DECLINING MACRO-ECONOMIC UNCERTAINTY AND THE COST OF EQUITY CAPITAL: ANALYSING THE PRE-EMU PERIOD IN A DYNAMIC SETTING

Juha Junttila
University of Oulu, Department of Economics,
PO Box 4600, FIN-90014, University of Oulu, FINLAND

Juha-Pekka Kallunki
University of Oulu, Department of Accounting and Finance,
PO Box 4600, FIN-90014, University of Oulu, FINLAND

Contact Address:
Juha Junttila,
Department of Economics, University of Oulu,
P.O. Box 4600, FIN-90014 University of Oulu, Finland.

phone: (+358) 8 553 2916
fax: (+358) 8 553 2906
e-mail: **juha.junttila@oulu.fi**

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Abstract

We analyze the effect of declining macro-economic risk to the country-wide cost of equity capital. Our empirical results indicate that the earnings capitalization rates derived from a standard equity valuation model increased especially in the EMU countries during the EMU convergence period. Corresponding increase was not observed in our control sample of non-EMU countries for the same period. The results suggest that part of this increase was clearly due to the declining macroeconomic risks based on the explicit convergence criteria, especially for inflation and the public budget deficits.

Key words: Stock market, Valuation, Earnings yield, Macroeconomic risks

EFM Classification Codes: 310, 560, 570, 630

1. INTRODUCTION

The cost of equity capital has an important role to play in theoretical and empirical research in many areas of financial economics, corporate finance and financial accounting. Especially, there is a growing body of literature investigating the macro-economic determinants of the market-wide estimates of the cost of equity capital. Henry (2000), for instance, reports that the stock market liberalizations lead private investment booms that decrease the cost of equity capital. The macro-economic factors can affect both components of the cost of equity capital, i.e. the risk-free rate of return and the equity risk premium, and the factors may have an inverse impact on these components. Furthermore, for example Claus and Thomas (2001) emphasize that the equity premium in international markets has been historically quite low, when analyzing it based on the discount rate that equates market valuations with expectations of future cash flows. Also Jagannathan et al (2000) have noticed that the U.S. equity premium has been strongly declining during the last three decades. They analyze this phenomenon in the standard Gordon valuation model based on a modification where the expected dividend growth rate is time varying. Their main result is that during the 1926 – 1970 period the equity premium was tenfold compared to the period from 1982 to 1999 in the US market.

The links between macroeconomic risk factors and the stock market valuation have been analyzed frequently in the previous studies. Like emphasized in Zhou (1999), there are basically two schools considering this issue. The first analyzes the macro factors affecting the stock market valuation as inherently latent and unobservable directly from the market data (for standard references, see Ross (1976), Roll (1977) Connor and Korajczyk (1986)), and hence, mainly utilizes the factor analytic approaches. The second school takes a more pragmatic point of view, and

treats the security factors as pre-specified economic or financial factors that appear to be related to asset prices and returns by simple financial reasoning or plain intuition (see Chen et al. (1986) and Fama and French (1993) for representative early studies, and Chan et al (1998) for a more recent study). For example, Sharpe (2002) uses the Campbell and Shiller (1988) dividend-price ratio modification of the standard Gordon growth model in analyzing the link between inflation and stock valuation. His main result is that the negative dependence of equity values and expected inflation is based on two effects, namely that a rise in expected inflation is connected to both the *lower* expected real earnings and *higher* required real returns. Furthermore, especially the earnings channel captures the negative relation between expected long-term earnings growth and expected inflation. Even more explicitly, for example the paper by Flavin and Wickens (2003) analyzes the role of macroeconomic variables in determining the optimal asset allocation strategies. Using a VAR model with multivariate GARCH error structure they find that in the UK data on three risky assets (equity and long- and short-term government bonds), the efficient portfolio frontier is time-varying and subject to contagion from inflation. When the inflation effect is taken into account the obtained efficient portfolios offer superior risk-return combinations to the investors.

In this paper we want to especially focus on the effect of the declining macro-economic risk to the country-wide cost of equity capital. Establishment of the European Monetary Union (EMU) in the late 1990's provides a unique environment to investigate the impact of macro-economic risk on the cost of equity capital, because one of the purposes of the EMU was to explicitly decline the macro-economic risks in the euro area. The change from individual domestic currencies to a common euro currency was preceded by a long convergence process beginning in 1979 with the creation of the European Monetary System (EMS). The common euro currency was a

natural consequence of the European integration development, and it was aimed to boost the capital market integration in Europe. The single currency is commonly believed to be a necessary condition for the emergence of pan-European capital markets, which would be comparable to the US capital markets in terms of market size. With this target in mind, the 11 prominent EMU countries were committed to stabilize their economies especially during the final stages of the convergence period from 1995 to 1998 by cutting their budget deficits, and controlling interest rates and inflation. For the most part, the first EMU countries achieved all these criteria implying that the macro-economic risks of the EMU countries gradually declined especially during the convergence period. Accordingly, we should observe a drop in the cost of equity capital during the EMU convergence period, if the macro-economic risk really is likely to affect the cost of equity.

Empirical evidence from the post-euro period indicates that the introduction of euro has affected relative valuation, volatility, bid-ask spreads and other trading characteristics of the European stock market (see, for instance, Morana and Beltratti 2002, Billio and Pelizzon 2003, and Bris et al. 2003). Morana and Beltratti (2002) investigate the effect of euro on the volatility of European stock markets. They argue that if the adoption of euro really stabilizes the fundamentals of the European economies, it should decrease the variance of stock returns in historically unstable stock markets in Europe. Their empirical results support this hypothesis at least in the Spanish and Italian stock markets. Billio and Pelizzon (2003) investigate the co-movements of European stock markets with the world stock market. They observe that the volatility spillovers from the world index have increased after the introduction of euro for most European stock markets, and the link between European capital markets has strengthened at the country level. Bris et al (2003) investigate the firm

valuation effects during the EMU convergence period and report that the introduction of the euro has increased Tobin's Q –ratios in EMU countries by 7.4 percent. Even though not explicitly analyzed, their finding suggests that the adoption of euro may have lowered the cost of equity capital especially in EMU countries.

