European Union Enlargement and Equity Markets in Accession Countries

Tomas Dvorak
Union College
Schenectady, NY 12308
email: dvorakt@union.edu

Richard Podpiera
International Monetary Fund
Washington, D.C. 20431
email: rpodpiera@imf.org

Abstract

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Abstract

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1 Introduction

The announcement of European Union (EU) enlargement coincided with the beginning of a dramatic rise in stock prices in candidate countries. Between November 2001, when the European Commission outlined the timing and named countries involved in the enlargement, and July 2004, stock prices in the eight Central and Eastern European candidate countries increased on average by over 90% in dollar terms.[1] In comparison, the world market index returned about 8% during the same time period. This paper investigates whether the rise in stock prices in the accession countries was a result of repricing of systematic risk due to the integration of local stock markets into the world market. In a segmented market, the source of systematic risk of each firm is the covariance of its returns with the local market. By contrast, in an integrated market, the source of systematic risk is the covariance of a firm's returns with the world market. The covariance of individual firm returns with the world market is likely to be smaller than the covariance with a local market. Thus, a move from a segmented to an integrated market should lead to a fall in systematic risk and to a permanent price increase.

It is possible that a credible announcement of EU enlargement led to an integration of the previously segmented Central and Eastern European stock markets with the rest of the world. Although foreign investors were allowed to invest in the accession countries for some time prior to the enlargement announcement, some foreigners may have refrained from investing in legally open markets because of real or perceived political, liquidity, and corporate governance risks. Clear prospects for EU accession may have alleviated these risks and increased the integration of local markets with the world market. Such integration would have led to a fall in systematic risk and a rise in stock prices.

Repricing of systematic risk following market integration was tested on stock market liberalizations in Asia and Latin America in the late 1980s and early 1990s. At the aggregate level, Henry (2000) and Bekaert and Harvey (2000) find that market integration leads to a permanent increase in the stock market index. This finding is consistent with shares being priced according to the market's covariance with world returns rather than according to the much larger variance of local market returns. Using firm level data, Errunza and Miller (2000) find that firms which offer ADRs experience abnormal returns following the ADR announcement and that these returns are related to the diver-

[1]The average return in terms of local currency was 65%. The eight Central and Eastern European accession countries include the Czech Republic, Hungary, Poland, Slovakia, Slovenia, Lithuania, Latvia, and Estonia. Figure 1 shows the stock price developments.

sification potential of each firm. Chari and Henry (2004) also examine the repricing effects of market integration at the firm level. They find that firms that experience larger changes in systematic risk upon integration also experience larger repricing. The change in systematic risk explains about 40% of the stock price increases upon integration. Our paper follows a similar strategy. It uses firm level data to calculate the changes in systematic risk for each firm, and examines whether changes in systematic risk are proportional to stock price changes while controlling for other simultaneous events, mainly the changes in expected future earnings. As a control group we include three Eastern European countries that were not part of the first wave of EU enlargement. If EU enlargement is responsible for the integration, repricing should occur only in the eight countries included in the enlargement.

Understanding whether repricing of systematic risk took place in the EU accession countries is important for at least three reasons. First, it allows us to evaluate the benefits of EU integration. Integrated capital markets should deliver a lower cost of capital leading to higher investment and growth. The lower cost of capital should come from the reduction in the risk free interest rate as well as the reduction in systematic risk. The reduction in systematic risk will benefit firms only if this risk is correctly priced by the market. If it is, then the benefits of EU integration extend beyond access to larger markets. In this sense, this paper complements a growing literature on stock market integration in the original 15 EU members (for a comprehensive survey see chapter 8 in Baele et. al. (2004)). Second, finding out whether changes in systematic risk are priced by the market is important beyond the context of the EU enlargement. Greater risk sharing is one of the frequently emphasized benefits of open capital markets (see, for example, Stulz (1999)). It is worthwhile to investigate whether risk sharing is actually priced by the market. In a similar vain, capital market integrations also provide a unique opportunity to test the asset pricing models in differences rather than in levels. This argument is forcefully made by Chari and Henry (2004) who argue that liberalizations are natural experiments which deliver power to detect cross the sectional relationship implied by the asset pricing model. EU enlargement is another such natural experiment where there is a large, arguably exogenous, change in the source of firms' systematic risk.

Many existing papers point out that capital market liberalizations are often associated with other events which may lead to higher expected profits.[2] This makes it difficult to separate the repricing effect from the effect of an increase in the expected growth rate of dividends. This is also an issue

[2]See Errunza and Miller (2000) p.579, Chari and Henry (2004) pp. 1298 and 1317 , Bekaert, Harvey and Lumsdaine (2002) p. 206, Henry (2000) p. 540, and Bekaert and Harvey (2000) p. 575.

in the context of the EU enlargement. EU accession provides better market access for Central and Eastern European firms and increased assistance from the EU budget which could have led to greater consumer confidence following the prospects of EU membership. The adoption of EU laws and standards may result in improved corporate governance. We control for the changes in expected growth of dividends by using changes in analysts' earnings estimates. We use data from the IBES on expected earnings as of the time of the announcement of EU enlargement. This is in contrast to both Errunza and Miller (2000) and Chari and Henry (2004) who attempt to control for an increase in the expected dividend growth by using changes in actual, rather than expected, earnings and dividends.

Dating market integration is notoriously difficult (see Bekaert, Harvey and Lundblad (2003) for a survey of methods). As already mentioned, integration depends not only on legal restrictions, but also on investors' willingness to participate in opened markets. We hypothesize that the integration increased in the months following the 2001 announcement of EU enlargement. Since an increase in integration should be associated with a price increase, the post-2001 rise in aggregate stock prices shown in Figure 1 and mentioned earlier is consistent with integration. If integration occurred earlier, we should see a sharp price increase prior to 2001. However, with the exception of Poland, the post-2001 boom in prices is unprecedented. Section 3 provides some additional evidence that foreign investors seriously considered the Central and Eastern European markets only once it became clear that these countries would become part of the EU. Since we can never be fully confident of the integration date, it is possible to view our analysis as a test of joint hypothesis that integration occurred in the months after the 2001 announcement and that markets price stocks according to their systematic risk.

In summary, this paper contributes to the existing literature by examining whether Chari and Henry's intriguing findings hold in a different setting – an increase in actual integration rather than removal of legal restrictions – and for a different set of countries. Ours is also the first paper which explicitly controls for changes in expected earnings when looking at the effects of capital market liberalization. Finally, this paper begins to address the effects of EU enlargement on stock markets in the new member countries. The remainder of the paper is organized as follows. Section 2 presents the theory behind changes in asset prices as a result of market integration. Section 3 makes the case that integration increased at the time of the fall 2001 announcement of EU enlargement. Sections 4 and 5 present the data and empirical results. Finally, section 6 concludes.

