Is There an S&P 500 Index Effect?

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Abstract

We find that the firms included in the S&P 500 index are characterized by large increases in earnings, appreciation in market value and positive price momentum in the period preceding their index inclusion. This strong pre-inclusion performance predicts (1) the permanent increase of market value and (2) the change in return comovement, reflected in declines of size, value and momentum betas, following index inclusion. Non-event firms with similar performance experience similar appreciation in value and changes in comovement coincident with the event firms. Contrary to the consensus in the literature, our results indicate that – after accounting for the firms' extraordinary pre-inclusion performance – index inclusion has *no permanent effect* on value and comovement.

Keywords: S&P 500 inclusions, Pre-inclusion performance, Factor betas, Price and earnings momentum, Value effect.

A large body of literature argues for the existence of a Standard and Poor's (S&P) 500 index membership effect whereby inclusion in the S&P 500 index has a *permanent* impact on the price and beta of the event firms. In particular, studies of the value effect argue that index inclusion leads to a permanent increase in the market value of the event firms.[1] Further studies claim that index inclusion leads to an increase in comovement of the event firm's stock return with market and S&P 500 index returns.[2] While the literature provides different interpretations of the permanent effects following index inclusion, there is a consensus that these effects are the outcome of membership in the S&P 500 index rather than of the characteristics of the event firms.

In this paper, we document that index-included firms exhibit extraordinary *pre-event performance*, such as large increases in earnings per share (EPS), appreciation in market value, positive price momentum and decline in book-to-market ratio (BM). We show that there is *no* permanent S&P 500 index effect with respect to value or comovement, in the sense that firms with the pre-event performance similar to the event firms but not included in the S&P 500 index experience similar changes in value and comovement as the event firms.

The pre-inclusion changes in firm characteristics are substantial. For our sample, on average, the increase in market capitalization in the two years preceding inclusion, adjusted for changes in the aggregate market level, is 56%. The increase in market value reflects the pre-

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[1] The exception is Harris and Gurel (1986) who find that the positive value effect is only temporary. They argue that after the initial excess demand by passive funds is satisfied and the price pressure abates, the prices revert to pre-addition levels. The permanent value effect found in other studies has been attributed to: (i) the excess demand due to indexing in the presence of long-term downward sloping demand curves (Shleifer, 1986, Beneish and Whaley, 1996, Lynch and Mendenhall, 1997, Wurgler and Zhuravskaya, 2002); (ii) the increase in expected future cash flows because inclusion in the index is perceived as a positive signal about the prospects of the firm (Jain, 1987, Dhillon and Johnson, 1991, Denis et al., 2003); (iii) the decrease in the required return due to improvement in liquidity (Erwin and Miller, 1998, Hegde and McDermott, 2003) and rise in investor awareness (Chen et al., 2004).

[2] Vijh (1994) studies the change in the beta on the value-weighted portfolio of NYSE and AMEX stocks and Barberis et al. (2005) the change in the beta on the S&P 500 index following index inclusions. This change in comovement is attributed primarily to S&P 500 trading by passive funds, consistent with irrational investor sentiment causing common variation in stock prices.

inclusion price momentum, and it coincides with strong earnings performance of the event firms. The total increase of EPS in the fiscal year before inclusion and the year of inclusion is about 57%.[3]

Given the evidence that index inclusions are preceded by substantial changes in stock characteristics that are known to be cross-sectional determinants of returns, we study the relation between the value effect of inclusions and the changes in characteristics.[4] We find that the permanent value effect is predictable on the basis of *pre-inclusion* information: (i) the average daily return in the pre-inclusion year and (ii) the pre-inclusion revision of analysts' EPS forecasts for the fiscal year of index inclusion.[5] The intercepts of the cross-sectional regressions of the changes in value on these variables are indistinguishable from zero, implying that the value effect is attributable to the firms' pre-event performance and expectations of performance.

Next, given that the changes in stock characteristics are expected to be associated with changes in factor loadings, we also examine the relation between changes in characteristics and changes in comovement around inclusions.[6] We study the behavior of daily and weekly factor betas. Departing from the literature, we employ the multi-factor models of Fama and French (1993)

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[3] The sample average increase in realized EPS is 34% in the fiscal year before inclusion and 23% in the year of inclusion. The magnitude of the changes in EPS in the year of inclusion is correctly reflected in the pre-inclusion revision of analyst forecasts for that fiscal year.

[4] For the relation between characteristics like size, book-to-market and momentum and returns, see Fama and French (1992), Lakonishok, Shleifer, and Vishny (1994), Jegadeesh and Titman (1993), Daniel and Titman (1997), among others. For the predictability of returns based on earnings information, see Ball and Brown (1968) and Bernard and Thomas (1989), among others, for evidence that firms reporting unexpectedly high earnings outperform firms reporting unexpectedly poor earnings, and Givoly and Lakonishok (1979) and Chan, Jegadeesh and Lakonishok (1996), among others, for evidence of the predictability of returns from past earning news, including past revisions in analysts' earnings forecasts.

[5] Our measure of the permanent value effect is similar to that employed in other index studies. See section 3 for details.

[6] The evidence of the common factors in stock returns associated with size, value and momentum characteristics is available for the periods with a limited market role of the S&P 500 index trading, for the non-U.S. markets and for different asset classes, e.g. Davis, Fama, and French (2000), Fama and French (2012), and Asness, Moskowitz, and Pedersen (2012), among others. This evidence suggests that the S&P 500 trading is not the primary source of the commonality in returns associated with the factors. Consequently, given the substantial changes in characteristics of the event stocks, one may expect changes in their factor loadings independent of index membership.

and Carhart (1997) and find no change in the market beta but instead significant declines in the SMB, HML and momentum betas of event firms around inclusions.[7] We show that declines in the SMB and HML betas are driven by (i) the pre-inclusion increase in the firms' market size and (ii) the pre-inclusion increase in analysts' EPS forecasts for the fiscal year of index inclusion. The decline in momentum beta is predictable on the basis of the average daily returns in the two years preceding index inclusion. This decline is consistent with the fact that the event stocks are positive momentum stocks before inclusions, but not after the initial period following inclusions. We also analyze the determinants of changes in the CAPM beta and S&P 500 beta in the one-factor model regression and find that the pre-inclusion increase in the firms' size explains the increase in these betas. This result is consistent with the evidence in the literature that size captures a significant part of the cross-sectional variation in the CAPM beta (Fama and French (1992) and Jegadeesh (1992), among others). It explains why in the multi-factor models – after controlling for the Fama and French (1993) size and value factors – there is no change in the market beta. The intercepts of regressions of changes in factor betas on pre-event changes in characteristics are not statistically different from zero for all factor betas at both daily and weekly return frequencies, except for the *daily* SMB betas. We also examine the timing of changes in factor betas around inclusions and document that the betas start changing already before inclusion events.

Considering strong evidence that the pre-inclusion information predicts both the change in comovement and the permanent value effect of index inclusion, we examine whether these phenomena are a consequence of index inclusion or whether they are simply coincident with, but independent of, inclusion. Our matched sample analysis, controlling for the firms' pre-event performance, indicates no significant differences between permanent post-inclusion changes in

[7] The analysis in Vijh (1994) and Barberis et al. (2005) is based on the market model regressions.

value of the event stocks and the coincident changes in value of the matched non-event stocks. This evidence implies that index inclusion has *no* permanent value effect, a result that is in contrast to the consensus in the current index literature. The results indicate that the permanent post-inclusion increase in value is a continuation of the pre-inclusion *price momentum* coincident with strong earnings performance of the index-included firms – this increase in value is independent of S&P 500 index membership. The evidence supports the conclusions in Harris and Gurel (1986) of the existence of a temporary but no permanent value effect of index inclusion. Our results regarding the determinants of the value effect are consistent with the extensive evidence on the price momentum anomaly of Jegadeesh and Titman (1993) and the relation between price momentum and earnings performance, specifically the predictability of returns from past earnings news (e.g. Chan, Jegadeesh and Lakonishok (1996) and references therein).

The control sample analysis for the factor betas indicates no significant differences between the changes in the factor betas of the event and control stocks, except for the *daily* SMB betas. This result is consistent with the cross-sectional evidence that part of the decline in the event stocks' daily SMB beta is not attributed to the pre-inclusion changes in the considered stock characteristics. Thus, the potential impact of index inclusion on comovement is limited to an increase, at the daily level, in synchronicity of comovement of prices of the newly-added stocks with prices of the larger stocks in the market. This is a high-frequency effect consistent with transitory price pressures of index trading. At the lower weekly frequency, index addition has *no* effect on comovement.

In summary, contrary to the consensus in prior literature, the results of this paper show that S&P 500 index inclusion has no permanent effect on the firms' market value and return comovement. Conclusions regarding the existence of the permanent effects of S&P 500 inclusion in the prior literature are explained by the lack of controls for the strong pre-event performance of the index-included firms.

The paper proceeds as follows. Section 1 describes the sample construction. Section 2 analyzes the changes in stock characteristics around inclusion events. Section 3 studies the value effect of index inclusion and its relation to the changes in stock characteristics. Section 4 analyzes the changes in factor betas, the relation between betas and characteristics, and the evolution of betas around inclusion. Section 5 provides a control sample analysis of the value effect and the changes in comovement. Section 6 presents the conclusions.

1. Sample Construction

The sample comprises stocks added to the S&P 500 index between October 1989 and October 2009.[8] The list of index additions is obtained from the Standard & Poor's Corporation. There were 562 additions to the index during our sample period. We exclude firms that were involved in mergers or takeovers around the inclusion event or firms that were a restructured version of a firm already included in the index. Further, the firms included in the sample are required to have a minimum of 60 daily return observations in the CRSP daily file in the 15 months before and after the month of addition announcement. The final sample consists of 403 index additions.

[8] Our sample starts after the change in Standard and Poor's index revision announcement policy. While before October 1989 Standard and Poor's announced and added stocks to the index on the same day that the changes became effective, after October 1989 it began announcing the revisions to the index about one week before they became effective. The change in announcement policy is not expected to have direct implications for our analysis. At the time of implementation of our analysis, the CRSP database provided market data till December 2010. Our sample ends in October 2009 to insure that the post-inclusion estimation interval of factor betas is of the same length for all sample stocks.

2. Changes in Stock Characteristics

The S&P's Index Committee examines five main criteria for Index inclusion candidates: liquidity, share ownership, profitability, market capitalization, and sector representation (Bos and Ruotolo, 2000). Since it is likely that stocks included in the index had above-average performance prior to inclusion, in this section we examine the changes in stock characteristics around index inclusions.

2.1. Market Size, Average Returns and Turnover

[INSERT TABLES I and II and FIGURE 1 HERE]

We present analysis of the changes in market size ($\Delta Size$), the average daily returns (*Ret*) and the changes in share turnover ($\Delta Turn$) of the event stocks before and after index inclusion. Panels A, B and C of Table II report cross-sectional means and medians of these variables for the two successive years preceding inclusions (indexed *Pre1* and *Pre2*) and from the pre-announcement day to six months after inclusion (indexed *Post*). To examine stock performance relative to the market, we also report the changes in the market-adjusted $\Delta Size$, *Ret* and $\Delta Turn$. The market-adjusted variable is defined as a stock variable divided by its market average. Table I presents the exact definitions of all variables employed in this paper.

The results in Panel A of Table II indicate that the sample average changes in size in the first and second pre-inclusion years, $\Delta Size_{Pre1}$ and $\Delta Size_{Pre2}$, are 31% and 38%, respectively. These changes are followed by a further increase in size in the post-inclusion period, $\Delta Size_{Post}$, of about 5%. The corresponding estimates for changes in the market-adjusted size are 26% and 30% prior to inclusions and 1% afterwards. Figure 1 plots the sample average market-adjusted size in consecutive 20-day windows from 360 days before to 360 days after inclusion announcement. The observed pattern indicates a steady increase in the firms' market value preceding index inclusion, followed by further relatively abrupt increase in value in the period following inclusion and then some reversal in the subsequent period. In unreported results we also find a significant decline in the book-to-market ratio (BM) of event firms around index inclusions, further illustrating the rapid rise in market value of these firms in this period.[9]

Estimates of the average daily returns, reported in Panel B of Table II, are consistent with the evidence of increases in the market value. In particular, the sample average returns during the first and second years preceding inclusion, Ret_{Pre1} and Ret_{Pre2}, are 0.15% and 0.17%, respectively, followed by an average post-inclusion return, Ret_{Post}, of 0.06%. The corresponding market-adjusted returns are 0.12%, 0.11% and 0.03%, respectively. All returns are highly significant.