Other points of view for the role of EMU in affecting the valuation of common stocks have been offered by Rouwenhorst (1999), Kempa and Nelles (2001), and Aggarwall et al (2003). Rouwenhorst (1999) postulates that both before and during the EMU convergence period the country effects were larger than industry effects in the equity markets of Western Europe for the EMU countries, despite the harmonization of economic policies following the Maastricht Treaty in 1992. Furthermore, even nowadays there still seem to be differences among the individual EMU countries' equity returns. Also Kempa and Nelles (2001) analyzed the dependencies of European stock markets, and found that in the national stock markets there is role for international diversification in the emerging European stock market relative to a strategy of purely national diversification both before and during the EMU period. In general, their results imply that international diversification is useful especially in the presence of foreign exchange market volatility, indicating that the elimination of FX volatility in the wake of EMU was likely to lower the cost of equity in the national stock markets. Finally, Aggarwal et al (2003) analyzed the time-varying integration of European equity markets over the period 1985 – 2002, and found that the degree of integration strongly increased towards the end of the convergence period in 1997 – 1998, i.e during the final stages of the official establishment of the EMU and the ECB.

We contribute to the previous literature on the macro-economic determinants of the cost of equity capital by providing evidence on the direct effect of the macro-

economic risk to the cost of equity capital and its components. The data from the EMU convergence period is ideal for this purpose, and hence, we analyze time-series of the key macro-economic risk variables for each country (here the explicit EMU criteria variables) and the expected values of these variables (the agreed target values of the EMU criteria variables). The main difference in our paper compared to the earlier papers on the effect of EMU to the cost of capital (like Bris et al. (2003)) is that we use actual data on the time series of the convergence criteria from each of the first phase EMU member countries. The results of the increase in the firm valuation during the EMU period reported by Bris et al. (2003) indicate that the cost of capital may have decreased because of the EMU, but they did not explicitly investigate the issue neither did they relate the change in the cost of equity to the specific macro-economic factors.

Our results suggest that especially the earnings response coefficients (ERCs), i.e. the earnings capitalization rates based on a standard equity valuation model of Ohlson (1995), really increased in the EMU countries during the EMU convergence period. Corresponding increase was not observed in our control sample of non-EMU countries during the same period. When using a dynamic setting in the empirical analysis we also find that a significant part of the increase in the ERCs was due to the decline in the macroeconomic risks in the EMU countries based on the explicit convergence criteria. Especially for the ultimate convergence period 1995 – 1998, the criteria on long-term interest rates and the government budget deficits seem to have had a strongly increasing effect on ERC's, and hence, a declining effect on discount rates. On the other hand, especially in the case of inflation criteria, increasing deviations from the criterion values based on best performing potential EMU countries seem to have had a negative effect on market valuation of stocks, and hence

an increasing effect on the discount rate.

The remainder of the paper is organized as follows. The next section discusses the connections between macroeconomic risks and stock valuation and previous literature on the theme. In the third section we formulate the basic model for our empirical analysis, and extend the basic model to a dynamic form. Discussion about the data and empirical methods used in the study are given in the fourth section. Section 5 provides the main empirical results of the paper, and conclusions are drawn in the sixth section.

2. THE COST OF EQUITY CAPITAL AND EMU CRITERIA

According to Hardouvelis et al (2004) the economic and monetary integration in Europe has affected the cost of equity capital of European firms in three ways, i.e. i) via the gradual abolition of barriers to intra-EU investments and the launch of the common currency which has induced more chances for risk sharing and diversification in the market; ii) through the elimination of intra-European currency risk, and finally; iii) through the interest rate convergence. For the part of increasing possibilities for risk sharing they give the figures for the cross border equity flows in the EU that nearly tripled from the early 1990s by mid 1998. Also Dathine et al (2000) have reported increased holdings of foreign assets by domestic residents within the EU. Furthermore, Hardouvelis et al (1999) report that prior to the launch of the euro, intra-European currency risk contributed on average about 14 % of the equity risk premium across EU countries.

As the most important concept related to our study, Hardouvelis et al (2004) implicitly focus on the effect of interest rate convergence on the cost of equity capital.

According to the convergence criteria based on the Maastricht Treaty, both inflation and interest rates had to converge among EU countries towards the lower levels of Germany, which was previously used as the benchmark country in the European context. Hence, even though the convergence process does not necessarily indicate lower real rates in general, the introduction of the new low inflation environment has benefited the previously high inflation regime countries through the lower variability in inflation rates. Accordingly, assuming that the inflation uncertainty is priced in money and bond markets, the reduction in the inflation premium at least in these countries has led to lower real interest rates and hence, to lower cost of capital for national investors.

Hardouvelis et al (2004) analyzed the question of whether the cost of capital has fallen in the EU via the use of traditional measure of a firms's beta relative to a market portfolio along with a measure of the long-run equity market risk premium. They formalize the model in terms of two potential sources of risk, related to the aggregate EU market portfolio and the local market portfolio. In the empirical analysis they use the stock market return data for the period of Januray 1991 – December 1998 from 10 different sectors in the first phase EMU countries and as the control group, the data from Denmark, Sweden and the UK. Their main conclusion is that for many sectors for most countries who are members of the single currency area the cost of capital has reduced during the convergence period up to 3 %, and on average around 1.5 %. Hence, the reduction in the cost of equity has led to an important rise in the net present value of the stock market and hence national wealth in EMU countries.