2 Theory

According to fundamental stock valuation, today's price of a stock equals the present discounted value of the future stream of dividends paid to the owners of the stock (Gordon (1962)). The present value depends on what the stream of dividends is, and on the rate at which these dividends are discounted. This means that the price of a stock could change when either the expected stream of dividends changes (the numerators), or when the discount rate changes (the denominators). One of the goals of this paper is to examine to what extent is the sharp price increase at the time of the EU enlargement announcement related to changes in expected future dividends and to changes in the discount rate.

The rate at which future dividends are discounted is the required rate of return for holding a stock. The required rate of return is the risk-free interest rate plus the stock's risk premium. The stock's risk premium is proportional to the market risk premium with the index of proportionality being the stock's beta. Beta measures the stock's contribution to the variance of the market portfolio. If a market is segmented from the rest of the word, the relevant market portfolio is the local market. Hence, under segmentation, the required rate of return on a stock is:

$$k_i = r_f + \beta_{i,M}\lambda_M, \tag{1}$$

where r_f is the risk free return in the segmented market, $\beta_{i,M}$ is the stock's *local* market beta calculated as the covariance of the stock's return with the *local* market return divided by the variance of the *local* market's return, $\beta_{i,M} = \frac{cov(R_i,R_M)}{var(R_M)}$, and λ_M, is the local market premium.

If a market is fully integrated with the rest of the world, the relevant market portfolio is the world market and the required rate of return for a stock is:

$$k_i^* = r_f^* + \beta_{i,W}\lambda_W, \tag{2}$$

where r_f^* is the risk free return in the integrated market, $\beta_{i,W}$ is the stock's *world* market beta calculated as the covariance of the stock's return with the *world* market return divided by the variance of the *world* market's return, $\beta_{i,W} = \frac{cov(R_i,R_W)}{var(R_W)}$, and λ_W is the world market premium.

2.1 Market premium is proportional to the variance of market returns

When investors maximize the expected utility of their wealth, the market premium equals the product of the coefficient of relative risk aversion and the variance of market returns. Thus, in a segmented market, the premium is proportional to the variance of the local market return, $\lambda_M =$

$\gamma var(R_M)$, where γ is the coefficient of relative risk aversion. In an integrated market, investors hold the world portfolio, and hence, market premium is proportional to the variance of the world portfolio, $\lambda_W = \gamma var(R_W)$. The average sample variance of local market returns is nearly 9 times the sample variance of world returns. This means that in theory, the market premium should fall substantially upon integration. We also assume that the coefficients of relative risk aversion of an average local and world investor are the same.[3]

Subtracting equation (1) from equation (2) and using the definitions of betas and lambdas:

$$k_i^* - k_i = (r_f^* - r_f) - \gamma DIFCOV_i, \tag{3}$$

where $DIFCOV_i = [cov(R_i, R_M) - cov(R_i, R_W)]$. Equation (3) says that the change in the required rate of return following market integration depends on two terms: the change in the risk free interest rate, and the difference between the covariance of the stock's return with the local market and the covariance of the stock's return with the world market. This is the specification derived by Chari and Henry (2004). The effect of the first term is straightforward: the lower the risk free interest rate under integration, the lower the required return on all stocks. Note that this effect does not vary across stocks. The second term in equation (3) measures the change in systematic risk. In a segmented market, the source of systematic risk is the covariance with the local market, while in an integrated market, the source of systematic risk is the covariance with the world market. A stock that moves less with the world market than with the local market has a lower systematic risk in an integrated market than in a segmented market. Lower systematic risk means a lower required rate of return. This in turn means that future dividends are discounted at a lower rate, and the price of a stock goes up. Thus, firms that have a high covariance with the local market but a low covariance with the world market should experience a large price increase upon integration.

2.2 Market premium is constant

In deriving $DIFCOV$ we assumed that the market premium is proportional to the variance of market returns. This is theoretically appealing because it is implied by utility maximization. However, when we estimate $DIFCOV$ using historical data, we implicitly assume that the market premium is proportional to the *sample* variance of market returns. The ratio of the sample variance of local to

[3]If global investors were less risk averse than investors in Central and Eastern Europe, market integration would have led to an increase in stock prices in accession countries regardless of return covariances. However, as Chari and Henry (2004), who also assume that the coefficients of risk aversion of world and local investors are the same, we do not seek to explain the price increase using differences in risk aversion.

world returns is nine to one. This implies that the market premium would drop by a factor of nine upon integration. While it is reasonable for the market premium to drop, a drop of this magnitude seems implausibly high. The historical time series in accession countries may be too short to make a reliable inference about the value of the market premium. There is also a good deal of literature on the equity premium puzzle (see Siegler and Thaler (1997), Clauss and Thomas (2001) or Fama and French (2002)) which points out that the observed market premium and the standard deviation of market returns are inconsistent with reasonable values of the coefficient of relative risk aversion. Given this uncertainty about the value of the market premium and its relationship to the variance of market returns, it may be worthwhile *not* to rely on on the assumption that the premium is proportional to the variance of market returns. As an alternative we assume that the market premium is the same across countries and does not change upon integration, thus $\lambda_W = \lambda_M = \lambda$. In this case, the difference in the required rate of return is:

$$k_i^* - k_i = (r_f^* - r_f) - \lambda DIFBETA_i, \tag{4}$$

where $DIFBETA_i = \beta_{i,M} - \beta_{i,W}$. Equation (4) says that the change in the required rate of return following market integration depends again on the change in the risk free rate and the difference between the local and world betas. Firms that have low world market betas relative to their local market betas should experience higher price increase than firms with relatively high world market betas. The intuition is the same as with the difference in covariances: firms that move relatively little with the world market provide more diversification to a global investor and hence should have a higher price upon integration.

We view $DIFBETA$ as an alternative measure of the change in systematic risk. The disadvantage of $DIFBETA$ is that unlike $DIFCOV$, it does not take into account possible changes in the market premium upon integration. The advantage of using $DIFBETA$ is that we no longer need to estimate the market premium using the *sample* variance of market returns. Assuming that market premium does not change is also consistent with practitioners using a "rule of thumb" estimate for market premium. For example, Welch (2000) surveys over 200 financial economists about their estimate of the market premium. The consensus estimate is about 7%. A commonly used estimate of the market premium in the U.S. is about 8%, as published by Ibbotson Associates. In practice, investors calculate the appropriate discount rate, k_i, by adding the risk free rate to the product of a stock's beta and some market premium. Investment services such as Value Line or Merrill Lynch's *Security Risk Evaluation* routinely publish betas, expecting investors to plug in their own "rule of thumb"

estimate of the market premium. In summary, we find that both $DIFCOV$ and $DIFBETA$ are useful measures of the changes in systematic risk. While $DIFCOV$ is theoretically more appealing, $DIFBETA$ recognizes the difficulty of estimating the market premium and emphasizes the use of beta by practitioners as a measure of systematic risk.

