. Similar to e.g. *Gebhardt et al.* (2001), 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 and 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: $E_t = E_{t-1}(1 + g)$[11].

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

[10] There is some controversy in the literature about how to construct the right D_0 or D_1, see for example *Harris and Marston* (1992). Moreover, the treatment 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.* (2003)

[11] Although analysts usually forecast earnings beyond year 1, we hadn't any access to this data. *Claus and Thomas* (2001) use the same approach to generate missing data in their study.

g_l are regularly published by economic consultant firms. *Consensus Economics Inc.* (2002) provides predictions 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*.

All data is as of 18. March 2003. The data was collected for all 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[12]. 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 implied cost of capital calculation.

3.2 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 (beta), the volatility of historical stock returns to account for total risk, and specific fundamental firm characteristics. Since the regressions are only carried out for the companies of the Euro Stoxx, the data has been collected for the relevant firms only.

[12]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.

3.2.1 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 European capital markets 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 is the only priced risk factor. This gives following relation of systematic risk:

$$r_{it} - r_{ft} = \alpha_i + \beta_i(r_{mt} - r_{ft}) + \varepsilon_i \tag{11}$$

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_i = error disturbance.

The Euro Stoxx index has been chosen as surrogate for the market portfolio. Again, the return on one-month German government securities is used as a proxy for a European risk-free asset. The factor model of equation (11) 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*.

3.2.2 Volatility

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

3.2.3 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 and 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 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.

3.3 Data for Return Forecast Regressions

The historical share prices to calculate the actual returns in the 12 months after the estimation of expected returns are also taken from *Datastream*.

4 The Equity Risk Premium

The equity risk premium is calculated directly from the cost of capital estimates. First, the yield on government securities 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 the 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[13]. 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 about 1.3% 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 and Thomas*

[13]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.

(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 transition phase is included in the model. Low earnings at the end of this phase cause very low 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 affirmed in section 2.3. Especially in the U.K., both estimates deviate by a small amount only. In the Euro Stoxx index, the difference is somewhat larger, with the two-stage RIM yielding an estimate that is around 70 basis points higher compared to the DDM. Still, the estimates of both PV formulas lead to estimates in the fairly small range from 6.3% and 7.2%. The high correlation of the estimated cost of capital k for each company from both models of 0.72 indicates the strong equivalence of both models, too: even at the level of the individual companies, the estimates of k are quite related to each other.

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[14]. Moreover, 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 and 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 since 2001 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.

5 Further Analysis of the Implied Cost of Capital Estimates

After the quantitative comparison of different models to estimate the implied ERP in the last section, this part aims to detect qualitative differences between the under-

[14]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 the estimates.

lying implied cost of capital estimates for the individual firms. The small data set of the FTSE-100 and Euro Stoxx-50 are the reason why we focus in the remainder of the study on the rather broad Euro Stoxx index.

5.1 Cross-Sectional Regressions

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. 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.

5.1.1 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 the cross-sectional regression approach by *Fama and MacBeth* (1973):

$$k_i - r_f = \gamma_0 + \gamma_1 \beta_i + \sum_{j=1}^{J} \delta_j C_{ij} + u_i \tag{12}$$

where $k_i - r_f$ is the implied risk premium estimate for firm i, C_{ij} are the characteristics j for firm i, and γ_1 and δ_j are the respective slope coefficients. All reported t-statistics are based on the White heteroscedasticity-consistent standard errors.

In contrast to related studies, the implied risk premium is regressed on the firm characteristics of the *same* year. Such a specification raises the question about spurious correlation between the dependent variable and the firm characteristics, since the latter are used to calculate the implied cost of capital. However, the two methods to calculate the cost of capital, DDM and RIM, offer the possibility to employ those firm characteristics that are *not* contributing to the dependent variable as regressors. Hence, this method allows to detect firm characteristics that explain the firm risk premium formed at the same point of time. This procedures avoids the usual one-year gap between the implied risk premium and firm characteristics in the regression equations (*Gebhardt et al.*, 2001; *Lee et al.*, 2003). These earlier studies consequently 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 is hence not captured in this setting.

The cross-sectional regressions are estimated with different specifications of the model displayed in equation (12). 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 regressed on $lnMC$ (log of the market capitalization), $lnPE$ (log of the PE ratio), and $lnBM$ (log of the BM ratio). In turn, the RIM estimates are regressed on $lnMC$ (log of the market capitalization) and the dividend yield (Yld). Since total risk should not be a priced risk factor according to theory, finally specification (S3) omits this variable from the regressors.