The evidence for the changes in share turnover is presented in Panel C of Table II. We find average increases of 15% and 10% in the unadjusted turnover in the first and second years preceding inclusion, $\Delta Turn_{Pre1}$ and $\Delta Turn_{Pre2}$, respectively. The corresponding market-adjusted changes in turnover are 12% and 7%. These pre-inclusion changes in turnover are all statistically significant. As to the post-inclusion period, while we find a significant 7% increase in the average unadjusted turnover, $\Delta Turn_{Post}$, there is no significant change in the market-adjusted turnover (although the median change is marginally significant and positive with t = 1.71). The evidence of little post-inclusion change in trading intensity (consistent with Chen, Norohna and Singal (2004)) is noteworthy. A possible interpretation of this result is related to the buy-and-hold strategy of passive funds that is expected to reduce share turnover, thus offsetting the increase in turnover associated with fund flows in and out of the index funds.

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[9] The decline in BM around index inclusions is consistent with the increase in the firms' market value in relation to their book value (as book value changes slowly over time).

2.2. Earnings per Share

Recent research indicates that cash-flow news is the primary source of long-term firm-level value changes (Vuolteenaho (2002), and Chen and Zhao (2011)). For instance, Chen and Zhao (2011) find that cash-flow news, proxied by analysts' earnings forecasts, account for 48%, 63% and 68% of the return variance at one-, two- and three-year horizons, respectively. Hence, the evidence of significant changes in market value around inclusion events suggests a change in earnings performance at this time. [10]

The behavior of firms' earnings around S&P 500 index additions is analyzed in Denis, McConnell, Ovtchinnikov and Yu (2003). Their study argues that analysts revise the current-year and one-year-ahead EPS forecasts upward upon firms' entry in the index relative to the forecasts of benchmark firms.[11] In the following, we analyze the firms' forecasted and realized EPS during a broader horizon from two fiscal years before to two fiscal years after index inclusion.

The EPS data are obtained from the *I/B/E/S* detailed history file. Denote the fiscal year with year-end before (after) the event of the index inclusion announcement as FY1b (FY1a). Thus, FY1a is the fiscal year in which the inclusion event takes place. Further, denote as FY2b the fiscal year preceding FY1b, and denote as FY2a the fiscal year following FY1a. Out of our sample of 403 index additions, there are 322 stocks for which the current-year EPS forecast data are available for both fiscal years FY1b and FY1a.[12] 312 of these 322 stocks have current-year forecasts available for the fiscal year FY2b, and 320 have forecasts available for the fiscal year

[10] Fama and French (1995) document that low BM and large stocks have persistently higher earnings than value and small stocks; moreover, there are size and BM factors in earnings like size and BM factors in returns.

[11] The conclusions of Denis et al. (2003) are similar for both forecasting horizons.

[12] The *I/B/E/S* database includes analyst forecasts of annual EPS up to five fiscal years ahead. The number of event stocks with available EPS forecasts drops significantly with an increase in the forecasting horizon. In order to maximize the number of stocks in the sample with available EPS data we focus on the current-year EPS forecasts.

FY2a. For each stock in each fiscal year we calculate (i) the analysts' current-year mean EPS forecast, EPS^e and (ii) the realized EPS, EPS^r.

Define log changes in the forecasted and realized EPS, ΔEPS^i ($i=e, r$), in the fiscal years around index inclusion as follows:

$$\Delta EPS^i_{FY1b}=ln(EPS^i_{FY1b})-ln(EPS^i_{FY2b}),$$

$$\Delta EPS^i_{FY1a}=ln(EPS^i_{FY1a})-ln(EPS^i_{FY1b}),$$

$$\Delta EPS^i_{FY2a}=ln(EPS^i_{FY2a})-ln(EPS^i_{FY1a}).$$

When calculating ΔEPS^e_{FY1a} (the change in the mean forecast from the pre-inclusion fiscal year, FY1b, to the year of inclusion, FY1a), the forecasts for the pre-inclusion year that are made after inclusion announcement are omitted from the calculation of the mean forecast EPS^e_{FY1b}.[13] This approach ensures that EPS^e_{FY1b} does not contain event-related information. Further, when one or both of the EPS^is on the right hand side of the formula for changes in earnings, ΔEPS^i, are negative, we calculate ΔEPS^i after replacing both EPS^is with the following transformed variables: $TEPS^i = EPS^i + 2 * | EPS^i |$.[14]

[INSERT TABLE III HERE]

Panels A and B of Table III report sample mean and median of paired changes in the forecasted and realized EPS. Considering the evidence in Panel A, the mean forecasted EPS increases by about 30% in the fiscal year preceding inclusion (ΔEPS^e_{FY1b}) and by about 24% in the year of inclusion (ΔEPS^e_{FY1a}), implying a total increase of about 54% during the two years. The

[13] Such cases may be observed if the earnings report date occurs after the event of index inclusion. Robustness checks, however, show that including the post-event forecasts for FY1b in the calculation of EPS^e_{FY1b} does not affect the results in this paper.

[14] The transformation does not change the percentage difference between the variables in the expression for ΔEPS^i. But it insures that the transformed variables are positive and therefore allows us to calculate the difference ΔEPS^i. There are only few stocks with negative mean EPS forecasts or negative realized EPS in the considered fiscal years around index inclusions. The results presented in the paper are not affected by excluding these stocks from the sample.

corresponding change in the realized EPS of about 57% (Panel B) is similar in magnitude to the change in forecasted EPS, indicating that the growth in firms' earnings is correctly anticipated by analysts.

The increase in EPS forecasts in the year of inclusion (FY1a) should be considered in the context of the evidence presented in Denis et al. (2003). Denis et al. analyze changes in the stocks' EPS forecasts from the period immediately before the month of index inclusion to the period after inclusion. Their results indicate a post-inclusion *decline* in the sample average EPS forecast of the event firms (which, as noted by the authors, is consistent with the evidence in the previous literature that analysts tend to revise their forecasts downward as the year progresses). However, the decline in EPS forecasts over the same period is significantly larger for the benchmark firms.[15] Denis et al. conclude that index inclusions trigger a positive revision (in relative terms) of the EPS forecasts. In the context of their results, it is reasonable to expect that much of the 24% increase in the forecasted EPS from the fiscal year FY1b to FY1a takes place prior to inclusion. To examine whether this is indeed the case, we calculate the *pre-event* change in forecasts from FY1b to FY1a as $\Delta EPS^e_{FY1a(pre)} = \ln(EPS^e_{FY1a(pre)}) - \ln(EPS^e_{FY1b})$, where $EPS^e_{FY1a(pre)}$ denotes the mean of analyst forecasts for the fiscal year FY1a made before addition announcement. We find (in column 3 of Table III, Panel A) that the sample average of $\Delta EPS^e_{FY1a(pre)}$ is 23%. Therefore, consistent with our expectations, almost all of the increase in earnings expectations during the year of index inclusion occurs prior to the addition announcement.

The results in the last column of Panel A of Table III show that analysts continue to revise their EPS forecasts upward in the fiscal year which begins after inclusion (FY2a). However, the rate of increase in EPS forecasts is considerably lower in FY2a compared to FY1a and FY1b, with

[15] Note that the stock-matching procedure in Denis et al. (2003) does not control for the pre-event performance (e.g. large increases in market value and expected earnings) characterizing the index-included firms.

the mean (median) ΔEPS^{e}_{FY2a} being about 7% (12%). With regard to the realized earnings, we find no significant change in the mean ΔEPS^{r}_{FY2a} but a significant 9% increase in the median ΔEPS^{r}_{FY2a}.

Summarizing the main findings in this section, the S&P 500 index inclusions take place in times of strong growth of the event firms, reflected in the pre-inclusion price momentum, increases in market value and earnings per share.[16]

3. Value Effect and Changes in Stock Characteristics

Given considerable evidence in the literature that firm characteristics analyzed in the previous section are determinants of cross-sectional dispersion of average returns (Fama and French (1992), Jegadeesh and Titman (1993), Chan, Jegadeesh and Lakonishok (1996), among others), this section studies the relation of the value effect of index inclusion to the changes in these characteristics around inclusions.

[INSERT TABLE IV HERE]

Table IV presents the abnormal returns (ARs) of the S&P 500 index inclusion. The abnormal return is measured as the difference between the return on the firm's stock and the CRSP value-weighted market return. Our estimates indicate that the sample average AR from the day of inclusion announcement to the post-announcement day, denoted *AR_AND*, is 4.34% with t = 16.03.[17] The cumulative abnormal return (CAR) from the day of inclusion announcement to the day following effective inclusion, *CAR_EFD*, is 6.01% with t = 12.43. We measure the permanent value effect of index inclusion as the CAR from the day of inclusion announcement to 40 days

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[16] Untabulated estimates show that the changes in market value and earnings are highly correlated; for instance, the correlation between $\Delta Size_{Pre1}$ and ΔEPS^{e}_{FY1a} (ΔEPS^{r}_{FY1a}) is 47% (40%).

[17] Index inclusion announcements and effective inclusions take place after trading hours.

after effective inclusion, *CAR40*.[18] The sample average *CAR40* is 3.34% with t = 3.80. The corresponding estimates of *AR_AND*, *CAR_EFD* and *CAR40* for the sample with available EPS data are 4.39% with t = 15.02, 5.72% with t = 10.41 and 2.90% with t = 2.96, respectively. The percentage of stocks with positive *AR_AND*, *CAR_EFD* and *CAR40* in the full (EPS) sample is 85% (85%), 83% (82%), and 63% (62%), respectively. Thus, the evidence indicates that, while about two months after effective inclusion in the index there is a reversal of the initial increase in value for part of the index-included stocks, for the sample, on average, there remains a positive return in excess of the market return.

We now examine the cross-sectional relation of abnormal returns to changes in stock characteristics around index inclusions.[19] Since the focus of the literature has been on the permanent value effect of index inclusion (footnote 1), we begin with the analysis of the determinants of *CAR40*. We first examine the relation of *CAR40* to each individual characteristic separately:

$$CAR40_i = \gamma_0 + \gamma_1 X_i + \varepsilon_i, \quad (1)$$

where X_i is a variable representing a stock characteristic, including the average returns, the changes in size, turnover and earnings.

[INSERT TABLE V HERE]

[18] Among the recent index studies (footnote 1), Chen et al. (2004) measures the permanent value effect of index inclusion in the interval extending to 60 trading days and Denis et al. (2003) in the interval extending to 30 trading days after effective inclusion. We pick an interval in-between these numbers. We have verified that our results are not sensitive to alternative lengths of the intervals extending to 30, 40, 50 or 60 days after inclusion. Moreover, we have repeated the analysis in this section using buy-and-hold abnormal returns instead of CARs. The evidence is qualitatively similar to that for CARs and is available upon request.

[19] We present the analysis of the restricted sample with available earnings data since the earnings variables are our principal explanatory variables. However, we have verified that the cross-sectional evidence on the relation between abnormal returns and non-earnings variables for the full sample is qualitatively similar to that for the restricted sample.

Results in Table V indicate a highly significant positive univariate relation of *CAR40* to $\Delta Size_{Pre1}$. The intercept of this regression is insignificant (0.81 with t = 0.70). Similarly, we find a highly significant positive relation between *CAR40* and Ret_{Pre1}, and the corresponding regression intercept is also indistinguishable from zero (-0.25 with t = -0.20). Hence, the results for $\Delta Size_{Pre1}$ and Ret_{Pre1} imply no statistically significant abnormal returns after accounting for the firms' performance in the pre-inclusion year. Further results indicate that the return in the second year prior to inclusion, Ret_{Pre2}, does not have a significant relation to *CAR40*. We also do not find a significant association between *CAR40* and the turnover variables, $\Delta Turn_{Pre1}$ and $\Delta Turn_{Post}$.

The next set of results presents estimates of the univariate regressions of *CAR40* on the earnings variables. We find a highly significant positive relation of *CAR40* to changes in the realized and expected EPS from the pre-event to post-event fiscal year, ΔEPS^{r}_{FY1a} and ΔEPS^{e}_{FY1a}; the corresponding regression intercepts are insignificant. Given these results, we examine whether the value effect is driven primarily by the pre- or post-inclusion earnings information. Recall from section 2.2 that the pre-event change in forecasts for the fiscal year FY1a is $\Delta EPS^{e}_{FY1a(pre)}=ln(EPS^{e}_{FY1a(pre)})-ln(EPS^{e}_{FY1b})$. Now we further define the *post-inclusion* change in forecasts for FY1a as $\Delta EPS^{e}_{FY1a(post)}=\Delta EPS^{e}_{FY1a} - \Delta EPS^{e}_{FY1a(pre)}$ (thus, excluding the pre-event forecast revision for FY1a). We regress *CAR40* on $\Delta EPS^{e}_{FY1a(pre)}$ and $\Delta EPS^{e}_{FY1a(post)}$ and report the results in columns VII and VIII of Table V. The estimates show positive and significant relation of *CAR40* to $\Delta EPS^{e}_{FY1a(pre)}$ with the regression intercept not statistically different from zero, similar to ΔEPS^{e}_{FY1a} and ΔEPS^{r}_{FY1a}, but no significant association of *CAR40* to $\Delta EPS^{e}_{FY1a(post)}$. Thus, the evidence indicates that the value effect is determined by changes in firm earnings in the year of index inclusion, with the information about these changes already reflected in the pre-inclusion revision of analysts' EPS forecasts.