Stock prices can also increase if the expected stream of dividends increases. It is quite possible that the EU enlargement gave investors reasons to expect higher future dividends. Therefore, in addition to $DIFCOV$ and $DIFBETA$, we include changes in expected earnings as possible explanations for the dramatic rise in stock prices following the announcement of EU enlargement.

3 Dating integration

In order to test whether repricing of systematic risk has taken place, market integration needs to be dated. Dating market integration is problematic. Bekaert, Harvey and Lundblad (2003) provide a survey of the variety of approaches which have been used. These range from a parameterized model of integration and segmentation by Bekaert and Harvey (1995), to identifying structural breaks in foreign capital flows in Bekaert and Harvey (2000), or in returns and dividend yields as in Bekaert, Harvey and Lumsdaine (2002), to examining changes in legal framework as in Kim and Singal (2000) or Henry (2000).[4] Integration means that the marginal investor, whether local or foreign, considers local assets as part of the world portfolio. The difficulty of dating integration comes from two facts. The first is that the removal of legal restrictions on foreign investment does not automatically lead to integration. When legal restrictions are not binding in the first place, investors may not respond to their removal. For example, foreigners may refrain from investing in a legally open market because of political, liquidity, and corporate governance risks. Also, local investors may not have the expertise or resources to diversify abroad, even if it is perfectly legal to do so. The second problem is that to a large extent, integration is a gradual process. Restrictions on foreign transactions are often lifted gradually. In addition, the perceptions of foreign and local investors are likely to change slowly. Thus, identifying the exact day or month when markets switch from segmentation to integration is virtually impossible.

Table I shows a number of dates pertaining to stock market liberalization in the eight countries. The second column shows that stock markets were established between 1988 (Slovenia) and 1996

[4]Henry (2000) uses three approaches. The first is the issuance of a decree by the government allowing foreign investment. The second is the establishment of a country fund traded in the U.S. market. The third is an increase in the number of firms deemed investible by the International Finance Corporation (IFC).

(Latvia, Lithuania, Estonia). The third column shows that most restrictions were lifted between 1994 and 1999. However, it is important to point out that the legal restrictions on foreign participation were lifted only gradually as indicated in the numerous footnotes in the table. The fourth column shows when the Emerging Markets Data Base (EMDB), the most commonly used source of emerging stock market data, began covering each market. The range of dates is from 1992 for Poland and Hungary to 1997 for Latvia. The first country to issue an ADR was Hungary in 1992, and the last were Lithuania and Latvia in 1997. In summary, it appears that to a large extent foreign participation was legal well before the 2001 announcement of EU enlargement. Actual foreign interest as manifested in the EMBD coverage and ADR activity is also apparent before 2001.

EU enlargement involved elimination of all restrictions on movement of capital. In EU law, movement of capital is covered by article 56 of the Treaty Establishing the European Community (EurLex (2002)). According to the article, any restrictions on movement of capital between two member states, or between a member state and a third country, are prohibited. For new members this provision is covered in chapter 4 of the enlargement negotiations (European Commission (2004)). All eight countries closed the negotiations of this chapter in December 2002.[5] The coverage of chapter 4 is extensive and includes ownership of assets and liabilities, payment systems, settlement and money laundering. It is clear that by December 2002 all eight countries were free of restrictions on the movement of capital.[6] In addition, it is possible that EU enlargement changed the perception of investors. EU enlargement is an irreversible event that could persuade global investors to include accession countries into their portfolios.

The intention of the eight countries to join the European Union was made public soon after the fall of communism in 1989 and the breakup of the Soviet Union in 1991. However, there has always been considerable uncertainty as to which countries would be allowed to join and when. Formal negotiations did not begin until 1998. The Treaty of Nice, which outlines the enlargement, was signed in 2000. The treaty was subsequently rejected in an Irish referendum in 2001 - a serious setback to the enlargement process. A second Irish referendum in 2002 accepted the treaty. The European Commission provided annual progress reports on enlargement, the most significant of which was published in November 2001. The report was significant not only because it listed the countries included in the first wave of enlargement, but also because it provided a timetable for

[5]The negotiations of this chapter began in the fall of 1999 for the Czech Republic, Hungary, Poland, Slovenia and Estonia. Latvia, Lithuania and Slovakia began negotiations in the fall of 2000.

[6]All eight countries negotiated 5 to 7 year transitional arrangements which restrict the acquisition of agricultural and forestry land.

enlargement. It is the publication of this report that coincides with the beginning of the rise of stock prices in the accession countries. The fact that EU enlargement was becoming a reality was reflected in media coverage. The earliest match to EU enlargement in the *New York Times* archive is a November 2001 article detailing the EU commission report (Green (2001)). Therefore, in the baseline specification we consider November 2001 as the beginning of the window in which the integration occurred. The length of the integration window in the baseline specification is 16 months which is set to capture the gradual nature of the integration. Chari and Henry use one and two months windows. In other stock market integration studies Henry (2000) and Christoffersen, Chung and Errunza (2002) use an 8 month window, Errunza and Miller (2000) use a 6 month window.

4 Data

We use two sets of data: one on returns and one on changes in expected earnings. The return data includes firm-level stock returns in accession countries, returns on aggregate market indices in accession countries, and returns on a world market index. The data on firm-level returns comes from the Emerging Markets Database (EMDB) which is maintained by Standard & Poor's. The EMDB has monthly data on large and active firms in all eight accession countries. In addition, we collect data on Russia, Romania and Croatia to use as a control group.[7] The firm-level returns include dividends.[8] For returns on the aggregate local market indices we use the log difference of the S&P global total return indices which are a part of the EMDB. For returns on the world market we use the log difference of the MSCI world equity index.

All returns and price changes are calculated in current U.S. dollars using current exchange rates. This amounts to assuming that the global investor is an American, or that relative PPP holds. If relative PPP holds, it does not matter in which currency we calculate returns because the real returns will be the same for an investor living anywhere.However, it is true that relative PPP does not hold, especially in the short run. Indeed, during the period we study, the currencies in the eight accession countries mostly appreciated and these appreciations were real, i.e. relative PPP did not hold. In deciding whether to calculate returns in local currencies, Euros or dollars, we decided to follow Chari and Henry (2004) and many others and calculated all returns in dollars. We are

[7] Of the other Eastern European countries EMDB also covers the Ukraine and Bulgaria. However, the two countries had no firms long enough to meet the minimum data requirements described below.

[8] We calculated total (dividend inclusive) returns as the log difference of the total return index. The total return index was calculated as $totalreturn = priceindex \cdot \frac{closingprice+dividend}{closingprice}$.

thus assuming that the global investor is best approximated by someone who cares about returns in dollars.