Our paper can be seen as a dynammic multi-factor extension of the analysis in Hardouvelis et al (2004). More formally, we use a version of the Ohlson (1995)

valuation model, and introduce the effects of changing macroeconomic conditions to the analysis of the cost of equity capital during the EMU convergence period. The Maastricht Treaty of February 1992 established the time frame and procedures for implementing the monetary union[1], including the determination of fiscal criteria required for EU members to qualify to the EMU. In previous studies (for example, Bris et al (2003)), the actual effects of these convergence criteria and the process via the lowering of interest rates, improvements of government financial position and price stability, have not been explicitly analyzed. For this purpose we have constructed the three most important criterion variables, which are:

1) *The criterion for price stability*: the average rate of inflation, observed over a period of one year before the examination, should not exceed by more than 1.5. percentage points that of the three best performing Member States in terms of price stability
2) *Government financial position*: the public deficit should not exceed 3 percent of GDP, unless it has declined substantially and continuously, and reached a level that comes close to 3 percent[2].
3) *Durability of convergence*: the average of the long-term interest rate, observed over a period of one year before the examination, should not exceed by more than 2 percentage points that of the three best performing Member States in terms of price stability.

[1] For more details see the text of the Treaty from http://europa.eu.int/en/record/mt/top.html.

[2] In addition, the public debt was required to be below 60 % of GDP, unless it was sufficiently diminishing and approaching 60 % at a satisfactory pace. Here we analyze only the first (3 % deficit requirement) of the government financial position criteria.

Notice that we calculate all the criteria variables exactly as they are defined which basically implies that the values of the actual criteria are also time-varying, in addition to the time variation of the country-wise macro variables that have been monitored, i.e. inflation, long-term interest rate, and the public deficit. This implies that we allow the market participants to value the effects of changing macro economic risks on the equity cost of capital as soon as the figures on macroeconomic conditions have been published.

3. RESEARCH DESIGN

We begin our empirical part by analysing the standard Ohlson (1995) model for our panel data set in the form

$$mv_{i,t} = \alpha + \beta X_{i,t} + \varepsilon_{i,t}, \qquad (3.1a)$$

or

$$mv_{i,t} = \alpha + \beta X_{i,t} + \gamma X_{i,t} \times DEMU + \varepsilon_{i,t}, \qquad (3.1b)$$

or

$$mv_{i,t} = \alpha + \beta X_{i,t} + \gamma X_{i,t} \times DEMU^{CONV} + \varepsilon_{i,t}, \qquad (3.1c)$$

where the dependent variable is always the contemporaneous market value deflated by the previous year's book value of the company i, ($mv_{i,t}$). In model (1a), in addition to the constant (α) we first include only the contemporaneous earnings (i.e. $X_{i,t} = e_{i,t}$), also deflated by the previous year's book value, or alternatively, only the contemporaneous dividends ($X_{i,t} = d_{i,t}$), deflated by the previous year's book value, to the model. Next, we analyze the possibility that the earnings or dividend response

coefficients have been higher in the EMU-countries for the whole period, by introducing the interaction variable *DEMU* to the model (case 1b). The variable is constructed by multiplying the earnings variable or the dividend variable with an EMU-dummy, that has a value of 1 for every firm from an EMU-country, and zero otherwise. In the last version (1c) the interaction variable is designed to control for the possibility that the ERC or the dividend response coefficient (DRC) has been different especially during the EMU convergence period, that is, from 1995 – 1998. Hence, the EMU-dummy $DEMU^{CONV}$ obtains here the value of one only for these years, otherwise it is zero.

The next stage of our empirical analysis is based on our a priori hypothesis that, when viewing the findings in the previous literature on the subject, during the analyzed time period of 1992 – 2001, the ERC (and DRC) in EMU countries might have been higher than in other countries. Furthermore, we want to find out whether this might have been due to the explicit macroeconomic convergence criteria. For this purpose we decompose the *implicit discount factor* in the Ohlson model to four factors, namely the short-term interest rate, and the three main macroeconomic convergence criteria 'factors' described already in the previous section of this paper. In addition, in the final stage of our empirical analysis we will use a dynamic representation of the model. This is based on the following derivation for the final regression model.

First, because of the cumulative nature of the market value of a firm, we would want to replace models (1a) – (1c) with a dynamic, ARX-type version

$$mv_{i,t} = \alpha + \phi mv_{i,t-1} + \beta_1 X_{i,t} + \varepsilon_{i,t}, \qquad (3.2)$$

where the error terms $\varepsilon_{i,t}$ are assumed to be independent of each other, but not necessarily to have equal variances. Furthermore, the error terms $\varepsilon_{i,t}$ are assumed to

be independent of the intercept α and of the explanatory factor $X_{i,t}$, that is treated as weakly exogenous.