The empirical study of *Fama and French* (1992), based on average realized returns present 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.* (2003) detect a positive relation between the implied cost of equity and the dividend yield, and *Easton* (2003) 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.

5.1.2 Individual Firm Regressions with Firm Betas

Table 3 presents the estimation results of the regressions where the individual firm risk premia are regressed on individual firm betas and individual firm characteristics. In the pure beta specification (S1), only the beta coefficients in the DDM regressions are significantly related to firm risk. The R^2 of these regressions is however rather low. After controlling in addition for return volatility and other firm characteristics (S2), neither of the risk variables is significant. This contrasts to the firm fundamentals, which exhibit a significant effect on the risk premia. The PE-ratio is significantly negatively related to the implied risk premia, the BM-ratio has a positive relationship, and the dividend yield is positively related to firm risk. In the regression of the DDM2[15] risk premia, R^2 attains 26%. When omitting return volatility (S3), the beta coefficients of the DDM regressions is again significant. Firm size is not significant in any specification.

When looking at the DDM-models, these findings provide a mixed picture in view of the theory: On the on hand, the positive beta coefficient and the rather insignificant influence of firm size is very much in line with the expectation. On the other hand, PE-ratio, BM-ratio and dividend yield should not be priced risk factors - but other studies detect similar relationships. The RIM analysis is disappointing from the point of view of the betas. Moreover, the F-stat rejects the hypothesis of all variables being jointly significant in almost all RIM specifications. The strong explanatory power of the dividend yield in RIM2 confirms the findings of *Dhaliwal et al.* (2003). This poor performance of the standard regression tests for expected returns raises the question what factors influence the implied risk premium calculated from the RIM approach. Although an 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 asset pricing theory.

5.1.3 Individual Firm Regressions With Country Betas

Since firm betas can usually be estimated with much noise only, 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 of the eleven countries in this study[16]. The results are reported in *table 4*.

Now, all DDM regressions indicate a positive relation between beta and firm risk premia. Moreover, the coefficient is in many cases even highly significant. This

[15]To simplify the notation, *DDM3* is the abbreviation for the *three-stage DDM*. *DDM2* stands for *two-stage DDM*, etc.

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

again contrasts to the RIM regressions, where the RIM2 detects a negative relation with a company's beta. Return volatility is for the first time an explaining factor for the DDM risk premia as well (S2). As for the other firm characteristics, the BM-ratio (DDM2) and dividend yield (RIM2) exhibits a significantly positive effect on the firm risk premium. Again, the PE-ratio (both DDM) is negatively related to firm risk.

Regarding the DDMs, this regression approach seems to fit the data better than the previous specification (R^2 increases slightly to 28% in S2). However, total risk is, in contrast to theory, a priced risk variable. In the RIM, the detected negative relationship between beta and firm risk is very clearly opposed to theory. This finding, together with relatively low R^2, indicate the poor explanatory power of the model and the cost of capital obtained from the RIM methodology.

5.2 Comparing estimates with actual stock returns

In this section, we finally test the ability of the implied cost of capital to predict actual stock returns. In the regression setup, the subsequent observed returns over 1 to 4 quarters (q) are regressed on the expected returns calculated in previous sections[17]. The regression equation looks as follows:

$$\frac{4}{q} r_{i,q} = a_0 + a_1 k_i + \varepsilon_i \tag{13}$$

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[18].

Table *5* 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

[17] *Lee and 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.

[18] 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.

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[19]. Second, the dividend discount 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 different from zero. In these regressions, R^2 declines down to 1%. However, one must notice that the DDM2 is likely to *underestimates* the overall stock returns, with the slope coefficient being almost twice as high than of 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 expected profits" (*Cohen*, 2002). Hence, including this information is crucial for estimating the implied cost of capital. With respect to such signals, the RIM makes clearly less use of publicly available information.

6 Conclusion

Because of the lack of alternative methods, *Freeman and Davidson* (1999) concluded only five 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 ERP.