The covariances and betas of firm, local and world returns are calculated using three years of historical data. Choosing three years of historical data tries to strike a balance between having enough time series observations to estimate covariances with some precision, and measuring the most recent pattern of co-movement.[9] The change in stock prices is calculated over the integration window from November 2001 to February 2003. These minimum data requirements mean that for a firm to be included in the analysis, the data must go back to at least October 1999 and be in the data set at least until February 2003. These restrictions eliminate 310 of original 410 firms which appear in the EMDB. Another 23 firms were eliminated because there were no earnings estimates available for them. Two more firms, VSZ of Slovakia and Rolast of Romania, were dropped because of suspect price data. Finally, one firm, Elektrim of Poland, was dropped because it filed for bankruptcy in September 2002. This leaves 74 firms. Table II shows the descriptive statistics of data for each country as well as how the 74 firms are distributed across the 11 countries. Poland, Hungary, Romania, the Czech Republic and Russia top the list with the largest number of firms.

The average percentage stock price increase during the integration window is shown in the third column of Table II. It shows that stock prices went up substantially in the eight countries as well as Romania, Russia and Croatia. The highest increase was in Slovenia, with stock prices rising 62%. The lowest price increases occurred in Poland and Hungary. The fourth column shows the average difference between the covariance of firm returns with local market returns and the covariance of firm returns with world market returns. This is the empirical counterpart to $DIFCOV$ discussed in Section 2. The average $DIFCOV$ is positive for all 11 countries. This is to be expected because local firm returns are likely to co-move with local market returns more than with world market returns. It indicates that the average firm's systematic risk should have fallen upon integration. All countries should experience a reduction in the cost of capital upon integration. The fifth column shows the difference between local and world beta – $DIFBETA$. Average $DIFBETA$ is positive for all but three countries. These three exceptions are Poland, Hungary and Russia. These countries have relatively high variance of local market returns, which makes local betas small relative to world betas. Local covariance is higher than the world covariance but not enough to offset the difference in the variance of local and world returns.

[9]When we allow the calculation of historical covariances and betas to use up to five years of historical data, the results remain qualitatively the same.

The second dataset we use includes changes in expected earnings of firms in accession countries. The data comes from the IBES which maintains a database of historical earnings forecasts not only in the U.S., but also internationally. The unit of observation in the IBES data is month, firm and forecast period. The forecast period is a fiscal year for which actual earnings are not yet available. For example, in May 2002 the forecast period may be fiscal years 2002, 2003 and 2004. We limit the forecast period to one, two or three fiscal years ahead.[10] For each month, firm, and forecast period we have three variables: the mean analyst forecast of earnings per share, the number of analysts who revised their estimates up from the previous month, and the number of analysts who revised their estimates down.

We measure the changes in earnings expectations as the number of analysts who increased their earnings estimates *minus* the number of analysts who lowered their estimates. We call this measure net upgrades. First, for each forecast period we subtract the number of analysts who lowered their earnings estimate from the number of analysts who increased their estimates. Second, we average across forecast periods. For example, in May 2002 we have earnings estimates for fiscal years 2002, 2003 and 2004. For each of these years we subtract the number of analysts who in May 2002 decreased their forecasts from the number of analysts who increased their forecasts. Then we average those differences to obtain net upgrades for May 2002. Net upgrades therefore capture the change in analysts expectations of future earnings. If in May 2002 analysts become generally optimistic about future earning of a company, the net upgrades will be high. Since this measure looks at the number of analysts rather than revisions, it is robust to a few analysts posting large revisions. The sixth column in Table II shows net upgrades for each country. In Poland, Hungary, Slovenia, Russia and Croatia more analysts lowered, rather than increased, their earnings estimates. In the Czech Republic, Slovakia, Romania and the Baltic countries, more analysts upped their estimates. On average there were only 0.7 upward revisions for every downward revision. It is somewhat surprising that analysts were not more optimistic during the period of dramatic stock price increases. This suggests that the price increase is more likely due to a reduction in the discount rate rather than an increase in expected dividends.

Table III shows descriptive statistics of each variable for the entire sample of firms. The average share price went up 36% in the 15 months following the integration, ranging from a 46% decrease to a 108% increase. $DIFCOV$ is positive for all but two firms. Mean and median difference between

[10] We also eliminate interim forecasts, long-term growth forecasts and secondary forecasts, all of which are mostly unavailable for the firms in the sample.

local and world beta is positive, but there a number of firms for which $DIFBETA$ is negative. Net upgrades range from -11 to 11. Following Chari and Henry, we construct a number of additional control variables. Size is the ratio of a firm's average market capitalization to average market capitalization of the entire local market during the 12 months prior to the integration date. It ranges from 0.1% to 82%. Turnover for each firm is the dollar value traded during the 12 months prior to the liberalization date divided by the firm's average market capitalization during the same time period. It ranges from 0.5% to 24600%.

5 Estimation

Our empirical strategy is to estimate the relationship between the increase in stock prices following the announcement of the enlargement and the two measures of changes in systematic risk: $DIFCOV$ and $DIFBETA$. We expect that the relationship to be positive for the EU accession countries and insignificant for the non-accession countries. Therefore, we interact $DIFCOV$ and $DIFBETA$ with an EU dummy variable which is one for the eight accession countries and zero for the three non-accession countries. If EU enlargement is responsible for the integration, and the integration leads to repricing of systematic risk, the coefficient on this interaction should be positive and significant.

5.1 Baseline regressions

Our baseline specification results are shown in Table IV. The dependent variable in each specification is the percentage stock price increase from November 2001 until the February of 2003. Standard errors in all regressions are estimated using heteroskedasticity robust formulas and assuming that observations are independent across countries but not within. Regressions in panel **a** include $DIFCOV$ as an explanatory variable, while regressions in panel **b** include $DIFBETA$ instead. The first specification includes the EU dummy, $DIFCOV$ and the interaction between EU and $DIFCOV$. The intercept is positive and highly significant. It shows that firms with no change in systematic risk could expect about a 56% increase in stock prices following the November 2001 announcement. This means that stock prices went up even for stocks that experienced no reduction in the systematic risk. The coefficient on the EU dummy is insignificant indicating that controlling for $DIFCOV$, stock prices in the accession countries went up no more than in the non-accession countries.

The coefficients on $DIFCOV$ as well as the interaction of $DIFCOV$ and EU are statistically insignificant. It means that the price changes are not related to changes in systematic risk as

measured by $DIFCOV$. This is true throughout, even when we control for expected earnings, country effects, size and turnover. It is evidence against the hypothesis that the dramatic rise in stock prices was a result of repricing of systematic risk as measured by $DIFCOV$. The coefficients on net upgrades in specifications (2a) through (4a) are always positive and statistically significant. This is to be expected as it implies that higher expected earnings lead to higher stock prices. Net upgrades are entered as a deviation from its overall mean so that the interpretation of the intercept is the expected price change of a non-accession firm with no-change in systematic risk and average net upgrade.