The effects of the different factors contributing to the discount rate used in the stock market valuation of the earnings (or dividends) can be taken into account by letting the parameter β_1 to be affected by these factors. Let *C(i)* denote the country of firm i and assume that in addition to the short-term interest rate (*r*), especially for the forthcoming EMU countries the most essential features of the macroeconomic environment can be characterized by $R_{C(i),t}$, the value of the EMU convergence criterion variable on long-term interest rate in country *C(i)* at time *t*, by $\pi_{C(i),t}$, the corresponding value of the inflation convergence variable, and finally, by $DEF_{C(i),t}$, the corresponding value of the government budget deficit criterion variable during the convergence period. If the slope parameter β_1 is assumed to depend on these 'macroenvironmental' factors linearly, we end up with the following dynamic specification for our model:

$$\begin{aligned} mv_{i,t} &= \alpha + \phi mv_{i,t-1} + \beta_1 X_{i,t} + \gamma_1 r_{C(i),t} X_{i,t} + \gamma_2 R_{C(i),t} X_{i,t} \\ &\quad + \gamma_3 \pi_{C(i),t} X_{i,t} + \gamma_4 DEF_{C(i),t} X_{i,t} + \varepsilon_{i,t}. \end{aligned} \tag{3.3}$$

We will use an iterative GMM-method to estimate the parameters $\alpha, \beta_1, \phi,$ and $\gamma_1 - \gamma_4$. We choose this estimation procedure because it is possible that the error terms $\varepsilon_{i,t}$ are heteroscedastic. Because we assume that the explanatory factors $X_{i,t}, r_{C(i),t}X_t, R_{C(i),t}X_{i,t}, \pi_{C(i),t}X_{i,t}$ and $DEF_{C(i),t}X_{i,t}$ are weakly exogenous, we can use them as their own instruments in the GMM-estimation. Furthermore, the differences $\Delta mv_{i,t-1} = mv_{i,t-1} - mv_{i,t-2}$ and $\Delta mv_{i,t-2}$ were used as instruments for the ϕ-parameter, because they do not correlate with the error term $\varepsilon_{i,t}$, but they do

correlate with the lagged endogenous variable $mv_{i,t-1}$. The asymptotic covariance matrix of the orthogonality functions, used to define the distance measure in the iterative GMM-procedure, is estimated by the Newey-West estimator (see, for instance, Hamilton, 1994, p. 281), which is robust with respect to autocorrelation up to the lag of three years.

4. DATA ENVIRONMENT AND PRELIMINARY DATA ANALYSIS

We analyze firm level data from the period of 1993 – 2001. The EMU-countries included are the same as in Bris et al. (2003), i.e., the ten first phase countries (Austia, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain), hence excluding Luxembourg and Greece from the current euro countries. However, in terms of the number of observations, our sample of the control group of countries is clearly larger than in Bris et al (2003), who included only Denmark, Sweden and the UK to their set. We have the US, Canada, Japan, Sweden and the UK data in the control group. All the firm-level data are gathered from the most recent Compustat Global Vantage database, and the data on macro variables are obtained from the Bank of Finland. Even though the Compustat data set starts already from 1990, the availability of the convergence criteria data limits the usable set of observations to cover the observations from 1993 onwards in the final analysis.

In Figures 1a and 1b we have plotted the time series of aggregate dividend and earnings yields calculated separately from the set of EMU-countries and non-EMU countries for the analyzed time period. The main message from the figure seems to be in line with the results from previous studies and our main hypothesis, namely that in the EMU markets the equity cost of capital may have been declining, indicated by the

downward trend in especially the earnings yield figures for the period of 1996 – 1999. During that time the earnings/price ratio declined from approximately 0.075 in the beginning of 1996 to value of 0.055 at the end of 1999 for the EMU-countries. The latest figures also show a strong downward trend in the earnings yield in the EMU area. On the other hand, also in the non-EMU countries both the earnings and dividend yields seem to have been declining during our sample period. From the preliminary examination of the data it is difficult to obtain any clear conclusions about the causes for the decline in observed cost of capital, and hence, in the following empirical analysis we want to analyze the possible role of EMU convergence criteria in details.

(Insert Figures 1a and 1b about here)

5. EMPIRICAL RESULTS

Table 1 reports the descriptive statistics of the variables used in our empirical analyses.

(Insert Table 1 about here)

When viewing the descriptive statistics there are no strong differences between the main important variables when comparing the EMU and non-EMU countries, except for the gvornment budget deficit, which seems to have been clearly smaller in the EMU countries than in non-EMU countries. In general, both the market values and earnings would seem to have varied more in the non-EMU countries, but it is not

possible to make any conclusions about their relationship based on these descriptive data. Hence, the next step in our empirical analysis was to analyse the basic Ohlson (1995) valuation model described by equations (3.1a – 3.1c) in the previous section.

(Insert Table 2 about here)

Table 2 reports the results of estimating model (3.1a), i.e. the basic earnings and dividend response coefficient model. The results indicate that the earnings and dividend response coefficients are both positive in our sample. The results of including the $DEMU$ and $DEMU^{CONV}$ dummies interacted with earnings and dividends indicate that the estimated earnings response coefficients are higher in the EMU countries than they are in the other countries. It also seems that both the earnings response and dividend response coefficients are higher during the EMU convergence period. This suggests that the cost of equity capital has declined during the EMU convergence period supporting the notion in previous studies, too. However, because this evidence would clearly seem to be (statistically) stronger when using the earnings (and not dividends) variable as the firm level regressor, the rest of the analysis in this paper will be based only on using the earnings variable as the main firm level variable.

(Insert Table 3 about here)

In table 3 we report the results from investigating the effect of the EMU convergence criteria on the estimated earnings response coefficients year by year. The results of the annual regressions indicate that the government budget criterion might

be negatively related to the estimated earnings response coefficient during the EMU convergence period, i.e. in the years from 1995 to 1998. All in all, in the annual regressions the effect of deviations from the required level of convergence value would not seem to be statistically significant. However, the main interesting result for this criterion variable is that when using the whole data, during the core convergence period from 1995 to 1998, the deficit variable has an increasing effect to the valuing of earnings in the market for the EMU countries (see the results in the last column of table 3). Since the government budget deficit has declined during the EMU convergence period, these results reveal that the estimated earnings response coefficient has partly increased because of the decline in the government budget deficit[3]. In other words, the cost of equity capital has decreased as a result of the decline in the macro-economic risk arising from the government budget deficit.