Next, we analyze the joint effects of all variables in the following multivariate regressions:[20]

$$CAR40_i = \gamma_0 + \gamma_1 Ret_{Pre1,i} + \gamma_2 Ret_{Pre2,i} + \gamma_3 \Delta Turn_{Pre1,i} + \gamma_4 \Delta Turn_{Post,i} + \gamma_5 \Delta EPS^{r}_{FY1a,i} + \varepsilon_i \qquad (2)$$

$$CAR40_i = \gamma_0 + \gamma_1 Ret_{Pre1,i} + \gamma_2 Ret_{Pre2,i} + \gamma_3 \Delta Turn_{Pre1,i} + \gamma_4 \Delta Turn_{Post,i} + \gamma_5 \Delta EPS^{e}_{FY1a(pre),i} + \gamma_6 \Delta EPS^{e}_{FY1a(post),i} + \varepsilon_i \qquad (3)$$

The estimates of specification (2) (in column IX of Table V) show significant effects related to pre-event returns and realized earnings growth, Ret_{Pre1} and ΔEPS^{r}_{FY1a}. In specification (3), the realized earnings are replaced by the pre- and post-event revision of earnings forecasts. The results (in column X) indicate that *CAR40* is significantly related to Ret_{Pre1} and $\Delta EPS^{e}_{FY1a(pre)}$. Thus, the evidence from multivariate regressions supports the univariate results that the pre-inclusion information predicts the permanent value effect of index inclusion.

Are the determinants of the *initial* post-inclusion increases in value, *AR_AND* and *CAR_EFD*, similar to those of *CAR40*? The last two columns of Table V report estimates of the specification (3) with the dependent variable set to *AR_AND* and to *CAR_EFD*. In the case of *AR_AND*, we find a marginally significant positive relation to $\Delta Turn_{Pre1}$ and $\Delta Turn_{Post}$ and a marginally significant negative relation to $\Delta EPS^{e}_{FY1a(pre)}$. In case of *CAR_EFD*, there is a positive and significant at the 5% level relation to Ret_{Pre2}. In contrast to the results for *CAR40*, the intercepts of the regressions for *AR_AND* and *CAR_EFD* are highly significant and positive.

Hence, the results indicate that the determinants of the initial and permanent value effects following index inclusion are largely different. In contrast to the initial value effects, the

[20] The contemporaneous cross-sectional correlation between the pre-inclusion changes in size and the average daily returns is about 90%, reflecting the fact that the documented increase in size is a consequence of the pre-inclusion price run-up of the event stocks. Preliminary analysis indicated that the estimates of regressions of the value effect on Ret_{Pre1} (Ret_{Pre2}) are qualitatively similar to those of regressions on $\Delta Size_{Pre1}$ ($\Delta Size_{Pre2}$). The reported multivariate regressions are based on the return variables.

permanent effect is predictable on the basis of the pre-event returns and the pre-event analysts' EPS forecast revisions for the fiscal year of index inclusion. This evidence is consistent with the permanent effect being a continuation of the pre-inclusion *price momentum* accompanied by strong earnings performance of the event firms. Our results are consistent with extensive evidence of the medium-horizon predictability of returns based on past returns (Jegadeesh and Titman (1993)) and past earnings news (see e.g. Givoly and Lakonishok (1979) and Chan, Jegadeesh and Lakonishok (1996) for predictability based on past revisions in analysts' EPS forecasts).[21]

Given our results, it is natural to ask whether the positive permanent value effect of the event stocks is a consequence of index inclusion, or whether it is simply coincident with this event. In the latter case, event stocks are not expected to show abnormal performance relative to non-event stocks with similar returns and earnings behavior. We address this question in section 5 of the paper. Before doing that, in the following section we study changes in covariances around inclusion events.

4. Comovement and Changes in Stock Characteristics

Considering the evidence of substantial changes in the characteristics of the event stocks around index inclusions, one may expect associated changes in their factor loadings. Specifically, the increase in market size and the decline in BM are expected to be associated with declines in the loadings on the Fama and French (1993) size and value factors. Furthermore, the fact that the event stocks are positive momentum stocks before index inclusion, but not afterwards, is expected

[21] Consistent with Chan, Jegadeesh and Lakonishok (1996), we find that each variable, past returns and past earnings news, have incremental predictive power, controlling for the other variable, consistent with each variable reflecting independent pieces of information.

to be associated with the post-inclusion decline in the loadings on the Carhart (1997) momentum factor.

Vijh (1994) and Barberis et al. (2005) document a post-inclusion increase in the market beta[22] and the S&P 500 beta, respectively, and attribute this increase primarily to index trading of the newly-added stocks. These studies, however, do not control for *expected* changes in the event stocks' loadings on common factors in returns around inclusions. To address this concern, in this section we re-examine changes in comovement around index inclusions, taking into account changes in the betas with respect to the Fama and French (1993) and Carhart (1997) factors.

4.1. Changes in Factor Betas

We begin with an analysis of changes in comovement using the standard CAPM framework:

$$R_{i,t}^{e} = \alpha_i + \beta_{mrk,i} RM_t^{e} + \varepsilon_{i,t} \tag{4}$$

where $R_{i,t}^{e}$ and RM_t^{e} denote event stock i and market returns in excess of the risk-free rate, respectively. The market return is the CRSP value-weighted return of NYSE, AMEX, and NASDAQ stocks. We estimate equation (4) separately for the pre-inclusion and post-inclusion time intervals defined as [-12, -1] and [+4, +15] months with respect to the month of inclusion announcement.[23] We then calculate the change in the market beta $\Delta\beta_{mkt}$ from before inclusions to after inclusions.

Next, we estimate the Fama and French (1993) 3-factor and Carhart (1997) 4-factor models:

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[22] The market return in Vijh (1994) is proxied by the value-weighted return of NYSE and AMEX stocks.

[23] The months surrounding inclusion event are excluded in order to eliminate any temporary effects on comovement related to index inclusions. However, these months are included in the analysis of section 4.3 in the context of the evolution of changes in comovement.

$$R_{i,t}^{e} = \alpha_i + \beta_{mrk,i} RM_t^e + \beta_{smb,i} SMB_t + \beta_{hml,i} HML_t + \varepsilon_{i,t} \quad (5)$$

$$R_{i,t}^{e} = \alpha_i + \beta_{mrk,i} RM_t^e + \beta_{smb,i} SMB_t + \beta_{hml,i} HML_t + \beta_{umd,i} UMD_t + \varepsilon_{i,t} \quad (6)$$

where SMB_t denotes the return on small minus big market capitalization stocks, HML_t denotes the return on high minus low book-to-market ratio stocks, and UMD_t denotes the return on winner minus loser stocks.[24] We estimate (5) and (6) before and after inclusions and calculate the pre- to post-inclusion changes in the factor betas. The models (4) – (6) are estimated using daily and weekly return data.

Panels A and B of Table VI present estimates of changes in the daily and weekly betas for the alternative factor models and report the cross-sectional mean and median changes in the betas.

[INSERT TABLE VI HERE]

The results indicate a significant increase in the CAPM beta following index inclusions, consistent with Vijh (1994). On average, the daily (weekly) betas increase by about 0.12 (0.09), and these increases are significant at the 1% level. However, estimates of the Fama and French 3-factor model show that, in contrast to previous results, changes in both the daily and weekly market betas are no longer significant for either the mean or the median changes. We further find that the loadings of stock returns on the SMB factor are significantly lower following index inclusions (the mean change in daily (weekly) SMB beta is -0.256 (-0.224) with t = -7.737 (-3.929)). Moreover, the loadings on the HML factor also decrease significantly (the mean change in the daily (weekly) HML beta is -0.153 (-0.204) with t = -2.862 (-2.529)). The results of the 4-factor model indicate a highly significant decline in the momentum beta (the mean change in daily (weekly) momentum beta is -0.313 (-0.300) with t = -6.689 (-5.093)). As before,

[24]The time-series of the four factors and the risk-free rate are obtained from Kenneth French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

we find no significant change in the market beta and significant declines in the SMB and HML betas. Hence, the changes in factor loadings are *as expected*, given the documented changes in characteristics of the index-included stocks around inclusions.

Barberis et al. (2005) document a post-inclusion increase in the S&P 500 beta. Since the correlation between the CRSP value-weighted market return and the S&P 500 index return in our sample period exceeds 98%, one may expect the effect of index inclusion on the S&P 500 beta to be similar to that documented for the CRSP market beta. However, we do repeat the analysis of the post-inclusion changes in comovement after replacing the CRSP value-weighted market return in the factor models (4) - (6) by the S&P 500 index return. [25] In the context of this analysis, it is important to note that the S&P 500 index may be seen as a proxy for a portfolio of the larger stocks in the U.S. market. Consequently, given substantial increases in market value of the event stocks in the period around inclusions, the increase in the loading on the S&P 500 index – similar to the decline in the loading on the size factor – may, in principle, be expected during this period, also independent of membership in the index.

[INSERT TABLE VII HERE]

Table VII reports the results of the specifications with the S&P 500 index return. [26] The estimates are similar to those in Table VI for the specifications with the CRSP market return, with the following exceptions: (i) in contrast to the daily $\Delta\beta_{mrk}$, the *daily* change in the S&P 500 beta

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[25] It is important to note that Barberis et al. (2005) analyze changes in the S&P 500 beta in two alternative specifications: (i) a univariate regression of stock returns on S&P 500 return and (ii) a bivariate regression of stock returns on S&P 500 return and value-weighted return of non-S&P 500 stocks. We have measured the value-weighted return of non-S&P 500 stocks, following the procedure described in Table 1 of Barberis et al. (2005), and documented that the correlation between S&P 500 and non-S&P 500 stock returns exceeds 93%. The concern regarding a multiple regression with highly correlated regressors is that its parameter estimates are likely to be regression artifacts, rendering their interpretation difficult. Therefore, we do not consider specifications which include both of these highly correlated indices in one regression.

[26] The reported results are based on specifications where we use raw returns and not excess returns of the event stocks and of the S&P 500 index (see Table VII for details). Specifications estimated using excess returns show similar evidence and are available on request.

$\Delta\beta_{sp}$ remains statistically significant in the multi-factor regressions, although the magnitude of the effect is reduced, and (ii) $\Delta\beta_{hml}$ turns insignificant. Thus, in the multi-factor specifications the change in comovement with the S&P 500 return is limited to high-frequency daily effects only; the weekly S&P 500 beta does not change following index inclusions (the sample average weekly $\Delta\beta_{sp}$ is 0.022 with t = 0.66).

4.2. The Cross-section of Changes in Betas and Characteristics

As already discussed, the documented changes in factor betas are expected to be related to the changes in characteristics of the event stocks around inclusion events. In this section, we study the relation between betas and characteristics.

4.2.1. The SMB and HML Betas

Tables VIII and IX present the cross-sectional analysis of the changes in the SMB and HML betas.[27]

[INSERT TABLE VIII and IX HERE]

In both tables, columns I-XIII report a detailed univariate and multivariate analysis of changes in betas in the 3-factor model. The evidence for betas in the 4-factor model is reported in columns XIV-XVI.[28] Estimates of the specifications including earnings variables are based on the sample with available EPS data. To demonstrate robustness of the cross-sectional relations across

[27] Our preliminary analysis indicated that the estimates of the regressions of the changes in factor betas on the *Ret* variables are qualitatively similar to those of the regressions on the $\Delta Size$ variables. For economically intuitive reasons, we employ $\Delta Size$ in the regressions for the size and value betas, and *Ret* in the regressions for the momentum betas. Further, $\Delta Size_{Pre2}$ and Ret_{Pre2} have no impact on the changes in size and value betas, and therefore, for the sake of parsimony, are not included in the regressions for these betas. The regressions including these variables are available upon request.

[28] The results for betas in the 4-factor model are qualitatively similar to those in the 3-factor models. Therefore, for brevity, for betas in the 4-factor model we report the estimates of the multivariate regressions only.

the full sample (403 stocks) and the EPS sample (322 stocks), columns I-V of the tables report estimates of the regressions without earnings variables for the full sample of additions. Panels A report estimates for the daily betas and Panels B for the weekly betas.