In columns (3a) and (4a) we include country fixed effects to allow intercepts to vary across countries.[11] In column (4a) we further control for size and turnover. Size is an important control because it could be positively correlated with the change in systematic risk as well as the change in prices. Large firms make up a large part of the local portfolio, and their returns are therefore likely to move with the returns on the local portfolio. There is also evidence that foreign investors prefer large firms (see, for example, Kang and Stulz (1999)). This could lead to a positive association between changes in covariance and price increases which are driven by size rather than by re-pricing of risk. This is supported by Christoffersen, Chung and Errunza (2002), who find that following capital market liberalization, large firms experience greater price increases relative to small firms. Therefore, it is necessary to control for size in looking at the relationship between the change in systematic risk and price increase. Following Christoffersen, Chung, Errunza (2002) and Chari and Henry (2004), we also control for turnover. On the one hand, liquid firms may be more attractive to foreign investors and thus experience large price increase. On the other hand, more liquid firms may be less subject to price pressure and thus experience smaller price increases. Both size and turnover are entered as deviations from their overall means so that the intercept can be interpreted as the expected price change of a non-accession firm with no change in systematic risk, average net upgrades, size and turnover. In all of the baseline specifications both size and turnover are statistically insignificant. This means that controlling for $DIFCOV$ large or more liquid firms experience no greater increase in price than small and illiquid ones.

Panel **b** of table IV replaces $DIFCOV$ with $DIFBETA$ as an explanatory variable. Column (1b) shows that the intercept is again large and highly significant. Therefore, even firms with no reduction

[11] The country fixed effects were restricted so that the intercepts and the *EU* dummy could be identified. Both the intercept and the *EU* dummy are perfectly co-linear with country dummies. Therefore, we need two constraints. We restrict that the effects of accession countries add up to zero and that the effects of all non-accession countries add up to zero.

in systematic risk, as measured by $DIFBETA$, experienced large price increases. The coefficient on the EU dummy is negative and significant which indicates that controlling for $DIFBETA$, stock prices in accession went up less than in the non-accession countries. The coefficient on $DIFBETA$ is statistically insignificant but the coefficient on the interaction of $DIFBETA$ and EU is positive and statistically significant at 1%. This indicates in only in the EU accession countries firms that have high local betas relative to world betas experienced higher price increases. In non-accession countries the relationship between price increase and $DIFBETA$ is insignificant. This is consistent with the theory – repricing of systematic risk occurs in EU accession but not in other countries. The coefficient on the interaction between $DIFBETA$ and EU remains significant even after we control for changes in expected earnings in column (2b), country effects in column (3b) and size and turnover in column (4b). Net upgrades are again significant at the 1% level in all specifications. Size and turnover are again insignificant.

The magnitude of the coefficient on the interaction between $DIFBETA$ and EU ranges from about 0.3 to 0.4. This means that when the difference in local and world beta is 0.24 (which is the average value of $DIFBETA$), stock prices are expected to increase about 8% ($0.35 \cdot 0.24 = 0.08$). Given that the average price increase is about 36%, we conclude that the difference in betas explains, on average, about 22% of the price increase during the integration window. In summary, $DIFBETA$ has much more explanatory power than $DIFCOV$ and the effect of $DIFBETA$ is consistent with EU enlargement leading to market integration and repricing of systematic risk. Furthermore, the effect of $DIFBETA$ in accession countries remains significant after controlling for changes in expected earnings and other controls. In the next section, we investigate whether the significance of $DIFBETA$ is robust to outliers and changes in the integration window.

5.2 Robustness

We first examine a number of scatter plots. While these show only bivariate relationships and do not allow us to control for country or other effects, they can identify outliers. Figure 1 shows the scatter plot of the change in stock price against $DIFCOV$, $DIFBETA$ and net upgrades. Each of the three scatter plots is presented separately for the accession and non-accession countries. The first two scatter plots shows that the relationship between $DIFCOV$ and the change in stock price is weak for both accession and non-accession countries. The scatter plots of stock price change on $DIFBETA$ shows relatively strong positive relationship for accession countries. The relationship appears much weaker for non-accession countries. The scatter shows that the relationships are

not driven by any outliers. Similarly, the positive relationship between price changes and the two measures of the changes in expected earnings does not appear to be driven by outliers either and, as expected, is positive for both accession and non-accession countries.

As a second robustness check, we estimate specification (4b) from Table IV a number of times, each time varying the integration date or the length of the integration window. Since integration is a gradual progress, a slight modification in the integration date should not make a large difference in the results. In the first two columns of Table V we shift the integration window one month ahead and one month back, i.e. consider the integration window to be in turn from October 2001 to January 2003 and from December 2001 to March 2003 instead of the baseline November 2001 to February 2003. This does not change the results: $DIFBETA$ remains statistically significant for the accession countries.

We also check if $DIFBETA$ is significant when it should not be. Specifically, we estimate the same regression as in (4b) with November 2000 as the start of the integration window. This is a full year before the enlargement announcement and prior to the beginning of the rise in stock prices. Therefore, we would not expect the changes in stock prices to be related to the difference between local and world beta. In contrast, the number of net upgrades should affect stock prices no matter what time period we look at. The estimation shows that $DIFBETA$ is insignificant for both the accession and non-accession countries, while the number of net upgrades remains significant.[12] These results give us some confidence that the significance of $DIFBETA$ in explaining changes in stock prices is due to capital market integration rather than anything else.

In the last two columns of Table V we again consider November 2001 as the start of the integration window, but change the length of the integration window. When we reduce the length from 16 (as in table IV) to 10, i.e. from November 2001 to August 2002, $DIFBETA$ is statistically significant at the 5% level. Net upgrades are positive but marginally insignificant. When the integration window is reduced to only 4 months, $DIFBETA$ is no longer significant. This is consistent with integration taking place over longer periods of time. If integration were to happen instantaneously we would observe a one time jump in the stock prices. This did not happen. Instead, in Figure 1 we see a gradual and continuing increase since November 2001. Therefore, we would expect that the difference in local and world betas would explain price changes only over a longer horizon. This is in contrast to Chari and Henry (2004), who set the length of their integration window to only one

[12]Using this window, there is only one non-accession country (Russia) with valid data. Therefore, with country fixed effects the EU dummy is no longer identified.

or two months and still find changes in systematic risk significant in explaining stock price changes. However, this difference in results appears consistent with the type of market integration we consider here – a gradual increase of integration in accession countries – as opposed to the removal of legal barriers in stock markets in Latin America and Asia considered by Chari and Henry.