In contrast most other empirical works who rarely investigate the plausibility of

[19] 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 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.

their models to estimate the implied ERP, this study carried out an analysis of several common formulas currently used, and applied them to a pan-European sample. The results of this study show that dividend discount models and residual income models can lead to similar ERP estimates. More precisely, the risk premia obtained from a two-stage RIM and a three-stage DDM deviate by a small amount only. The subsequent cross-sectional analysis on the underlying firm-specific risk premia detected however some qualitative differences between both approaches. Interestingly, the individual firm risk obtained from the RIM cannot be explained by common factors of asset pricing theory. In contrast, firm characteristics and betas explain up to 28% of the variation of the DDM risk premia. In line with theory, beta is positively related to firm risk in most regressions. However, total risk is a priced risk factor as well. In terms of firm characteristics, PE-ratio and, to a lesser extent, the BM-ratio, contribute to the explanation of implied firm risk. Firm size is not relevant for expected firm risk. Whether this conformity with theory is crucial for predicting future stock returns is an empirical question. Such forecasting regressions were carried out in the last section of this paper. It was 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, which the residual income model cannot make use of. Together with the presented theoretical irrelevance of current book value for equity valuation in section 2.3, this study suggests that multistage DDMs are preferable models to estimate the implied cost of capital, contradicting the alleged superiority of the RIM, as stated e.g. in *Claus and Thomas* (2001), and its use in many empirical studies.

One must keep in mind the weak point of this empirical work. The data used in this study reflects only the expectations as of 18 March 2003. To obtain a more general conclusion about differences between cost of capital estimates from DDM and RIM, a longer time period could be examined. However, whether the presented results can be sustained over a long time interval or not, this study clearly puts forward empirical evidence that the DDM offers some advantages in the implied ERP estimation over the RIM.

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. Both qualitatively and quantitatively, the differences of the various approaches can be large. Since both models can have advantages, a sound analysis of the implied risk premium should at minimum include DDM-based approaches. Second, the results of other empirical studies on the implied cost of capital relying only on the RIM should be interpreted with caution. The so-obtained findings may only hold for RIM based cost-of-capital estimates, but not for the general implied cost-of-capital concept.

Appendix:
Transformation of the Residual Income Model

Derivation of expression (10) from the general RIM formula (equation 3):

$$\begin{aligned}
P_0 &= B_0 + \sum_{t=1}^{\infty} \frac{E[R_t]}{(1+k)^t} \\
&= B_0 + \sum_{t=1}^{\infty} \frac{E_t - k(B_{t-1})}{(1+k)^t} \\
&= B_0 + \sum_{t=1}^{\infty} \frac{E_t}{(1+k)^t} - k \sum_{t=1}^{\infty} \frac{B_{t-1}}{(1+k)^t}
\end{aligned}$$

The third term can be transformed further:

$$\begin{aligned}
k \sum_{t=1}^{\infty} \frac{B_{t-1}}{(1+k)^t} &= \frac{kB_0}{1+k} + \sum_{t=2}^{\infty} \frac{B_0 + \sum_{s=1}^{t-1} r_s E_s}{(1+k)^t} \\
&= \frac{kB_0}{1+k} + k \sum_{t=2}^{\infty} \frac{B_0}{(1+k)^t} + k \sum_{t=2}^{\infty} \frac{\sum_{s=1}^{t-1} r_s E_s}{(1+k)^t} \\
&= k \sum_{t=1}^{\infty} \frac{B_0}{(1+k)^t} + \frac{k}{1+k} \sum_{t=1}^{\infty} \frac{\sum_{s=1}^{t} r_s E_s}{(1+k)^t} \\
&= B_0 + \frac{k}{1+k} \sum_{t=1}^{\infty} \frac{\sum_{s=1}^{t} r_s E_s}{(1+k)^t}
\end{aligned}$$

Inserting in the equation above leads finally to equation (10):

$$\begin{aligned}
P_0 &= B_0 + \sum_{t=1}^{\infty} \frac{E_t}{(1+k)^t} - B_0 - \frac{k}{1+k} \sum_{t=1}^{\infty} \frac{\sum_{s=1}^{t} r_s E_s}{(1+k)^t} \\
&= \sum_{t=1}^{\infty} \frac{E_t}{(1+k)^t} - \frac{k}{1+k} \sum_{t=1}^{\infty} \frac{\sum_{s=1}^{t} r_s E_s}{(1+k)^t}
\end{aligned}$$