Table 3 also reports the effect of the other EMU criteria to the estimated earnings response coefficient and consequent estimate of the cost of capital. At first sight, in the annual regressions no significant relation between the other EMU criteria and the estimated earnings response coefficient can be found. However, the results for the whole data indicate that the decline in the inflation has increased the estimated earnings response coefficient in the EMU countries during the EMU convergence period. In other words, the decline in the macro-economic risk arising from inflation has declined the cost of equity capital. This result is based on the interpretation that when the value of inflation convergence variable in our study increases (implying that actual inflation increases compared to the convergence value) it has a decreasing

[3] Notice that regarding the budget deficit variable positive values are a 'good thing' for the stock market because positive values reflect that the government budget is in surplus, and hence, increase the value of common stock in the country's market due to the lower 'public deficit risk' implying a lower discount rate in the valuation process.

effect on the market value of stocks, and hence, an increasing effect on the discount rate, due to the observed rise in the inflation risk. Next we discuss our final results based on analyzing the dynamic version of our model, given in equation (3.3) in the previous section.

(Insert Table 4 about here)

Table 4 reports the results of estimating the dynamic version of our extended model from the whole data. The statistically significant positive slope coefficient of the lagged dependent variable $mv_{i,t-1}$ supports the use of the dynamic model, i.e. the positive autocorrelation in the dependent variable needs to be taken into account. The main finding in Table 4 is the result that all the EMU convergence criteria variables affect the estimated earnings response coefficient in the EMU countries during the EMU convergence period. In line with the results already for the static version reported in table 3, the inflation criterion has a decreasing effect and the public deficit criterion has an increasing effect on the valuation of stocks in EMU countries especially during the core convergence period 1995 – 1998. The positive effect of long term interest rate convergence criterion may be interpreted via analysing the effect of the term structure of interest rates, because increasing values of long-term interest rates in a country might be seen as indicting a tightening of monetary policy, and hence, lowering the future values of inflation (or current inflation *expectations*), which have a decreasing value on the discount rate, and hence an increasing value on the market valuation. Like observed also in the previous literature, it is also obvious from our results, that the main important factor in the discount rate is the short term interest rate. However, our results indicate that using the short-term interest rate as a

proxy for the discount factor alone and hence, as the single factor (i.e., the risk-free rate) affecting the valuation of earnings, is clearly not appropriate when there are significant changes in the macroeconomic 'environment'.

6. CONCLUSIONS

A growing body of literature is investigating the macro-economic determinants of the market-wide estimates of the cost of equity capital. The macro-economic factors can affect both components of the cost of equity capital, i.e. the risk-free rate of return and the equity risk premium, and the factors may have an inverse impact on these components. Henry (2000), for instance, reports that the stock market liberalizations lead private investment booms that decrease the cost of equity capital. Furthermore, for example Claus and Thomas (2001) emphasize that the equity premium in international markets has been historically quite low.

This paper investigates the effect of the declining macro-economic risk to the country-wide cost of equity capital by analyzing data from countries that join the European Monetary Union (EMU) in the late 1990's. The data provide a unique environment to investigate the impact of macro-economic risk on the cost of equity capital. The change from domestic currencies to euro was preceded by a long convergence process beginning in 1979 with the creation of the European Monetary System.

We contribute to the previous literature by providing evidence on the direct effect of the macro-economic risks to the cost of equity capital. The data from the EMU convergence period is ideal for this purpose. We analyze time-series of the key macro-economic risk variables for each country represented by the explicit EMU

convergence criteria variables. Our results suggest that the earnings response coefficients (ERC), i.e. the earnings capitalization rates derived from the standard equity valuation models, increased in the EMU countries during the EMU convergence period. Corresponding increase was not observed in our control sample of non-EMU countries during the same period. Furthermore, in addition to the effects of the risk-free interest rate, part of the increase in the ERC values was due to the lowering macroeconomic risk, and the most important macro factors would seem to have been the inflation and public deficit factors.

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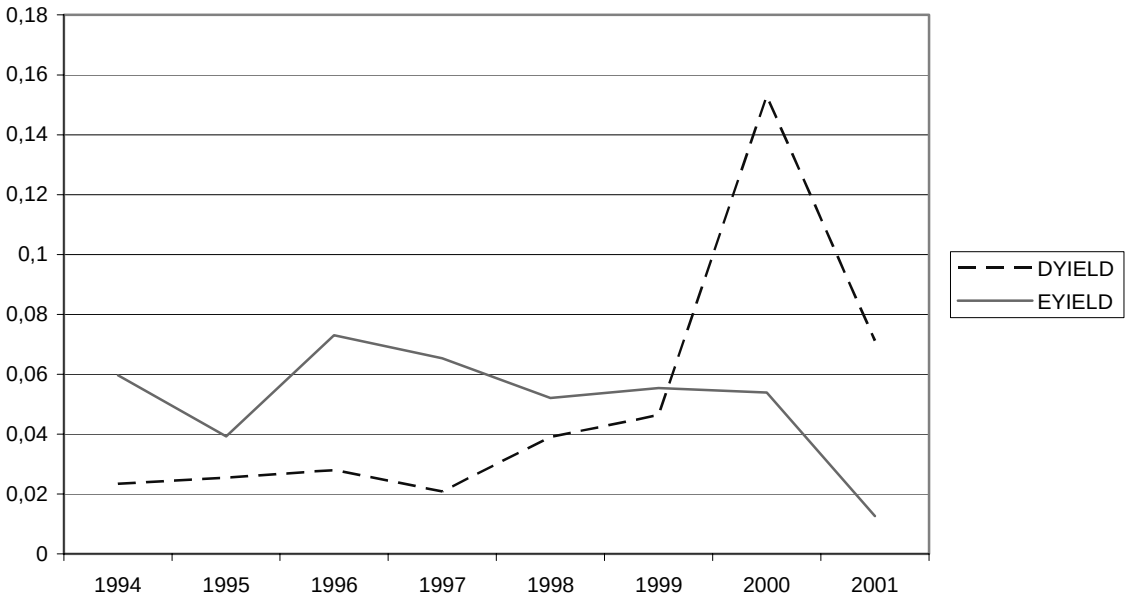