The univariate evidence in Tables VIII and IX indicates a highly significant negative relation of the daily and weekly $\Delta\beta_{smb}$ and $\Delta\beta_{hml}$ to the pre-inclusion size changes, $\Delta Size_{Pre1}$. The results for the post-inclusion size changes, $\Delta Size_{Post}$, are mixed. We find a negative and significant univariate relation of $\Delta Size_{Post}$ to the daily $\Delta\beta_{smb}$ but not the weekly $\Delta\beta_{smb}$. The relation of $\Delta Size_{Post}$ to $\Delta\beta_{hml}$ is insignificant for the daily $\Delta\beta_{hml}$ but it is positive and significant at the 5% level for the weekly $\Delta\beta_{hml}$. Further estimates show no significant association of the changes in betas to $\Delta Turn_{Pre1}$ and $\Delta Turn_{Post}$. When both size and turnover are included in the regression (column V), the results are similar to the univariate case: the pre-event change in size is a significant determinant of changes in size and value betas. In column VI, we re-estimate this regression using the sample with EPS data and again find similar results.

Next, we report estimates from univariate regressions of $\Delta\beta_{smb}$ and $\Delta\beta_{hml}$ on realized and forecasted earnings changes, ΔEPS^{r}_{FY1a} and ΔEPS^{e}_{FY1a}, and find negative and significant effects in both cases. The decomposition of forecast revisions ΔEPS^{e}_{FY1a} into the pre-event and post-event components indicates that the pre-event component $EPS^{e}_{FY1a(pre)}$ drives the relation between the betas and earnings. For the weekly $\Delta\beta_{smb}$ and both the daily and weekly $\Delta\beta_{hml}$, the intercepts of the univariate regressions on $\Delta Size_{Pre1}$, ΔEPS^{r}_{FY1a}, ΔEPS^{e}_{FY1a} *and* $EPS^{e}_{FY1a(pre)}$, are not statistically different from zero.

Finally, we report estimates from the following multivariate specifications adding earnings to the size and turnover variables:

$$\Delta\beta_{smb/hml,i} = \alpha_0 + \alpha_1 \Delta Size_{\Pr e1,i} + \alpha_2 \Delta Size_{Post,i} + \alpha_3 \Delta Turn_{\Pr e1,i} + \alpha_4 \Delta Turn_{Post,i} + \alpha_5 \Delta EPS^{r/e}_{FY1a,i} + \varepsilon_i \quad (7)$$

$$\Delta\beta_{smb/hml,i} = \alpha_0 + \alpha_1 \Delta Size_{\Pr e1,i} + \alpha_2 \Delta Size_{Post,i} + \alpha_3 \Delta Turn_{\Pr e1,i} + \alpha_4 \Delta Turn_{Post,i} + \alpha_5 \Delta EPS^{e}_{FY1a(pre),i} + \alpha_6 \Delta EPS^{e}_{FY1a(post),i} + \varepsilon_i \quad (8)$$

The results of (7) and (8) are generally consistent with the univariate evidence (see columns XI to XVI). In some cases the significance of $\Delta Size_{Pre1}$ and earnings variables declines in the multivariate setting, reflecting the large positive correlation between these variables.

We conclude that the pre-inclusion change in market value and the change in EPS in the year of inclusion (correctly anticipated in analysts' pre-event EPS revisions) determine the decline of size and value betas around inclusion events. We note that the cross-sectional determinants of the value effect of index inclusion (Table V) and the changes in SMB and HML betas are similar. These results establish a robust link between the changes in value and comovement and the changes in firm characteristics around index inclusions.

4.2.2. The Momentum Betas

Table X presents cross-sectional analysis of changes in the momentum betas, $\Delta\beta_{umd}$.

[INSERT TABLE X HERE]

The estimates of the regression of $\Delta\beta_{umd}$ on the average daily returns in the two years before index inclusion, Ret_{Pre1} and Ret_{Pre2}, are shown in column I and indicate highly significant negative effects related to these variables. It is noteworthy that the intercept of this regression is positive (and significant for the daily betas). Noting that the unconditional $\Delta\beta_{umd}$ is negative (Table VI), the results indicate that the pre-inclusion momentum of the event stocks explains the post-inclusion decline of their momentum betas. This evidence may be interpreted as consistent with a long-run reversal in the relative performance of the event stocks in the period following their index inclusion.[29]

In column II, we regress $\Delta\beta_{umd}$ on Ret_{Post} and find a highly significant positive relation between these variables for both daily and weekly $\Delta\beta_{umd}$. This positive relation is intuitive: the stocks with superior post-inclusion performance experience smaller decline in their momentum betas. Note, however, that in contrast to the regression on the pre-event returns, the intercepts of the regression on Ret_{Post} remain highly significant negative. Further, univariate estimates indicate that in the cross section $\Delta\beta_{umd}$ tends to be associated negatively with the changes in turnover around inclusions (columns III and IV): there is a statistically significant negative relation of the daily $\Delta\beta_{umd}$ to $\Delta Turn_{Post}$ and of the weekly $\Delta\beta_{umd}$ to $\Delta Turn_{Pre}$. This negative relation is consistent with the evidence in Lee and Swaminathan (2000) that firms with higher (lower) turnover earn lower (higher) future returns. The intercepts of the regressions of $\Delta\beta_{umd}$ on the turnover variables, however, remain highly significant and negative, and their magnitude is similar to the unconditional $\Delta\beta_{umd}$ (see Table VI), which implies that changes in trading intensity are not the source of the post-inclusion decline in the momentum betas. The estimates of multivariate regressions, including both the return and turnover variables are reported in column V (for the full sample) and column VI (for the EPS sample). The evidence is qualitatively similar to the univariate results. Finally, columns VII-X of the table report the estimates of univariate regressions of $\Delta\beta_{umd}$ on the earnings variables. In contrast to the SMB and HML betas, the relation between momentum betas and earnings tends to be weak.

Next, we estimate the following multivariate regressions, including all the variables (see columns XI-XIII):

[29] DeBondt and Thaler (1985) document a negative autocorrelation in long-horizon returns of three to five years.

$$\Delta\beta_{umd,i} = \alpha_0 + \alpha_1 Ret_{Pre1,i} + \alpha_2 Ret_{Pre2,i} + \alpha_3 Ret_{Post,i} + \alpha_4 \Delta Turn_{Pre1,i} + \alpha_5 \Delta Turn_{Post,i} + \alpha_6 \Delta EPS^{r/e}_{FY1a,i} + \varepsilon_i \quad (9)$$

$$\Delta\beta_{umd,i} = \gamma_0 + \gamma_1 Ret_{Pre1,i} + \gamma_2 Ret_{Pre2,i} + \gamma_3 Ret_{Post,i} + \gamma_4 \Delta Turn_{Pre1,i} + \gamma_5 \Delta Turn_{Post,i} + \gamma_6 \Delta EPS^{e}_{FY1a(pre),i} + \gamma_7 \Delta EPS^{e}_{FY1a(post),i} + \varepsilon_i \quad (10)$$

As before, there is a strong negative relation of $\Delta\beta_{umd}$ to Ret_{Pre1} and Ret_{Pre2} and a positive relation to Ret_{Post}. With respect to the turnover variables, we find a negative and significant relation of both daily and weekly $\Delta\beta_{umd}$ to $\Delta Turn_{Pre1}$. There is also a marginally significant negative relation between the daily $\Delta\beta_{umd}$ and $\Delta Turn_{Post}$. In the multivariate setting, we also find a positive and significant relation of the weekly $\Delta\beta_{umd}$ to ΔEPS^{r}_{FY1a}, ΔEPS^{e}_{FY1a} and $\Delta EPS^{e}_{FY1a(pre)}$.

4.2.3. The CAPM and S&P 500 Betas

We have also analyzed the determinants of changes in the CAPM beta, $\Delta\beta_{mrk}$ (i.e. the change in beta in the one-factor model). The results are presented in Table 1A of the Internet Appendix to the paper.[30] There is compelling evidence that the pre-inclusion increase in size, $\Delta Size_{Pre1}$, drives the increase in the CAPM beta. The intercepts of both univariate and multivariate regressions of the daily and weekly $\Delta\beta_{mrk}$ on $\Delta Size_{Pre1}$ are indistinguishable from zero. This evidence explains the results in Tables VI that in the Fama and French (1993) model, controlling for the stocks' loadings on size and value factors, the change in market beta turns insignificant. The size effect underlies the post-inclusion increase in the CAPM beta. This is consistent with the evidence in the literature that firm size captures a significant part of the cross-sectional variation in the CAPM beta (Fama and French (1992) and Jegadeesh (1992), among others). Does the same hold for the univariate S&P 500 beta? The evidence for $\Delta\beta_{sp}$ in Table 2A of the Internet Appendix

[30] http://www.newyorkfed.org/research/economists/sarkar/INTERNET_APPENDIX.pdf.

is very similar to that for $\Delta\beta_{mrk}$ in Table 1A: $\Delta Size_{Pre1}$ predicts the change in the S&P 500 beta. Finally, given the evidence in Table VII that, in contrast to the daily $\Delta\beta_{mrk}$, the *daily* $\Delta\beta_{sp}$ remains significant in the 3- and 4-factor models, we have also carried out a cross-sectional analysis of the daily $\Delta\beta_{sp}$ from multi-factor models.[31] In contrast to $\Delta\beta_{sp}$ from the one-factor model, there is no significant association between the multi-factor daily $\Delta\beta_{sp}$ and $\Delta Size_{Pre1}$. As before, the size effect is controlled for by the Fama and French factors.

Summarizing the evidence of the cross-sectional analysis of factor loadings, we find that pre-inclusion changes in stock characteristics predict the changes in comovement around index inclusions:

(1) The declines in the SMB and HML betas are explained by the pre-inclusion increase in market size and improvements in realized and forecasted EPS in the year of index inclusion; the decomposition of changes in EPS forecasts on the pre-event and post-event changes indicates that the pre-event revision of forecasts contains the information that explains the relation between earnings and beta changes. (2) The decline in the momentum betas is determined by the average returns in the two years preceding index inclusion. (3) The increases in the CAPM and univariate S&P 500 betas are predicted by the pre-inclusion increase in market size. The intercepts of the regressions of changes in factor betas on the pre-event stock characteristics are statistically indistinguishable from zero for all daily and weekly betas, expect for the *daily* SMB betas.

4.3 Evolution of the Betas around Index Inclusions

We have documented significant differences between the pre-inclusion and post-inclusion levels of the betas of the index-included stocks. The cross-sectional evidence indicates that these

[31] These estimates are not tabulated but are available upon request.

differences are determined by the pre-inclusion changes in stock characteristics. In this section we examine the pattern in evolution of the factor betas around inclusion events.

[INSERT FIGURE 2 HERE]

Figure 2 plots the cross-sectional averages of the betas estimated in consecutive non-overlapping 120-day windows before and after the day of index inclusion announcement. The betas from the specifications with the CRSP value-weighted market return are presented in Panel A, and the betas from the specifications with the S&P 500 return are in Panel B. To maintain consistency with our post-inclusion estimation interval which ends about one and a half years after the month of inclusion announcement (section 4.1), the last post-inclusion window covers 240 to 360 days after the announcement day (denoted 240_360). Correspondingly, the first pre-inclusion window covers 360 to 240 days before the announcement day (denoted 360_240). The last pre-inclusion window is 120_0, and the first post-inclusion window is 0_120. The plots of the development of the market and S&P 500 betas include estimates from the 1-, 3- and 4-factor models. The plots for the SMB and HML betas show the estimates from the 3- and 4-factor models. The plots for the momentum betas are based on estimates from the 4-factor model. The plots on the left present the development of the daily betas and the plots on the right show the development of the weekly betas. To indicate statistical significance of changes in the betas in the consecutive estimation intervals, we mark the line connecting these intervals with a shaded circle in case of significance at the 5% and 1% levels, and with an unshaded circle in case of significance at the 10% level only. The corresponding estimates are available in Table 3.A of the Internet Appendix to the paper.[32]

[32] http://www.newyorkfed.org/research/economists/sarkar/INTERNET_APPENDIX.pdf.