As a final robustness check, we consider if the results are driven by high beta stocks doing well in an upmarket. We regressed price changes on local market beta and the interaction between the local beta and the EU dummy. The results appear in table VI. The coefficients on both local beta and on the interaction with the EU dummy are insignificant. Net upgrades are again significant. Therefore, it appears that our results are driven by the changes in systematic risk rather than high and low beta stocks behaving differently in an upmarket: what matters is $DIFBETA$, not beta.

6 Conclusion

This paper examines the hypothesis that the dramatic increase in stock prices in EU accession countries following the announcement of EU enlargement was a result of market integration and the subsequent re-pricing of systematic risk. We test two versions of this hypothesis: one in which integration is associated with a change in the market premium, and one in which the market premium is constant. In the first version, the change in systematic risk is measured by the difference between the covariance of returns with the local market and the covariance of returns with the world market. The differences in local and world covariances do not appear to be related to the changes in stock prices. In the second version, the change in systematic risk is measured by the difference between local and world betas. The evidence suggests that at least part of the stock price increase can be explained by the difference between stocks' local and world betas. Stocks that had high local beta but a low world beta experienced a higher price increase than other stocks. We also test whether the dramatic rise in stock prices is a reflection of an increase in expected earnings. We find that changes in expected earnings are consistently related to changes in stock prices. An upward revision of expected earnings has a positive impact on a firm's stock price.

Our finding that a measure of the change in systematic risk explains changes in stock prices is consistent with the findings of Henry and Chari (2004). Changes in systematic risk are followed by proportional changes in stock prices. Unlike Chari and Henry (2004), however, we do not find that the difference in covariances matters, but we do find that the differences in betas are important in explaining stock price changes. Covariances should matter when investors update their estimate

of the market premium using historical variances. Since Central and Eastern European markets have limited historical data, investors may not use historical variances to estimate market premia. Instead our results suggest that investors use CAPM mechanically, i.e. discounting future cash flows using local betas prior to the announcement of EU accession and using world betas after the announcement.

We find the significance of the differences in local and world betas for explaining price changes rather striking. This is because as an empirical question, the odds are stacked against finding this effect. First, we have only 74 observations and 12 explanatory variables (including country effects), which leaves few degrees of freedom to estimate the coefficients with precision. Second, we rely on betas calculated using historical data, implicitly assuming that investors consider historical betas as an accurate guide to what betas will be in the future. Given that the countries are undergoing dramatic changes, this may be a strong assumption. In some sense, increased integration itself could bring a change in the structure of the economy and alter the pattern of co-movement of returns. We rely on the assumption that the degree of co-movement of returns is determined in the product markets and that product markets had been integrated well before capital market integration. Thus, capital market integration is not expected to have an effect on covariances or on betas. Finally, estimating the repricing effect is hard because there is considerable uncertainty about the timing of stock market integration.

Our findings should give impetus to further integration. This is because capital market integration has the effects predicted by the standard international asset pricing model. Following the announcement of EU enlargement, investors *did* re-value firms according to their systematic risk. The risk sharing capacity of Central and Eastern European firms is correctly priced, and therefore firms benefit from capital market integration according their capacity to diversify risk for the global investor.

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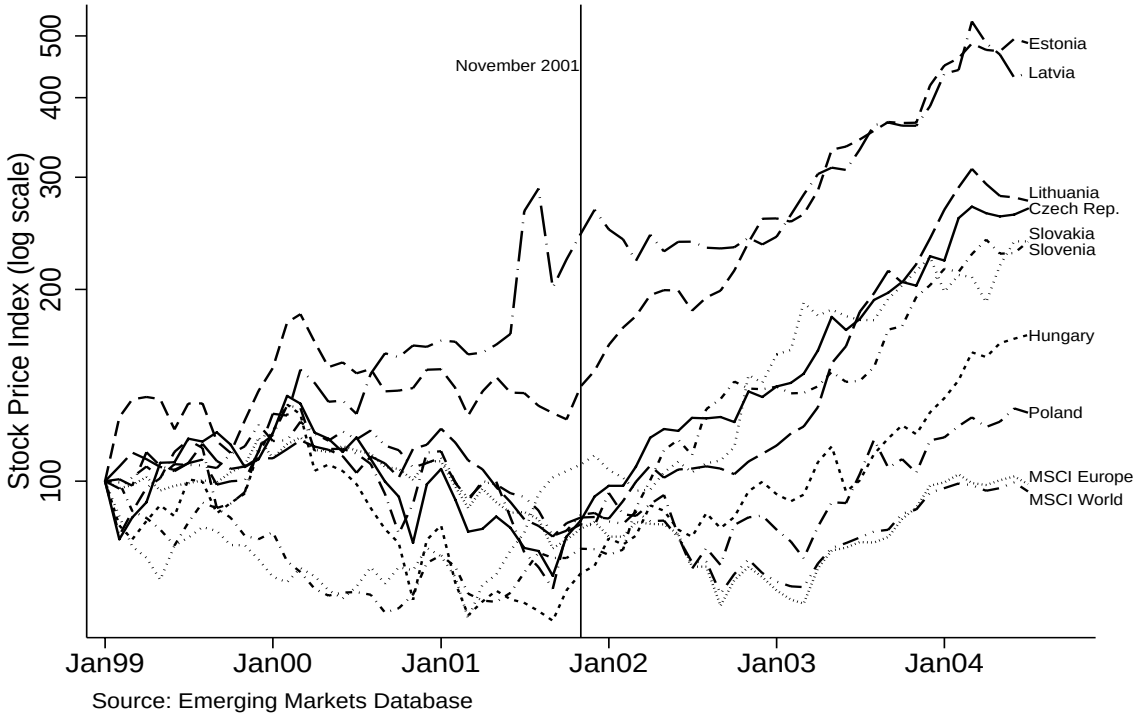

Figure 1. Stock Market Indices in Accession Countries. Total U.S. dollar return indices from the Emerging Markets Database for each country are scaled to equal 100 in January 1999.