Figure 1a. The dividend (DYIELD) and earnings (EYIELD) yields in EMU-countries.

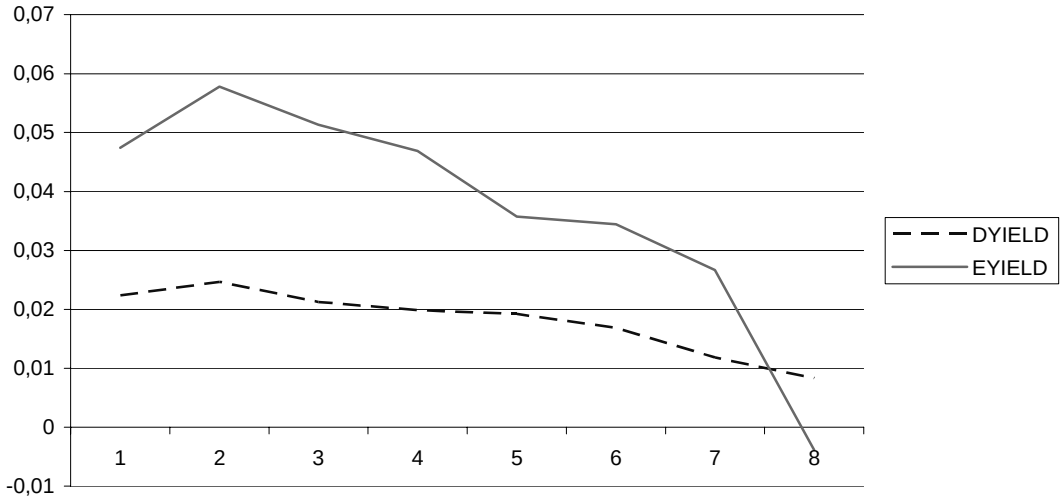

Figure 1b. The dividend (DYIELD) and earnings (EYIELD) yields in non-EMU countries

Table 1. Descriptive statistics of the primary variables for the final sample period (1993 – 2001)

		the EMU countries										the non-EMU countries				
Variable	Statistics	Aus	Bel	Fin	Fra	Ger	Ire	Ita	Nld	Por	Spa	Can	Jpn	Swe	UK	US
$mv_{i,t}$	Mean	1.932	1.931	1.721	2.638	2.571	2.106	1.520	2.525	1.424	2.476	2.113	1.448	2.438	2.282	2.653
	Min	0.622	0.625	0.336	0.312	0.344	0.353	0.678	0.344	0.451	1.158	0.311	0.307	0.355	0.307	0.355
	Max	6.289	8.454	7.048	10.400	10.372	10.256	2.958	9.030	5.092	8.122	10.184	10.463	10.381	10.076	10.38
$e_{i,t}$	Mean	0.143	0.009	0.130	0.101	0.093	0.136	0.121	0.177	0.077	0.141	0.073	0.019	0.104	0.120	0.104
	Min	-0.185	-0.389	-0.499	-0.478	-0.489	-0.327	0.026	-0.369	-0.164	0.056	-0.533	-0.535	-0.484	-0.518	-0.484
	Max	0.398	0.304	0.395	0.375	0.381	0.405	0.346	0.398	0.247	0.238	0.408	0.408	0.390	0.409	0.391
$d_{i,t}$	Mean	0.061	0.011	4.237	0.008	0.055	0.052	0.022	0.063	0.009	0.038	0.028	0.015	0.776	0.071	0.776
	Min	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Max	0.460	0.098	203.518	0.261	0.642	0.856	0.063	0.237	0.040	0.122	1.636	0.178	49.743	1.414	49.743
$\pi_{n(i),t}$	Mean	1.898	2.208	1.993	1.359	1.772	3.703	2.322	2.575	2.781	2.949	1.717	0.188	1.416	2.562	1.416
	Min	0.560	0.949	0.615	0.530	0.581	1.619	1.640	1.908	2.138	1.818	0.185	-0.737	-0.133	1.547	-0.133
	Max	2.917	2.512	3.308	1.989	2.725	5.406	2.749	4.434	4.042	4.613	2.708	1.713	2.497	3.364	2.497
$R_{n(i),t}$	Mean	1.310	1.288	1.612	1.413	1.238	1.227	1.074	1.689	1.348	1.219	1.474	1.633	1.359	0.200	1.359
	Min	0.759	0.805	0.713	0.617	0.484	-1.049	-0.255	0.633	0.441	0.476	0.250	0.971	0.717	-1.857	0.717
	Max	0.224	2.276	3.927	2.474	2.887	2.388	1.886	3.166	1.947	2.045	3.235	2.521	2.340	2.651	2.340
$DEF_{n(i),t}$	Mean	-1.313	-0.172	3.067	-2.633	-1.664	1.466	-1.714	-0.655	-3.084	-3.681	.	-5.487	2.859	-0.959	2.859
	Min	-4.970	-1.960	-5.674	-5.530	-3.460	-2.150	-2.810	-4.150	-4.500	-6.900	.	-7.370	-10.800	-6.730	-10.800
	Max	0.160	0.380	7.096	-1.340	1.100	4.440	-0.550	2.170	-2.400	-0.100	.	-2.280	4.800	3.950	4.800
$r_{n(i),t}$	Mean	3.905	3.932	3.771	4.143	3.929	4.804	4.234	3.801	5.175	5.996	.4.888	0.643	4.098	6.023	4.098
	Min	2.864	2.864	2.864	2.864	2.864	2.864	2.864	2.864	2.864	2.864	3.416	0.184	3.215	5.054	3.215
	Max	5.112	4.330	5.614	6.607	5.381	6.122	6.946	5.203	9.529	9.230	6.950	2.301	8.620	7.392	8.620