The evidence in Figure 2 indicates that the rise in the CAPM beta (first row of Panel A) and the univariate S&P 500 beta (first row of Panel B) begins in the pre-inclusion period. In particular, our estimates show a statistically significant average change in the daily (weekly) CAPM beta by 0.056 (0.072) with t = 2.138 (t = 1.724) from the 240_120 to 120_0 pre-inclusion interval. The corresponding increase in the univariate daily (weekly) S&P 500 beta is 0.066 (0.100) with t = 2.510 (t = 2.291). From the last pre-inclusion interval to the first post-inclusion interval (from 120_0 to 0_120), the changes in the daily and weekly CAPM beta and in the weekly S&P 500 beta are insignificant, indicating no abrupt changes in the CAPM beta or weekly S&P 500 beta coincident with membership in the index. In contrast, the changes in the daily S&P 500 beta in the first two post-inclusion intervals are statistically significant. Turning to the estimates from the 3-factor model, there are no significant changes in the daily and weekly CRSP market and S&P 500 betas in the consecutive intervals surrounding index inclusion. This implies that the documented changes in the univariate market and S&P 500 betas across these intervals are accounted for by the changes in the stocks' loadings on the size and value factors. This is consistent with our cross-sectional evidence in section 4.2 that the size effect drives the change in the CAPM and S&P 500 betas around index inclusions. The evidence for the market and S&P 500 betas from the 4-factor model is qualitatively similar to that from the 3-factor model.

Next, we analyze the changes in the size and value betas (second and third rows of Panels A and B of Figure 2). We observe that in the 3-factor model the daily and weekly SMB and HML betas tend to decline both before and after index inclusion. In case of the weekly betas this decline is almost monotonic across the considered consecutive estimation intervals around inclusions. In particular, our results indicate that the changes in the weekly betas are negative but insignificant[33]

[33] The decline in the weekly SMB beta is significant at the 10% level in the pre-inclusion period from 360_240 to 240_120. See Table 3.A in the Internet Appendix for details.

in all consecutive intervals consistent with a *gradual decline* in the weekly betas, which is reflected in a significant decline from the pre-inclusion to the post-inclusion level (documented in Panel B of Table VI). The decline in the daily SMB and HML betas is somewhat less gradual. In particular, for both the SMB and HML betas we observe significant decreases in the first post-inclusion interval (from 120_0 to 0_120), and for the SMB betas there is also a significant decline in the pre-inclusion period (from 360_240 to 240_120).

Finally, the estimates from the 4-factor model indicate a steady decline in the momentum betas across the consecutive estimation intervals starting around the inclusion event and continuing until the end of the post-inclusion period (last row of Panels A and B of Figure 2). This pattern is consistent with our evidence in Panel B of Table II that the magnitude of the pre-inclusion average daily returns (reflecting pre-inclusion price momentum) drops significantly in the months immediately following inclusion. Our further (unreported) estimates indicate that the performance of the event stocks tends to be relatively flat following the initial post-inclusion period.[34]

Reviewing the evidence in this section, the following results stand out: The CAPM and the univariate S&P 500 betas exhibit stronger increases in the period immediately prior to index inclusion as compared to the period immediately after inclusion. In the multi-factor specifications there is a steady decline in the weekly SMB betas as well as the daily and weekly momentum betas around index inclusions. Finally, there is a relatively abrupt decline in the *daily* SMB beta in the period immediately following inclusion, which may indicate that this decline is related to membership in the index.[35] The latter conjecture is supported by the cross-sectional evidence in

[34] The average daily returns tend to be negative, but very small in magnitude.

[35] Note, however, that there is also a significant decline in the daily SMB beta in the pre-inclusion period, from 360_240 to 240_120 (i.e. in the period without a specific event which may cause a change in comovement). It is noteworthy that while the decline in the daily SMB beta from 360_240 to 240_120 coincides with a significant and

section 4.2 that part of the decline in the daily SMB beta (in contrast to all other daily and weekly factor betas) is not attributed to the pre-inclusion changes in characteristics of the event stocks.

5. Is There an Index Effect?

The cross-sectional evidence in this paper shows that the same *pre-inclusion* information – increase in market value, price momentum and improvement in earnings expectations – determines both the change in comovement and the permanent value effect of index inclusion. This evidence raises the possibility that these phenomena – interpreted in the literature as a *consequence* of index inclusion – are simply *coincident* with inclusion events. In other words, it is possible that the inclusion event *per se* has no independent effect on the value and comovement of the event firms. The matched sample analysis in this section addresses this issue.

In the choice of the matching variables we make use of the aforementioned evidence on the determinants of the value effect and the changes in comovement around inclusion events. Our preliminary analysis indicated that simultaneous matching on multiple control variables results in imprecise matching. We therefore choose a strategy of matching on changes in size and realized earnings, $\Delta Size_{Pre1}$ and ΔEPS^{r}_{FY1a}, as the main control variables, and, then, in the next step, controlling for differences in other relevant variables in the difference-in-difference regressions.[36] For each event stock in our sample with available EPS data we match a control stock based on the following criteria: The control stock

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similar in magnitude decline in the weekly SMB beta, the decline in the daily SMB beta from 120_0 to 0_120 does not.

[36] We have verified that matching on changes in the expected earnings, ΔEPS^{e}_{FY1a}, rather than in the realized earnings, ΔEPS^{r}_{FY1a}, leads to similar conclusions from the matched sample analysis. The results in the previous sections have indicated that the pre-inclusion revision in earnings forecasts, $\Delta EPS^{e}_{FY1a(pre)}$, contains the information that determines the relation of ΔEPS^{r}_{FY1a} and ΔEPS^{e}_{FY1a} to both the value effect and the changes in betas. In our difference-in-difference regressions we explicitly control for the pre-inclusion and post-inclusion differences of the changes in earnings forecasts of the event and control stocks.

(i) is not added to the S&P 500 index over the period of [-15, +15] months with respect to the month of addition announcement of the event stock,

(ii) is traded on the same exchange as the event stock,[37]

(iii) is in the same size decile as the event stock in the pre-announcement month,

(iv) has EPS forecast data available from *I/B/E/S* for both the fiscal years with year-end before (FY1b) and after (FY1a) the inclusion event,

(v) has pre-event change in size, $\Delta Size_{Pre1}$, of similar magnitude as the event stock,

(vi) has change in realized EPS in the year of inclusion, ΔEPS^{r}_{FY1a}, of similar magnitude as the event stock.

To implement the matching, we identify, for each event stock, a control sample of stocks that satisfy the criteria (i) - (iv). We then calculate the Euclidean distance *D* of the event stock with respect to all stocks in its control sample as follows

$$D = \sqrt{\left(\Delta Size_{pre1} - \Delta Size^{C}_{pre1}\right)^2 + \left(\Delta EPS^{r}_{FY1a} - \Delta EPS^{r,C}_{FY1a}\right)^2}. \tag{11}$$

We choose the stock with the minimum value of *D* as the control stock.

5.1. Difference-in-difference Analysis of Abnormal Returns

[INSERT TABLE XI HERE]

Table XI presents the difference-in-difference analysis of abnormal returns. The first three columns of the table analyze *ΔCAR40*, the difference between *CAR40* of the event stocks and *CAR40* of the control stocks. We present estimates of alternative specifications, where *ΔCAR40* is regressed on the difference between the changes in size of the event and control stocks

[37] We match event stocks traded on NYSE/AMEX to control stocks on NYSE/AMEX. Similarly, event stocks traded on Nasdaq are matched to control stocks on Nasdaq.

in the pre-inclusion year, $\Delta\Delta Size_{Pre1}$, the difference in the average returns in the pre- inclusion year, ΔRet_{Pre1}, the difference in the average returns in the second year before inclusion, ΔRet_{Pre2}, the difference in the changes of the realized earnings in the year of inclusion, $\Delta\Delta EPS^{r}_{FY1a}$, and the differences in the pre-event and post-event changes in earnings forecasts, $\Delta\Delta EPS^{e}_{FY1a(pre)}$ and $\Delta\Delta EPS^{e}_{FY1a(post)}$.

If index inclusion causes a permanent increase in the stocks' market value, we expect the intercepts of the difference-in-difference regressions to be positive and significant. In fact, the estimated regression intercepts are negative but insignificant at the conventional levels. This implies that the average cumulative abnormal return of *non-event* control firms is at least as large 40 days after index inclusion as that of the event firms. The matched sample analysis therefore indicates that conclusions of the prior literature about the existence of a permanent value effect of S&P 500 index inclusion are due to the lack of controls for the characteristics of the index-included firms.

The evidence in section 3 has shown that, in contrast to *CAR40*, the initial post-inclusion increases in value, *AR_AND* and *CAR_EFD*, are not driven by the pre-event characteristics of the event firms. Consistent with this evidence, the results in Table XI indicate that the intercepts of the difference-in-difference regressions are highly significant and positive when, instead of *ΔCAR40*, the dependant variable is either *ΔAR_AND* (the difference between *AR_AND* of the event and control stocks) or *ΔCAR_EFD* (the difference between *CAR_EFD* of the event and control stocks).

Finally, since our sample period 1989-2009 covers the recent period not included in earlier studies of the value effect of index addition, we have repeated the analysis in Table XII only for the first half of our sample period, 1989-2000. These estimates are presented in Table 4A of the Internet Appendix to the paper.[38] The evidence is similar to that for the full sample in Table XI, indicating that our results are not driven by effects specific to the recent period.

In summary, the results indicate the existence of temporary but no permanent value effect of S&P 500 index inclusion, consistent with the conclusions in Harris and Gurel (1986). Our analysis reveals that the increase in value of the event firms during the first months following index inclusion is a continuation of their strong performance preceding inclusion. This increase in value is independent of membership in the index.

5.2 Difference-in-difference Analysis of Factor Betas

[INSERT XII HERE]

Table XII presents the difference-in-difference regression analysis of the daily (Panel A) and weekly (Panel B) factor betas from the Carhart (1997) 4-factor model. As before, we consider the changes in betas in the two specifications with the CRSP market return and the S&P 500 return. The differences of the changes in betas of the event and control stocks are regressed on the same set of the variables used in the difference-in-difference regressions for the value effect, including $\Delta\Delta Size_{Pre1}$ (in case of the market, size and value betas), ΔRet_{Pre1} (in case of the momentum betas), ΔRet_{Pre2}, $\Delta\Delta EPS^{r}_{FY1a}$, $\Delta\Delta EPS^{e}_{FY1a(pre)}$ and $\Delta\Delta EPS^{e}_{FY1a(post)}$.[39]

If the changes in betas are coincident (but independent) of index membership, we expect the intercepts of the difference-in-difference regressions to be insignificant. Indeed, the evidence in Panel B of Table XII indicates that the intercepts of the regressions for all weekly betas are not statistically different from zero. The same holds for the daily betas, expect for the significant

[38] http://www.newyorkfed.org/research/economists/sarkar/INTERNET_APPENDIX.pdf.

[39] As before, the specifications based on either *ΔSize* or *Ret* variables result in qualitatively similar estimates for all the betas.

negative intercepts for the daily SMB betas. We also find a marginally significant positive intercept for the daily S&P 500 betas in one of the two estimated specifications. The evidence that the event stocks experience stronger post-inclusion decline in the *daily* SMB betas as compared to the matched non-event stocks is in line with a) the cross-sectional evidence in section 4.2, which indicates that part of the decline in the daily SMB beta cannot be attributed to the pre-inclusion increases in size and earnings expectations of the event stocks, and b) the evidence of the relatively abrupt post-inclusion decline in the daily SMB betas in section 4.3. Hence, the evidence indicates that index inclusion tends to contribute to an increase in *synchronicity* of comovement of the index-included stocks with the larger stocks in the market, as reflected in decline of the *daily* SMB betas. This is a high-frequency effect consistent with transitory price pressures of index trading. At the lower weekly frequency, index membership has *no* independent effect on comovement. The change in comovement at the lower frequency is the consequence of the substantial pre-inclusion increase in market size, price momentum and improvement in fundamentals of the event firms.

6. Conclusions

This paper demonstrates that the S&P 500 index inclusion has no permanent effect on market value and return comovement of the index-included firms. Our results are in contrast to the consensus in the large index literature. The differences of the conclusions in the prior literature from those in the present study are explained by the lack of controls in the literature for the strong pre-event performance of the index-included firms. We find that this pre-event performance predicts both the permanent value effect and the change in comovement, which had previously been attributed to membership in the S&P 500 index. Non-event firms with similar performance experience similar changes in value and comovement coincident with the event firms.