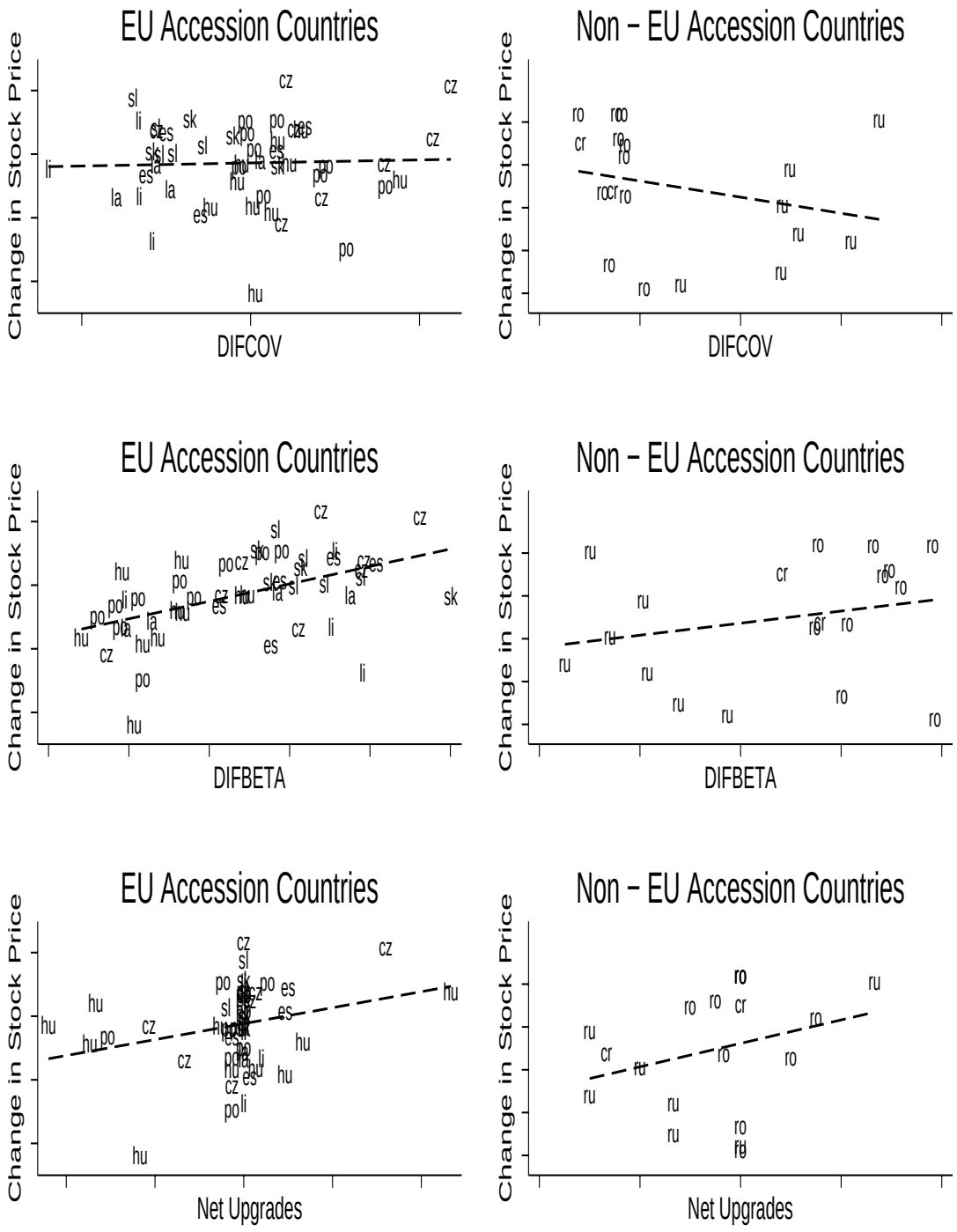

Figure 2. Scatter Plot of the Relationship Between Stock Price Changes $DIFCOV$, $DIFBETA$, and Net Upgrades.

Table I
Opening Dates and Legal Restrictions

The sources are Bekaert Harvey's chronology of Economic, Political and Financial Events in Emerging Markets, and Bank of New York list of depository receipts.

Country	Stock Market Established	Restrictions Lifted	Start of EMDB Coverage	First ADR
Czech Republic	June 1992	September 1994[a]	January 1994	June 1995
Hungary	July 1990	1996[b]	December 1992	July 1992
Poland	January 1991	February 1997	December 1992	February 1997
Slovenia	December 1988	1999[c]	January 1996	June 1997
Slovakia	January 1994	April 1998[d]	January 1996	April 1996
Estonia	May 1996	1996[e]	April 1998	December 1997
Lithuania	January 1996	June 1999[f]	January 1996	July 1996
Latvia	January 1996	1996[g]	December 1997	December 1997
Croatia	1991	1998[h]	January 1998	April 1996
Romania	1995	NA	January 1998	April 1998
Russia	1991	NA	January 1996	December 1994

[a]More restrictions lifted in 1999.
[b]More restrictions lifted in 1998.
[c]Until 1999 foreign sales within 7 years taxed 12%. 25% foreign ownership limit.
[d]More controls lifted in 2000.
[e]More liberalization in 2000. Restrictions on certain industries.
[f]Foreign investment still restricted in certain industries.
[g]All restrictions lifted in 1999.
[h]More restrictions lifted in 2002.

Table II
Means of Key Variables by Country

Price increase is the percentage stock price increase between November 2001 and February 2003. $DIFCOV$ is the covariance of firm returns with local market returns minus the covariance of firm returns with world returns. $DIFBETA$ is the difference between local market beta and world market beta. Both covariances and betas were calculated using 36 months of historical returns from November 2001 and prior. Average Revision is the average percentage change in mean expected earnings between November 2001 and February 2003. The number of net upgrades is the average number of upward revisions minus the number of downward revisions between November 2001 and December 2002.

Country	# of Firms	% Price Increase	$DIFCOV$	$DIFBETA$	Net Upgrades
Poland	15	0.16	0.0070	-0.19	-1.91
Hungary	10	0.11	0.0056	-0.24	-1.70
Czech Republic	8	0.43	0.0071	0.41	0.08
Slovenia	5	0.63	0.0023	0.59	-0.20
Slovakia	4	0.61	0.0035	0.59	0.00
Lithuania	4	0.39	0.0010	0.46	0.25
Latvia	4	0.28	0.0028	0.06	0.00
Estonia	5	0.46	0.0041	0.52	0.70
Romania	10	0.54	0.0074	1.43	0.07
Russia	7	0.37	0.0231	-0.86	-1.14
Croatia	2	0.55	0.0054	0.66	-0.83
Total	74	0.36	0.0071	0.24	-0.68

Table III
Descriptive Statistics

Price increase is the percentage stock price increase between November 2001 and February 2003. $DIFCOV$ is the covariance of firm returns with local market returns minus the covariance of firm returns with world returns. $DIFBETA$ is the difference between local market beta and world market beta. Both covariances and betas were calculated using 36 months of historical returns from November 2001 and prior. Average Revision is the average percentage change in mean expected earnings between November 2001 and February 2003. The number of net upgrades is the average number of upward revisions minus the number of downward revisions between November 2001 and February 2003. Size is a firm's average market capitalization as a percentage of average total domestic market capitalization during the 12 months prior to November 2001. Turnover is the dollar value traded during the 12 months prior to the liberalization date as percentage of a firm's average market capitalization.