NOTES: For each variable the mean, maximum and minimum values are given for each country. The subscripts *i*, *n* and *t* denote firm, country and time, respectively. The market value *(mv*) is calculated as the ratio of the market value of firm *i* in year *t* divided by the previous year's book value. The variables (*e*) and (*d*) are calculated also as a ratio of the firm *i* earnings in year *t* divided by the previous year's book value (for *e*) and correspondingly, as year *t* dividends divided by the previous years book value (for *d*). Inflation rate (π) is calculated as the annual change in the consumer price index, whereas *R* measures the term structure of interest rates calculated as the difference between the 5 year interest rate (in most cases) and the short-term, i.e. 3-month money market interest rate (*r* in the tables). Finally, *DEF* refers to the actual values of the government budget deficit in relation to GDP, and positive values of *DEF* indicate that the government budget has been in surplus. The countries are (from left to right) Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain, Canada, Japan, Sweden, the UK and the US.

Table 2. Preliminary empirical results for the pooled data for the whole sample 1990 - 2001.

The dependent variable is the contemporaneous market value deflated by the previous year's book value of the company *i*, ($mv_{i,t}$). In addition to the constant (*a*), we first include only the contemporaneous earnings ($e_{i,t}$), also deflated by the previous year's book value, to the model (Model I_e), or alternatively, only the contemporaneous dividends ($d_{i,t}$), deflated by the previous year's book value, to the model (Model I_d). Next, we analyze the possibility that the earnings (or dividends) response coefficient has been higher in the EMU-countries for the whole period (Models II_e and II_d, correspondingly), by introducing the interaction variable *DEMU* to the model. The variable is constructed by multiplying the earnings variable (*e* in Model II_e) or the dividend variable (*d* in Model II_d) with an EMU-dummy, that has a value of 1 for every firm from an EMU-country, and zero otherwise. In the last version (Models III_e and III_d), the interaction variable is designed to control for the possibility that the ERC or the dividend response coefficient (DRC) has been different especially during the EMU convergence period, that is, from 1995 – 1998, hence the EMU-dummy $DEMU^{CONV}$ obtains here the value of one only for these years, otherwise it is zero. *N* is the number of observations, $Adj\ R^2$ is the adjusted coefficient of determination, and *RMSE* is the root mean squared error from the estimation. Below the parameter estimates we report the standard errors, and ***, **, * denote the significance at 1, 5 and 10 % levels, respectively.

Right-hand-side variables	Parameter estimates in Model					
	I_e	I_d	II_e	II_d	III_e	III_d
a	1.916***	2.150***	1.916***	2.150***	1.915***	2.151***
	(0.009)	(0.012)	(0.009)	(0.012)	(0.009)	(0.012)
$e_{i,t}$	4.025***	-	3.995***	-	3.997***	-
	(0.057)		(0.059)		(0.057)	
$d_{i,t}$		2.219***		2.074***		2.083***
		(0.363)		(0.377)		(0.369)
DEMU	-	-	0.470**	1.470	-	-
			(0.209)	(1.007)		
$DEMU^{CONV}$	-	-	-	-	1.432***	3.232**
					(0.363)	(1.512)
N	40255	40880	40255	40880	40255	40.880
$Adj.\ R^2$	0.110	0.001	0.110	0.001	0.111	0.001
RMSE	1.706	1.887	1.707	1.887	1.707	1.888

Table 3. Empirical results for the pooled data for the whole sample 1990 – 2001, analyzed annually.

The estimated model is $mv_{i,t} = a + be_{i,t} + c_1 R_t^{EMU,(95-98)} e_{i,t} + c_2 \pi_t^{EMU,(95-98)} e_{i,t} + c_3 DEF_t^{EMU,(95-98)} e_{i,t} + dr_t + \varepsilon_{i,t}$. The dependent variable ($mv_{i,t}$) is the contemporaneous market value deflated by the previous year's book value of the company. In addition to the constant (*a*), the set of independent variables includes the contemporaneous earnings ($e_{i,t}$), also deflated by the previous year's book value, and the three control variables, plus the short-term interest rate (r_t). The three macroeconomic control variables designed to detect the effect of the EMU convergence criteria conditions are the long-term interest rate criterion (R_t^{EMU}, $R_t^{EMU,95-98}$), the inflation criterion (π_t^{EMU}, $\pi_t^{EMU,95-98}$), and the government budget deficit criterion (DEF_t^{EMU}, $DEF_t^{EMU,95-98}$). To derive the interactive terms for the empirical analysis all these three variables and the short-term interest rate are each multiplied separately by the earnings variable (*e*) in order to detect their effects on the earnings response coefficient in the analysis. The superscript separates the cases where we have controlled only for the fact that the firm data are from EMU country (*EMU)*, and alternatively, for the firm data from EMU country during the convergence period 1995 – 1998 (*EMU, 95-98)*. For the years 1990 – 1992 the number of usable data points was too small, so the results start from year 1993. *N* is the number of observations, $Adj\ R^2$ is the adjusted coefficient of determination, and *RMSE* is the root mean squared error from the estimation. Below the parameter estimates we report the standard errors, and ***, **, * denote the significance at 1, 5 and 10 % levels, respectively.