In particular, our results indicate that the positive cumulative return in the first months following inclusion is predictable on the basis of (a) the pre-inclusion return of the event stocks and (b) the pre-inclusion revision of analysts' earnings forecasts for the fiscal year of index inclusion, consistent with the well-known phenomena of price and earnings momentum in stock returns (Jegadeesh and Titman (1993), Chan, Jegadeesh and Lakonishok (1996)). The pre-inclusion performance also determines the change in comovement around inclusions. This performance drives both (i) the increase in CAPM beta and (ii) the declines in size, value and momentum betas in the multi-factor models in which there is no significant change in market beta. Specifically, the strong pre-inclusion increase in market size underlies the increase in market beta in the one-factor (CAPM) model, which is consistent with the evidence in the literature that firm size captures a significant part of the cross-sectional variation in the CAPM beta (Fama and French (1992), Jegadeesh (1992)). The declines in size and value betas are determined by the increase in size and the improvement in earnings expectations preceding inclusions (Fama and French (1993, 1995)). The post-inclusion decline in momentum beta is predictable based on the returns in the two years preceding inclusions. This decline reflects the well-known phenomenon of long-term reversal in the cross section of stock returns (DeBondt and Thaler (1985)).

The conclusions of our study emphasize the importance of careful controls for stock characteristics in the event study context.

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Table I
Definition of the Variables

$\Delta Size_{Pre2}$	Change in log size between the months [-24] and [-13] with respect to the month of announcement (month=0).
$\Delta Size_{Pre1}$	Change in log size between month [-12] and the pre-announcement day.
$\Delta Size_{Post}$	Change in log size between the pre-announcement day and month [+6].
$\Delta Size_{Pre2,adj}$, $\Delta Size_{Pre1,adj}$, $\Delta Size_{Post,adj}$	The same as $\Delta Size_{Pre2}$, $\Delta Size_{Pre1}$, $\Delta Size_{Post}$, respectively, but measured using market-adjusted size (equal to firm size divided by the average size of all NYSE, AMEX and NASDAQ common stocks).
Ret_{Pre2}	Average daily return between the months [-24] and [-13].
Ret_{Pre1}	Average daily return in the period between month [-12] and the pre-announcement day.
Ret_{Post}	Average daily return in the period between the pre-announcement day and month [+6].
$Ret_{Pre2,adj}$, $Ret_{Pre1,adj}$, $Ret_{Post,adj}$	The same as Ret_{Pre2}, Ret_{Pre1}, Ret_{Post}, respectively, but measured using market-adjusted returns (equal to stock return divided by the average return of all NYSE, AMEX and NASDAQ common stocks).
$\Delta Turn_{Pre2}$	Change in log turnover between the months [-24] and [-13].
$\Delta Turn_{Pre1}$	Change in log turnover between month [-12] and the pre-announcement month.
$\Delta Turn_{Post}$	Change in log turnover between the pre-announcement month and month [+6].
$\Delta Turn_{Pre2,adj}$ $\Delta Turn_{Pre1,adj}$ $\Delta Turn_{Post,adj}$	The same as $\Delta Turn_{Pre2}$, $\Delta Turn_{Pre1}$, $\Delta Turn_{Post}$, respectively, but for the NYSE/AMEX event stocks measured using stock turnover divided by average turnover of all NYSE and AMEX common stocks, and for the NASDAQ event stocks measured using stock turnover divided by average turnover of all NASDAQ common stocks. We employ separate procedures for NYSE/AMEX and NASDAQ stocks in order to account for the double-counting of dealer trades in the reported volume on NASDAQ.

$\Delta EPS^{e/r}_{FY1b}$ $\Delta EPS^{e/r}_{FY1a}$ $\Delta EPS^{e/r}_{FY2a}$	Changes in forecasted (e) and realized (r) log earnings per share (EPS): $\Delta EPS^{e/r}_{FY1b} = \ln(EPS^{e/r}_{FY1b}) - \ln(EPS^{e/r}_{FY2b})$, $\Delta EPS^{e/r}_{FY1a} = \ln(EPS^{e/r}_{FY1a}) - \ln(EPS^{e/r}_{FY1b})$, $\Delta EPS^{e/r}_{FY2a} = \ln(EPS^{e/r}_{FY2a}) - \ln(EPS^{e/r}_{FY1a})$, where FY1b denotes the fiscal year with year-end before and FY1a the fiscal year with year-end after index inclusion announcements. FY2b denotes the fiscal year preceding FY1b, and FY2a denotes the fiscal year following FY1a.
$\Delta EPS^{e}_{FY1a(pre)}$ $\Delta EPS^{e}_{FY1a(post)}$	$\Delta EPS^{e}_{FY1a(pre)} = \ln(EPS^{e}_{FY1a\_pre}) - \ln(EPS^{e}_{FY1b})$, $\Delta EPS^{e}_{FY1a(post)} = \Delta EPS^{e}_{FY1a} - \Delta EPS^{e}_{FY1a\_pre}$, where $EPS^{e}_{FY1a(pre)}$ denotes the mean of analyst forecasts for the fiscal year FY1a made in the period prior to inclusion announcement.
$\Delta\beta_j$	(*j=mrk/sp/smb/hml/umd*) Changes in factor betas are defined in Tables VI and VII.
AR_AND	The abnormal return (AR) from the day of inclusion announcement to the post-announcement day. AR is measured as the difference between the stock return and the return on the CRSP value-weighted market return.
CAR_EFD	The cumulative abnormal return (CAR) from the day of inclusion announcement to the day following effective inclusion.
CAR40	The CAR from the day of inclusion announcement to 40 days after effective inclusion.

Table II
Market Size, Average Returns and Share Turnover

This table reports cross-sectional mean and median changes in market size (Panel A), average daily returns (Panel B) and changes in share turnover (Panel C) in the period surrounding index inclusions. The variables are defined in Table I. The figures in parentheses indicate the t-test statistics and Wilcoxon signed ranks test statistics for the mean and median differences, respectively, to be equal to zero. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

Panel A. Market size

	$\Delta Size_{Pre2}$	$\Delta Size_{Pre1}$	$\Delta Size_{Post}$	$\Delta Size_{Pre2,adj}$	$\Delta Size_{Pre1,adj}$	$\Delta Size_{Post,adj}$
Mean	**0.378**	**0.308**	**0.046**	**0.301**	**0.256**	0.011
(t-stat)	**(16.054)**	**(12.476)**	**(2.299)**	**(13.771)**	**(11.637)**	(0.620)
Median	**0.335**	**0.262**	**0.053**	**0.274**	**0.231**	0.017
(WSR-stat)	**(13.995)**	**(12.024)**	**(3.706)**	**(12.331)**	**(11.242)**	(1.276)

Panel B. Average returns (%)

	Ret_{Pre2}	Ret_{Pre1}	Ret_{Post}	$Ret_{Pre2,adj}$	$Ret_{Pre1,adj}$	$Ret_{Post,adj}$
Mean	**0.169**	**0.153**	**0.056**	**0.112**	**0.123**	**0.031**
(t-stat)	**(17.555)**	**(16.303)**	**(4.358)**	**(11.536)**	**(14.122)**	**(2.690)**
Median	**0.145**	**0.121**	**0.060**	**0.082**	**0.105**	**0.039**
(WSR-stat)	**(15.122)**	**(14.312)**	**(5.508)**	**(11.755)**	**(12.984)**	**(3.358)**

Panel C. Share turnover

	$\Delta Turn_{Pre2}$	$\Delta Turn_{Pre1}$	$\Delta Turn_{Post}$	$\Delta Turn_{Pre2,adj}$	$\Delta Turn_{Pre1,adj}$	$\Delta Turn_{Post,adj}$
Mean	**0.103**	**0.145**	**0.065**	**0.072**	**0.119**	0.030
(t-stat)	**(3.851)**	**(5.367)**	**(2.766)**	**(3.054)**	**(4.142)**	(1.249)
Median	**0.086**	**0.112**	**0.078**	**0.065**	**0.092**	**0.057**
(WSR-stat)	**(3.594)**	**(5.129)**	**(2.996)**	**(3.001)**	**(3.909)**	**(1.711)**

Table III
Forecasted and Realized Earnings per Share

This table reports cross-sectional mean and median changes in forecasted and realized earnings per share, ΔEPS^e and ΔEPS^r, in the period surrounding index inclusions. The variables are defined in Table I. The figures in parentheses indicate t-statistics and Wilcoxon signed ranks test statistics for the mean and median differences, respectively, to be equal to zero. The estimates are reported for the restricted sample of stocks for which earnings data are available from the *I/B/E/S* detailed history file for the fiscal years before (FY1b) and after (FY1a) index inclusions. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

Panel A. Forecasted EPS

	ΔEPS^e_{FY1b}	ΔEPS^e_{FY1a}	$\Delta EPS^e_{FY1a(pre)}$	ΔEPS^e_{FY2a}
Mean	**0.303**	**0.238**	**0.228**	**0.074**
(t-stat)	**(9.500)**	**(11.567)**	**(10.223)**	**(3.691)**
Median	**0.234**	**0.200**	**0.172**	**0.117**
(WSR-stat)	**(13.118)**	**(12.993)**	**(11.793)**	**(6.443)**

Panel B. Realized EPS

	ΔEPS^r_{FY1b}	ΔEPS^r_{FY1a}	ΔEPS^r_{FY2a}
Mean	**0.338**	**0.230**	-0.005
(t-stat)	**(11.166)**	**(9.999)**	(-0.175)
Median	**0.230**	**0.190**	**0.086**
(WSR-stat)	**(13.149)**	**(11.923)**	**(3.418)**

Table IV
The Value Effects of S&P 500 Index Inclusions

This table presents abnormal returns associated with the S&P 500 index inclusions. The variables are defined in Table I. The estimates are reported for the full sample of index inclusions and for the restricted sample of inclusions with EPS data available from the *I/B/E/S* database. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

	Full sample			Sample with EPS data		
	AR_AND	*CAR_EFD*	*CAR40*	*AR_AND*	*CAR_EFD*	*CAR40*
Mean	**4.336**	**6.012**	**3.343**	**4.387**	**5.724**	**2.900**
(t-stat)	**(16.029)**	**(12.434)**	**(3.804)**	**(15.018)**	**(10.407)**	**(2.955)**
Median	**3.571**	**4.936**	**3.751**	**3.762**	**4.934**	**3.141**
(WSR-stat)	**(14.077)**	**(12.792)**	**(4.804)**	**(12.884)**	**(10.996)**	**(3.638)**
% positive	85%	83%	63%	85%	82%	62%

Table V
The Value Effect and Changes in Characteristics

This table presents cross-sectional analysis of the abnormal returns associated with the S&P 500 index inclusions. The dependent variables are *CAR40, AR_AND* and *CAR_EFD*. All variables are defined in Table I. The estimates are reported for the restricted sample of inclusions with earnings data available from the *I/B/E/S* database. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

	CAR40										*CAR_AND*	*CAR_EFD*
	I	II	III	IV	V	VI	VII	VIII	IX	X		
Intercept	0.81	-0.25	-0.73	**3.35**	0.72	0.50	0.88	**2.91**	-0.83	-0.75	**4.13**	**4.63**
t-stat	(0.70)	(-0.20)	(-0.49)	**(3.17)**	(0.65)	(0.43)	(0.79)	**(2.95)**	(-0.53)	(-0.48)	**(8.75)**	**(5.19)**
$\Delta Size_{Pre1}$	**6.93**											
t-stat	**(3.34)**											
Ret_{Pre1}		**21.27**	**20.76**						**14.03**	**13.66**	0.41	-2.90
t-stat		**(3.90)**	**(3.75)**						**(2.30)**	**(2.17)**	0.21	-0.80
Ret_{Pre2}			3.07						2.97	2.22	1.88	**6.97**
t-stat			(0.56)						(0.55)	(0.41)	1.13	**(2.22)**
$\Delta Turn_{Pre1}$				-2.51					-2.36	-2.48	**1.25**	-0.81
t-stat				(-1.20)					(-1.15)	(-1.21)	**(1.80)**	-0.69
$\Delta Turn_{Post}$				-1.58					-2.30	-2.43	**1.28**	0.02
t-stat				(-0.68)					(-1.02)	(-1.08)	**(1.87)**	0.02
ΔEPS^{r}_{FY1a}					**9.40**				**6.86**			
t-stat					**(4.03)**				**(2.68)**			
ΔEPS^{e}_{FY1a}						**10.07**						
t-stat						**(3.88)**						
$\Delta EPS^{e}_{FY1a(pre)}$							**8.88**			**7.38**	**-1.63**	1.89
t-stat							**(3.68)**			**(2.45)**	**(-1.78)**	(1.09)
$\Delta EPS^{e}_{FY1a(post)}$								-0.65		4.07	-1.16	1.72
t-stat								(-0.15)		(0.88)	(-0.82)	(0.65)
R^2	3.4%	4.5%	4.6%	0.5%	4.8%	4.5%	4.0%	0.0%	7.2%	6.9%	2.8%	2.2%

Table VI
Changes in Factor Betas:
Specifications with the CRSP Value-weighted Market Return