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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 Calculation	Number of Firms	85	48	228
	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 Calculation	Number of Firms	80	45	223
	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		
		U.K.	Euro Area	
		FTSE-100	Euro Stoxx-50	Euro Stoxx
	Observations (n)	84	48	228
A	2-stage DDM from Equation(6)	5.21% (2.45%)	5.08% (3.62%)	4.83% (3.69%)
A	3-stage DDM from Equation(7)	6.31% (3.22%)	6.35% (4.20%)	6.43% (5.46%)
	Observations (n)	80	45	223
B	2-stage RIM from Equation(8)	6.46% (2.64%)	6.78% (3.10%)	7.18% (4.05%)
B	3-stage RIM from Equation(9)	6.41% (3.09%)	7.05% (3.47%)	7.75% (5.23%)

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

Table 3: *Regressions of Individual Firm Data*

	S1				S2				S3			
	DDM2	DDM3	RIM2	RIM3	DDM2	DDM3	RIM2	RIM3	DDM2	DDM3	RIM2	RIM3
Intercept	0.05***	0.06***	0.08***	0.08***	0.11	0.17*	0.13	0.18*	0.19***	0.23***	0.15**	0.19**
	(11.06)	(10.66)	(16.62)	(14.02)	(1.75)	(1.86)	(1.51)	(1.80)	(2.83)	(2.80)	(2.20)	(2.27)
Beta (β)	0.01*	0.02**	0.00	0.01	-0.01	0.01	-0.00	0.01	0.02***	0.03***	0.00	0.01
	(1.80)	(2.37)	(0.50)	(1.48)	(-0.40)	(0.57)	(-0.21)	(0.73)	(2.88)	(3.60)	(0.43)	(1.45)
Return volatility					0.43	0.28	0.12	0.01				
					(1.27)	(0.77)	(0.52)	(0.04)				
Size ($lnMC$)					-0.00	-0.00	-0.00	-0.01	-0.00	-0.00	-0.00	-0.01
					(-0.12)	(-0.37)	(-1.00)	(-1.28)	(-0.99)	(-0.86)	(-1.33)	(-1.47)
PE-ratio ($lnPE$)					-0.03***	-0.04***			-0.03***	-0.04***		
					(-3.36)	(-4.00)			(-2.96)	(-3.66)		
BM-ratio ($lnBM$)					0.01***	0.01*			0.01***	0.01*		
					(2.91)	(1.75)			(2.90)	(1.76)		
Dividend yield (Yld)							0.37**	0.25			0.39**	0.25
							(2.15)	(1.39)			(2.08)	(1.38)
R^2	0.01	0.02	0.00	0.01	0.26	0.18	0.08	0.08	0.24	0.18	0.08	0.04
n	222	222	218	218	218	218	218	218	218	218	218	218

Note: White 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

Table 4: *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**	0.03*	0.10***	0.08***	0.13**	0.16**	0.14**	0.16*	0.18***	0.22***	0.15**	0.18**
	(2.57)	(1.86)	(7.68)	(5.29)	(2.25)	(2.03)	(2.06)	(1.93)	(2.78)	(2.67)	(2.28)	(2.19)
Beta (β)	0.04**	0.06***	−0.03*	0.00	0.05***	0.08***	−0.03*	-0.00	0.06***	0.09***	-0.03	0.00
	(2.27)	(2.79)	(-1.47)	(0.09)	(2.91)	(3.61)	(-1.74)	(-0.12)	(3.39)	(3.96)	(-1.52)	(0.22)
Return volatility					0.29**	0.35**	0.11	0.18				
					(2.09)	(2.34)	(1.01)	(1.30)				
Size ($lnMC$)					-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
					(-0.76)	(-0.73)	(-1.04)	(-1.31)	(-1.26)	(-1.21)	(-1.17)	(-1.48)
PE-ratio ($lnPE$)					−0.04***	−0.05***			−0.04***	−0.05***		
					(-3.28)	(-4.00)			(-2.86)	(3.47)		
BM-ratio ($lnBM$)					0.01**	0.01			0.01**	0.01		
					(2.23)	(1.11)			(2.32)	(1.26)		
Dividend yield (Yld)							0.38**	0.23			0.40**	0.26
							(2.18)	(1.31)			(2.21)	(1.42)
R^2	0.01	0.03	0.01	0.00	0.28	0.21	0.09	0.04	0.25	0.19	0.08	0.03
n	222	222	218	218	218	218	218	218	218	218	218	218

Note: White 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

Table 5: *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 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