	Parameter estimates for the variables using the data from										
Right-hand-side variables	1993	1994	1995	1996	1997	1998	1999	2000	2001	Whole sample	
a	2.262***	2.023***	2.173***	1.911***	1.800***	1.764***	1.796***	1.684***	1.874***	1.896***	1.896***
	(0.029)	(0.030)	(0.031)	(0.028)	(0.028)	(0.026)	(0.029)	(0.027)	(0.026)	(0.009)	(0.009)
$e_{i,t}$	3.927***	3.616***	3.948***	4.463***	5.040***	4.425***	4.316***	4.099***	3.296***	4.186***	4.179***
	(0.191)	(0.184)	(0.200)	(0.184)	(0.179)	(0.167)	(0.192)	(0.173)	(0.161)	(0.060)	(0.060)
$R_t^{EMU} e_{i,t}$	-5.275*	5.048	-4.075	-2.021	2.717	-5.561	30.020	-9.154	-37.513	0.419	-
	(2.762)	(7.833)	(4.807)	(1.595)	(2.717)	(5.307)	(28.794)	(6.255)	(35.970)	(0.732)	
$\pi_t^{EMU} e_{i,t}$	-3.282	-5.248*	4.519	5.533	-2.229	-0.503	-3.527	-0.600	-0.615	-1.020***	-
	(6.460)	(3.015)	(3.040)	(3.740)	(1.510)	(1.991)	(4.933)	(0.621)	(0.537)	(0.315)	
$DEF_t^{EMU} e_{i,t}$	-0.208	-3.777	-3.252**	-0.506	-3.547**	-1.807*	-3.786	-1.193***	-0.311	-0.008	-
	(0.979)	(2.850)	(1.490)	(1.054)	(1.753)	(0.970)	(2.329)	(0.392)	(0.264)	(0.102)	
$R_t^{EMU,95-98} e_{i,t}$	-	-	-	-	-	-	-	-	-	-	0.425
											(0.931)
$\pi_t^{EMU,95-98} e_t$	-	-	-	-	-	-	-	-	-	-	-2.167**
											(0.920)
$DEF_t^{EMU,95-98} e_{i,t}$	-	-	-	-	-	-	-	-	-	-	0.805**
											(0.329)
$r_t e_{i,t}$	0.647*	0.340	-0.279	1.062**	2.346***	0.633**	-0.785	0.568***	-0.147	0.112**	0.056
	(0.391)	(0.381)	(0.187)	(0.415)	(0.524)	(0.319)	(0.581)	(0.209)	(0.201)	(0.051)	(0.053)
N	3051	3216	3508	4213	4457	4768	4947	5228	4548	37944	37944
$Adj.\ \ R^2$	0.131	0.111	0.101	0.134	0.167	0.136	0.101	0.110	0.097	0.119	0.119
RMSE	1.460	1.465	1.581	1.563	1.699	1.732	1.896	1.804	1.724	1.698	1.698

Table 4.

Results from the dynamic GMM-estimation of the model for the whole panel data.

The estimated model is $mv_{i,t} = a + \varphi mv_{i,t-1} + be_{i,t} + c_1 R_t^{EMU,(95-98)} e_{i,t} + c_2 \pi_t^{EMU,(95-98)} e_{i,t} + c_3 DEF_t^{EMU,(95-98)} + dr_t e_{i,t} + \varepsilon_{i,t}$. In addition to parameter estimates we also report the number of observations (*N*) used for the estimation, the adjusted coefficient of determination from the estimated equation (R^2), the root mean squared error (RMSE) values and the statistics for the Hansen (1982) test (H) for overidentification restrictions, which asymptotically follows a $\chi^2_{(1)}$ distribution under the null of valid instruments in the GMM estimation. The critical values for the Hansen test are 6.64, 3.84, and 2.71 at 1, 5 and 10 % risk levels, respectively. The parameter estimates we report the heteroskedasticity -consistent standard errors, and ***, **, * denote the significance at 1, 5 and 10 % levels, respectively.

Right-hand-side variables	Parameter estimates in the model	
	Controlling for the firms from EMU-countries	Controlling for the firms from EMU-countries during the convergence period
a	0.577***	0.577***
	(0.024)	(0.024)
$mv_{i,t-1}$	0.573***	0.572***
	(0.013)	(0.013)
$e_{i,t}$	1.302***	1.265***
	(0.111)	(0.111)
$R_t^{EMU} e_{i,t}$	3.590***	-
	(1.278)	
$\pi_t^{EMU} e_{i,t}$	-0.649*	-
	(0.358)	
$DEF_t^{EMU} e_{i,t}$	0.043	-
	(0.132)	
$R_t^{EMU,95-98} e_{i,t}$	-	3.081**
		(1.225)
$\pi_t^{EMU,95-98} e_t$	-	-3.595***
		(0.989)
$DEF_t^{EMU,95-98} e_{i,t}$	-	1.527***
		(0.400)
$r_t e_{i,t}$	0.341***	0.346***
	(0.027)	(0.027)
N	24474	24474
R^2	0.553	0.553
RMSE	1.099	1.100
H	3.105	3.062