For each event stock i in the sample we estimate the CAPM model

$$R^e_{i,t} = \alpha_i + \beta_{mrk,i} R^e_{mrk,t} + \varepsilon_{i,t},$$

the Fama and French (1993) 3-factor model

$$R^e_{i,t} = \alpha_i + \beta_{mrk,i} RM^e_t + \beta_{smb,i} SMB_t + \beta_{hml,i} HML_t + \varepsilon_{i,t},$$

and the Carhart (1997) 4-factor model

$$R^e_{i,t} = \alpha_i + \beta_{mrk,i} RM^e_t + \beta_{smb,i} SMB_t + \beta_{hml,i} HML_t + \beta_{umd,i} UMD_t + \varepsilon_{i,t},$$

in the pre-event and post-event intervals, defined as [-12, -1] and [+4, +15] months with respect to the month of inclusion announcement. $R^e_{i,t}$ and RM^e_t denote event stock i returns and CRSP value-weighted market returns in excess of the risk-free rate; SMB_t denotes returns on small minus big market capitalization stocks; HML_t denotes returns on high minus low book-to-market ratio stocks, and UMD_t denotes returns on winner minus loser stocks. We report the cross-sectional mean and median differences of the betas estimated over the post- and pre-event intervals. The figures in parentheses indicate the t-test statistics and Wilcoxon signed ranks test statistics for the mean and median differences, respectively, to be equal to zero. The models are estimated using daily (Panel A) and weekly (Panel B) data. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

Panel A. Daily betas

	CAPM	3-Factor Model			4-Factor Model			
	$\Delta\beta_{mrk}$	$\Delta\beta_{mrk}$	$\Delta\beta_{smb}$	$\Delta\beta_{hml}$	$\Delta\beta_{mrk}$	$\Delta\beta_{smb}$	$\Delta\beta_{hml}$	$\Delta\beta_{umd}$
Mean	**0.116**	0.021	**-0.256**	**-0.153**	0.028	**-0.222**	**-0.109**	**-0.313**
(t-stat)	**(4.912)**	(0.760)	**(-7.737)**	**(-2.862)**	(1.314)	**(-6.855)**	**(-2.185)**	**(-6.689)**
Median	**0.128**	0.030	**-0.233**	**-0.140**	0.032	**-0.180**	**-0.073**	**-0.198**
(WSR-stat)	**(5.247)**	(1.275)	**(-7.999)**	**(-2.889)**	(1.585)	**(-7.083)**	**(-1.818)**	**(-5.985)**

Panel B. Weekly betas

	CAPM	3-Factor Model			4-Factor Model			
	$\Delta\beta_{mrk}$	$\Delta\beta_{mrk}$	$\Delta\beta_{smb}$	$\Delta\beta_{hml}$	$\Delta\beta_{mrk}$	$\Delta\beta_{smb}$	$\Delta\beta_{hml}$	$\Delta\beta_{umd}$
Mean	**0.088**	0.015	**-0.224**	**-0.204**	0.040	**-0.215**	**-0.157**	**-0.300**
(t-stat)	**(2.767)**	(0.341)	**(-3.929)**	**(-2.529)**	(1.006)	**(-3.530)**	**(-1.918)**	**(-5.093)**
Median	**0.065**	0.037	**-0.190**	**-0.150**	0.042	**-0.191**	**-0.097**	**-0.157**
(WSR-stat)	**(2.663)**	(0.666)	**(-3.899)**	**(-2.434)**	(1.435)	**(-3.241)**	**(-1.740)**	**(-4.933)**

Table VII
Changes in Factor Betas:
Specifications with the S&P 500 Index Return

For each event stock i in the sample we estimate the single-factor model

$$R_{i,t} = \alpha_i + \beta_{sp,i} R_{sp,t} + \varepsilon_{i,t},$$

the Fama and French (1993) 3-factor model

$$R_{i,t} = \alpha_i + \beta_{sp,i} R_{sp,t} + \beta_{smb,i} SMB_t + \beta_{hml,i} HML_t + \varepsilon_{i,t},$$

and the Carhart (1997) 4-factor model

$$R_{i,t} = \alpha_i + \beta_{sp,i} R_{sp,t} + \beta_{smb,i} SMB_t + \beta_{hml,i} HML_t + \beta_{umd,i} UMD_t + \varepsilon_{i,t},$$

in the pre-event and post-event intervals, defined as [-12, -1] and [+4, +15] months with respect to the month of inclusion announcement. $R_{i,t}$ and $R_{sp,t}$ denote event stock *i* returns and S&P 500 index returns; SMB_t denotes returns on small minus big market capitalization stocks; HML_t denotes returns on high minus low book-to-market ratio stocks, and UMD_t denotes returns on winner minus loser stocks. We report the cross-sectional mean and median differences of the betas estimated over the post- and pre-event intervals. The figures in parentheses indicate the t-test statistics and Wilcoxon signed ranks test statistics for the mean and median differences, respectively, to be equal to zero. The models are estimated using daily (Panel A) and weekly (Panel B) data. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

Panel A. Daily betas

	1-Factor Model	3-Factor Model			4-Factor Model			
	$\Delta\beta_{sp}$	$\Delta\beta_{sp}$	$\Delta\beta_{smb}$	$\Delta\beta_{hml}$	$\Delta\beta_{sp}$	$\Delta\beta_{smb}$	$\Delta\beta_{hml}$	$\Delta\beta_{umd}$
Mean	**0.173**	**0.078**	**-0.249**	**-0.093**	**0.090**	**-0.201**	-0.053	**-0.344**
(t-stat)	**(7.138)**	**(2.774)**	**(-6.794)**	**(-1.694)**	**(3.590)**	**(-5.709)**	(-0.999)	**(-7.137)**
Median	**0.172**	**0.082**	**-0.223**	-0.069	**0.113**	**-0.157**	-0.040	**-0.217**
(WSR-stat)	**(7.538)**	**(3.528)**	**(-7.144)**	(-1.479)	**(4.714)**	**(5.978)**	(-0.515)	**(-6.704)**

Panel B. Weekly betas

	1-Factor Model	3-Factor Model			4-Factor Model			
	$\Delta\beta_{sp}$	$\Delta\beta_{sp}$	$\Delta\beta_{smb}$	$\Delta\beta_{hml}$	$\Delta\beta_{sp}$	$\Delta\beta_{smb}$	$\Delta\beta_{hml}$	$\Delta\beta_{umd}$
Mean	**0.126**	0.022	**-0.300**	-0.072	0.022	**-0.245**	-0.062	**-0.431**
(t-stat)	**(3.913)**	(0.659)	**(-4.711)**	(-0.934)	(0.658)	**(-3.710)**	(-0.783)	**(-6.201)**
Median	**0.098**	0.037	**-0.222**	-0.064	0.024	**-0.244**	-0.087	**-0.203**
(WSR-stat)	**(4.255)**	(1.145)	**(4.812)**	(-1.268)	(1.081)	**(3.725)**	(-1.067)	**(-5.236)**

Table VIII
Cross-sectional Analysis of Changes in the SMB Betas

This table presents cross-sectional analysis of changes in the daily and weekly SMB betas around index inclusion events, $\Delta\beta_{smb}$. Changes in the betas are defined in Table III. All other variables are defined in Table I. The estimates are reported for the full sample of index inclusions and for the restricted sample of inclusions with earnings data available from the *I/B/E/S* database. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

Panel A. Daily betas

	Full sample					Sample with EPS data										
						3-factor model								4-factor model		
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
Intercept	**-0.16**	**-0.25**	**-0.26**	**-0.25**	**-0.16**	**-0.17**	**-0.19**	**-0.17**	**-0.19**	**-0.25**	**-0.15**	**-0.14**	**-0.14**	**-0.13**	**-0.13**	**-0.13**
t-stat	**(-4.30)**	**(-7.44)**	**(-7.69)**	**(-7.61)**	**(-3.97)**	**(-3.69)**	**(-4.49)**	**(-3.90)**	**(-4.61)**	**(-6.89)**	**(-3.21)**	**(-2.92)**	**(-2.92)**	**(-2.87)**	**(-2.74)**	**(-2.74)**
$\Delta Size_{Pre1}$	**-0.28**				**-0.27**	**-0.24**					**-0.18**	-0.14	-0.14	**-0.16**	**-0.15**	**-0.15**
t-stat	**(-4.24)**				**(-4.18)**	**(-3.12)**					**(-2.07)**	(-1.54)	(-1.56)	**(-1.94)**	**(-1.71)**	**(-1.70)**
$\Delta Size_{Post}$		**-0.22**			**-0.25**	**-0.27**					**-0.24**	**-0.27**	**-0.27**	-0.12	-0.14	-0.14
t-stat		**(-2.75)**			**(-3.02)**	**(-2.67)**					**(-2.35)**	**(-2.68)**	**(-2.70)**	(-1.23)	(-1.46)	(-1.41)
$\Delta Turn_{Pre1}$			0.09		0.07	0.05					0.06	0.07	0.07	0.02	0.02	0.02
t-stat			(1.48)		(1.00)	(0.67)					(0.80)	(0.89)	(0.85)	(0.26)	(0.28)	(0.29)
$\Delta Turn_{Post}$				-0.02	-0.03	-0.04					-0.03	-0.03	-0.03	0.04	0.03	0.03
t-stat				(-0.36)	(-0.41)	(-0.47)					(-0.35)	(-0.39)	(-0.40)	(0.41)	(0.37)	(0.38)
ΔEPS^{r}_{FY1a}							**-0.30**				**-0.19**			-0.12		
t-stat							**(-3.40)**				**(-1.95)**			(-1.28)		
ΔEPS^{e}_{FY1a}								**-0.37**				**-0.28**			-0.15	
t-stat								**(-3.78)**				**(-2.58)**			(-1.39)	
$\Delta EPS^{e}_{FY1a(pre)}$									**-0.27**				**-0.27**			-0.15
t-stat									**(-3.01)**				**(-2.45)**			(-1.38)
$\Delta EPS^{e}_{FY1a(post)}$										-0.12			**-0.33**			-0.13
t-stat										(-0.79)			**(-1.93)**			(-0.79)
R^2	4.3%	1.8%	0.5%	0.0%	6.8%	5.7%	3.5%	4.3%	2.7%	0.2%	6.8%	7.6%	7.7%	3.6%	3.7%	3.7%

Panel B. Weekly betas

	Full sample					Sample with EPS data										
						3-factor model								4-factor model		
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
Intercept	0.00	**-0.22**	**-0.23**	**-0.22**	0.02	0.00	-0.08	-0.08	-0.08	**-0.25**	0.05	0.04	0.04	0.08	0.06	0.07
t-stat	(0.05)	**(-3.88)**	**(-3.81)**	**(-3.75)**	(0.26)	(0.03)	(-1.05)	(-0.72)	(-1.10)	**(-3.87)**	(0.67)	(0.51)	(0.53)	(0.92)	(0.76)	(0.78)
$\Delta Size_{Pre1}$	**-0.71**				**-0.70**	**-0.75**					**-0.57**	**-0.62**	**-0.60**	**-0.57**	**-0.62**	**-0.60**
t-stat	**(-6.40)**				**(-6.30)**	**(-5.55)**					**(-3.89)**	**(-4.03)**	**(-3.94)**	**(-3.77)**	**(-3.91)**	**(-3.81)**
$\Delta Size_{Post}$		-0.02			-0.06	0.09					0.17	0.09	0.13	0.24	0.17	0.21
t-stat		(-0.13)			(-0.45)	(0.49)					(0.96)	(0.50)	(0.72)	(1.31)	(0.94)	(1.15)
$\Delta Turn_{Pre1}$			0.08		-0.03	-0.12					-0.09	-0.10	-0.08	-0.18	-0.19	-0.17
t-stat			(0.73)		(-0.28)	(-0.90)					(-0.71)	(-0.75)	(-0.58)	(-1.33)	(-1.38)	(-1.21)
$\Delta Turn_{Post}$				-0.13	-0.13	-0.12					-0.09	-0.11	-0.10	-0.06	-0.07	-0.06
t-stat				(-1.06)	(-1.01)	(-0.79)					(-0.62)	(-0.73)	(-0.68)	(-0.36)	(-0.46)	(-0.41)
ΔEPS^{r}_{FY1a}							**-0.75**				**-0.51**			**-0.43**		
t-stat							**(-4.91)**				**(-3.08)**			**(-2.53)**		
ΔEPS^{e}_{FY1a}								**-1.01**				**-0.35**			-0.28	
t-stat								**(-4.21)**				**(-1.83)**			(-1.42)	
$\Delta EPS^{e}_{FY1a(pre)}$									**-0.74**				**-0.43**			**-0.36**
t-stat									**(-4.67)**				**(-2.19)**			**(-1.78)**
$\Delta EPS^{e}_{FY1a(post)}$										0.34			0.12			0.19
t-stat										(1.23)			(0.41)			(0.62)
R^2	9.3%	0.0%	0.1%	0.9%	9.5%	9.4%	7.0%	5.2%	6.4%	0.5%	12.0%	10.3%	11.4%	10.3%	9.0%	10.1%