	Mean	Median	Min	Max	Std. Dev.
Price Change	0.356	0.413	-0.462	1.085	0.366
$DIFCOV$	0.007	0.006	-0.001	0.030	0.006
$DIFBETA$	0.237	0.234	-1.404	2.091	0.761
Net Upgrades	-0.682	0.000	-11.000	10.667	3.233
Size	0.111	0.047	0.001	0.824	0.152
Turnover	37.414	3.258	0.005	246.225	65.632

Table IV
Baseline Regression Results

The dependent variable is the percentage stock price increase between November 2001 and February 2003. $DIFCOV$ is the covariance of firm returns with local market returns minus the covariance of firm returns with world returns. $DIFBETA$ is the difference between local market beta and world market beta. Both covariances and betas were calculated using 36 months of historical returns from November 2001 and prior. EU is a dummy variable equal to one for the eight accession countries. The number of net upgrades is the average number of upward revisions minus the number of downward revisions between November 2001 and February 2003. Size is a firm's average market capitalization as a percentage of average total domestic market capitalization during the 12 months prior to November 2001. Turnover is the dollar value traded during the 12 months prior to November 2001 as percentage of a firm's average market capitalization. Net Upgrades, Size and Turnover are entered as deviations from their overall means. The country effects are constrained so that they sum to zero for accession countries and so that they sum to zero for non-accession countries. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A * and ** indicate significance at 5 and 1 %. The number of observations is 74.

	Panel a				**Panel b**			
	(1a)	(2a)	(3a)	(4a)	(1b)	(2b)	(3b)	(4b)
Intercept	0.560**	0.556**	0.508**	0.512**	0.457**	0.477**	0.563**	0.532**
	(4.48)	(4.59)	(4.47)	(4.41)	(7.42)	(8.54)	(4.92)	(3.70)
EU	-0.083	-0.079	-0.190	-0.147	-0.201*	-0.19**	-0.250	-0.206
	(-0.50)	(-0.50)	(-1.08)	(-0.51)	(-2.65)	(-2.77)	(-1.97)	(-1.39)
$DIFCOV$	-6.156	-4.355	13.953	12.609				
	(-0.85)	(-0.72)	(1.08)	(1.07)				
$DIFCOV * EU$	-26.140	-22.208	-25.508	-24.33				
	(-1.25)	(-1.26)	(-1.13)	(-0.99)				
$DIFBETA$					0.047	0.034	-0.138	-0.125
					(0.75)	(0.58)	(-0.87)	(-0.89)
$DIFBETA * EU$					0.349**	0.314**	0.414*	0.402*
					(3.31)	(3.09)	(2.12)	(2.21)
Net Upgrades		0.039**	0.031**	0.031**		0.028**	0.028**	0.028**
		(3.35)	(2.76)	(2.68)		(3.32)	(2.84)	(2.74)
Size				-0.016				-0.093
				(-0.07)				(-0.46)
Turnover				-0.000				-0.000
				(-0.93)				(-1.07)
Country Effects			yes	yes			yes	yes
R^2	0.090	0.205	0.329	0.345	0.296	0.356	0.398	0.403

Table V
Varying Integration Date and Window

The dependent variable is the percentage stock price increase during the integration window. $DIFBETA$ is the difference between local market beta and world market beta. Both covariances and betas were calculated using months of historical returns from the beginning of the integration window and prior. EU is a dummy variable equal to one for the eight accession countries. The number of net upgrades is the average number of upward revisions minus number of downward revisions during the integration window. Size is a firm's average market capitalization as a percentage of average total domestic market capitalization during the 12 months prior to the beginning of the integration window. Turnover is the dollar value traded during the 12 months prior to the beginning of the integration window as percentage of a firm's average market capitalization. Net Upgrades, Size and Turnover are entered as deviations from their overall means. The country effects are constrained so that they sum to zero for accession countries and so that they sum to zero for non-accession countries. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A * and ** indicate significance at 5 and 1 %.

Integration Date	Oct. '01	Dec. '01	Nov. '00	Nov. '01	Nov. '01
Window Length	16	16	16	10	4
Intercept	0.716**	0.639**	0.128	0.481**	0.230**
	(6.58)	(6.28)	(0.83)	(5.58)	(3.37)
EU	-0.213	-0.207		-0.211	-0.126
	(-1.60)	(-0.54)		(-1.08)	(-0.96)
$DIFBETA$	-0.165	-0.172	-0.166	-0.122	-0.033
	(-1.09)	(-1.32)	(-1.23)	(-1.02)	(-0.34)
$DIFBETA * EU$	0.418*	0.468**	0.066	0.317*	0.018
	(2.35)	(2.81)	(0.38)	(2.15)	(0.17)
Net Upgrades	0.017	0.034**	0.022**	0.015	0.031*
	(1.48)	(3.51)	(3.95)	(1.51)	(2.47)
Size	0.019	-0.009	0.282	0.193	0.174
	(0.10)	(-0.05)	(0.67)	(1.14)	(1.41)
Turnover	-0.000	-0.000*	-0.000*	-0.002	0.000
	(-0.86)	(-2.27)	(-2.34)	(-2.16)	(1.43)
Country Effects	yes	yes	yes	yes	yes
R^2	0.287	0.453	0.391	0.291	0.207
Number of Obs.	69	72	65	84	84

Table VI
Price Changes and Beta

The dependent variable is the percentage stock price increase during the integration window. $BETA_M$ is the local market beta calculated using 36 months of historical returns from the beginning of the integration window and prior. EU is a dummy variable equal to one for the eight accession countries. The number of net upgrades is the average number of upward revisions minus number of downward revisions during the integration window. Size is a firm's average market capitalization as a percentage of average total domestic market capitalization during the 12 months prior to the beginning of the integration window. Turnover is the dollar value traded during the 12 months prior to the beginning of the integration window as percentage of a firm's average market capitalization. Net Upgrades, Size and Turnover are entered as deviations from their overall means. The country effects are constrained so that they sum to zero for accession countries and so that they sum to zero for non-accession countries. T-statistics calculated using robust and country "clustered" standard errors are in parentheses. A * and ** indicate significance at 5 and 1 %.

	(1)	(2)	(3)	(4)
Intercept	0.444	0.503	0.591**	0.504**
	(1.65)	(1.98)	(3.01)	(3.19)
EU	0.046	-0.005	-0.249	0.305
	(0.16)	(-0.02)	(-1.26)	(1.75)
$BETA_M$	0.033	-0.004	-0.014	0.073
	(0.17)	(-0.02)	(-0.06)	(0.40)
$BETA_M * EU$	-0.269	-0.202	-0.252	-0.395
	(-1.09)	(-0.88)	(-1.02)	(-1.81)
Net Upgrades		0.040**	0.031*	0.031*
		(3.53)	(2.98)	(2.79)
Size				0.186
				(0.70)
Turnover				0.000**
				(5.18)
Country Effects	no	no	yes	yes
R^2	0.075	0.198	0.351	0.364
Number of Obs.	74	74	74	74