Table IX
Cross-sectional Analysis of Changes in the HML Betas

This table presents cross-sectional analysis of changes in the daily and weekly HML betas around index inclusion events, $\Delta\beta_{hml}$. Changes in the betas are defined in Table III. All other variables are defined in Table I. The estimates are reported for the full sample of index inclusions and for the restricted sample of inclusions with earnings data available from the *I/B/E/S* database. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

Panel A. Daily betas

	Full sample					Sample with EPS data										
						3-factor model								4-factor model		
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
Intercept	-0.01	**-0.15**	**-0.14**	**-0.15**	0.02	-0.01	-0.06	0.00	-0.06	**-0.13**	0.01	0.05	0.04	0.10	**0.13**	**0.13**
t-stat	(-0.21)	**(-2.86)**	**(-2.42)**	**(-2.77)**	(0.23)	(-0.19)	(-0.85)	(-0.01)	(-0.91)	**(-2.12)**	(0.11)	(0.58)	(0.49)	(1.48)	**(1.80)**	**(1.79)**
$\Delta Size_{Pre1}$	**-0.43**				**-0.44**	**-0.30**					-0.22	-0.11	-0.13	**-0.31**	**-0.24**	**-0.25**
t-stat	**(-4.03)**				**(-4.09)**	**(-2.29)**					(-1.53)	(-0.78)	(-0.87)	**(-2.44)**	**(-1.82)**	**(-1.87)**
$\Delta Size_{Post}$		0.03			-0.01	0.00					0.04	-0.02	-0.02	**0.33**	**0.27**	**0.25**
t-stat		(0.21)			(-0.11)	(0.00)					(0.21)	(-0.10)	(-0.13)	**(2.17)**	**(1.82)**	**(1.67)**
$\Delta Turn_{Pre1}$			-0.07		-0.14	-0.15					-0.14	-0.19	-0.14	**-0.21**	**-0.21**	**-0.22**
t-stat			(-0.74)		(-1.28)	(-1.17)					(-1.06)	(-1.55)	(-1.07)	**(-1.83)**	**(-1.79)**	**(-1.87)**
$\Delta Turn_{Post}$				-0.06	-0.08	-0.11					-0.10	-0.17	-0.10	-0.04	-0.04	-0.05
t-stat				(-0.50)	(-0.59)	(-0.72)					(-0.64)	(-1.12)	(-0.68)	(-0.31)	(-0.33)	(-0.37)
ΔEPS^{r}_{FY1a}							**-0.32**				-0.22			**-0.42**		
t-stat							**(-2.21)**				(-1.39)			**(-2.93)**		
ΔEPS^{e}_{FY1a}								**-0.55**				**-0.48**			**-0.59**	
t-stat								**(-3.45)**				**(-2.62)**			**(-3.62)**	
$\Delta EPS^{e}_{FY1a(pre)}$									**-0.31**				**-0.43**			**-0.56**
t-stat									**(-2.05)**				**(-2.29)**			**(-3.35)**
$\Delta EPS^{e}_{FY1a(post)}$										**-0.48**			**-0.79**			**-0.78**
t-stat										**(-1.88)**			**(-2.72)**			**(-3.03)**
R^2	3.9%	0.0%	0.1%	0.1%	4.3%	2.0%	1.5%	3.6%	1.3%	1.1%	2.6%	4.5%	4.6%	8.7%	10.1%	10.3%

Panel B. Weekly betas

	Full sample					Sample with EPS data										
						3-factor model								4-factor model		
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
Intercept	0.07	**-0.22**	**-0.20**	**-0.19**	0.07	0.03	-0.08	-0.04	-0.09	**-0.20**	0.06	0.06	0.06	0.18	0.14	0.14
t-stat	(0.77)	**(-2.77)**	**(-2.33)**	**(-2.38)**	(0.72)	(0.26)	(-0.79)	(-0.39)	(-0.84)	**(-2.19)**	(0.53)	(0.51)	(0.51)	(1.63)	(1.17)	(1.18)
$\Delta Size_{Pre1}$	**-0.86**				**-0.86**	**-0.80**					**-0.69**	**-0.70**	**-0.70**	**-0.81**	**-0.76**	**-0.75**
t-stat	**(-5.45)**				**(-5.44)**	**(-4.16)**					**(-3.29)**	**(-3.20)**	**(-3.19)**	**(-3.48)**	**(-3.48)**	**(-3.41)**
$\Delta Size_{Post}$		**0.43**			**0.40**	**0.71**					**0.76**	**0.71**	**0.71**	**0.71**	**0.85**	**0.88**
t-stat		**(2.15)**			**(2.02)**	**(2.84)**					**(3.02)**	**(2.85)**	**(2.84)**	**(2.58)**	**(3.39)**	**(3.50)**
$\Delta Turn_{Pre1}$			0.01		-0.11	-0.17					-0.16	-0.15	-0.15	-0.18	-0.29	-0.27
t-stat			(0.04)		(-0.68)	(-0.89)					(-0.83)	(-0.81)	(-0.79)	(-1.05)	(-1.50)	(-1.40)
$\Delta Turn_{Post}$				-0.16	-0.06	-0.05					-0.03	-0.05	-0.05	-0.32	-0.10	-0.09
t-stat				(-0.94)	(-0.33)	(-0.24)					(-0.15)	(-0.21)	(-0.21)	(-1.51)	(-0.46)	(-0.43)
ΔEPS^{r}_{FY1a}							**-0.54**				-0.31			**-0.55**		
t-stat							**(-2.43)**				(-1.32)			**(-2.31)**		
ΔEPS^{e}_{FY1a}								**-0.68**				-0.26			-0.31	
t-stat								**(-2.77)**				(-0.97)			(-1.13)	
$\Delta EPS^{e}_{FY1a(pre)}$									**-0.51**				-0.27			-0.37
t-stat									**(-2.23)**				(-0.97)			(-1.33)
$\Delta EPS^{e}_{FY1a(post)}$										-0.21			-0.23			0.08
t-stat										(-0.55)			(-0.53)			(0.19)
R^2	6.9%	1.1%	0.0%	0.2%	8.1%	7.7%	1.8%	2.3%	1.5%	0.1%	8.3%	8.0%	8.0%	10.9%	10.3%	10.7%

Table X
Cross-sectional Analysis of Changes in the Momentum Betas

This table presents cross-sectional analysis of changes in the daily and weekly momentum betas around index inclusion events, $\Delta\beta_{umd}$. Changes in the betas are defined in Table III. All other variables are defined in Table I. The estimates are reported for the full sample of index inclusions and for the restricted sample of inclusions with earnings data available from the *I/B/E/S* database. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

Panel A. Daily betas

	Full sample					Sample with EPS data							
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
Intercept	**0.16**	**-0.39**	**-0.30**	**-0.30**	**0.11**	0.10	**-0.34**	**-0.26**	**-0.31**	**-0.33**	0.09	0.10	0.10
t-stat	**(2.59)**	**(-8.67)**	**(-6.23)**	**(-6.36)**	**(1.78)**	(1.34)	**(-5.64)**	**(-4.18)**	**(-5.08)**	**(-6.29)**	(1.14)	(1.29)	(1.28)
Ret_{Pre1}	**-0.96**				**-0.94**	**-0.99**					**-1.22**	**-1.04**	**-1.08**
t-stat	**(-4.27)**				**(-4.42)**	**(-3.72)**					**(-4.17)**	**(-3.47)**	**(-3.58)**
Ret_{Pre2}	**-1.97**				**-1.80**	**-1.80**					**-1.80**	**-1.81**	**-1.79**
t-stat	**(-8.97)**				**(-8.68)**	**(-6.92)**					**(-6.94)**	**(-6.92)**	**(-6.84)**
Ret_{Post}		**1.30**			**1.06**	**1.08**					**1.04**	**1.08**	**1.06**
t-stat		**(7.60)**			**(6.88)**	**(5.68)**					**(5.42)**	**(5.67)**	**(5.50)**
$\Delta Turn_{Pre1}$			-0.10		**-0.20**	**-0.23**					**-0.24**	**-0.23**	**-0.24**
t-stat			(-1.19)		**(-2.43)**	**(-2.37)**					**(-2.45)**	**(-2.38)**	**(-2.48)**
$\Delta Turn_{Post}$				**-0.22**	**-0.19**	**-0.21**					**-0.21**	**-0.21**	**-0.21**
t-stat				**(-2.21)**	**(-2.03)**	**(-1.93)**					**(-1.97)**	**(-1.93)**	**(-1.94)**
ΔEPS^{r}_{FY1a}							0.03				**0.23**		
t-stat							(0.23)				**(1.89)**		
ΔEPS^{e}_{FY1a}								**-0.31**				0.05	
t-stat								**(-2.21)**				(0.39)	
$\Delta EPS^{e}_{FY1a(pre)}$									-0.12				0.09
t-stat									(-0.90)				(0.63)
$\Delta EPS^{e}_{FY1a(post)}$										**-0.44**			-0.15
t-stat										**(-1.95)**			(-0.70)
R^2	22.6%	12.6%	0.4%	1.2%	32.7%	26.7%	0.0%	1.5%	0.3%	1.2%	27.5%	26.7%	27.1%

Panel B. Weekly betas

	Full sample					Sample with EPS data							
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
Intercept	0.08	**-0.38**	**-0.29**	**-0.29**	0.08	0.08	**-0.37**	**-0.30**	**-0.33**	**-0.33**	0.05	0.06	0.06
t-stat	(1.01)	**(-6.75)**	**(-5.07)**	**(-4.95)**	(1.00)	(0.90)	**(-5.37)**	**(-4.23)**	**(-4.84)**	**(-5.50)**	(0.56)	(0.66)	(0.65)
Ret_{Pre1}	**-0.84**				**-0.86**	**-1.35**					**-1.82**	**-1.69**	**-1.74**
t-stat	**(-2.97)**				**(-3.08)**	**(-4.21)**					**(-5.23)**	**(-4.70)**	**(-4.83)**
Ret_{Pre2}	**-1.64**				**-1.55**	**-1.25**					**-1.25**	**-1.29**	**-1.27**
t-stat	**(-5.93)**				**(-5.67)**	**(-3.98)**					**(-4.03)**	**(-4.14)**	**(-4.06)**
Ret_{Post}		**0.88**			**0.67**	**0.87**					**0.78**	**0.88**	**0.84**
t-stat		**(4.18)**			**(3.33)**	**(3.80)**					**(3.42)**	**(3.84)**	**(3.66)**
$\Delta Turn_{Pre1}$			**-0.26**		**-0.32**	**-0.36**					**-0.38**	**-0.38**	**-0.39**
t-stat			**(-2.50)**		**(-3.03)**	**(-3.09)**					**(-3.28)**	**(-3.21)**	**(-3.32)**
$\Delta Turn_{Post}$				-0.09	-0.11	-0.10					-0.11	-0.10	-0.11
t-stat				(-0.69)	(-0.92)	(-0.76)					(-0.82)	(-0.80)	(-0.80)
ΔEPS^{r}_{FY1a}							0.16				**0.48**		
t-stat							(1.11)				**(3.25)**		
ΔEPS^{e}_{FY1a}								-0.13				**0.35**	
t-stat								(-0.81)				**(2.05)**	
$\Delta EPS^{e}_{FY1a(pre)}$									0.01				**0.40**
t-stat									(0.05)				**(2.30)**
$\Delta EPS^{e}_{FY1a(post)}$										-0.35			0.06
t-stat										(-1.37)			(0.23)
R^2	11.6%	4.2%	1.5%	0.1%	16.2%	16.6%	0.4%	0.2%	0.0%	0.6%	19.3%	17.7%	18.3%

Table XI
Difference-in-Difference Analysis of the Abnormal Returns

This table presents the difference-in-difference analysis of the abnormal returns around index inclusion. The differences between the abnormal returns of the event stocks and the control stocks (*ΔCAR40, ΔCAR_AND* and *ΔCAR_EFD)* are regressed on the differences between changes in the following characteristics of the event and control stocks: size in the pre-event year ($\Delta\Delta Size_{Pre1}$), average returns in the first year (ΔRet_{Pre1}) and in the second year (ΔRet_{Pre2}) before the event, the realized EPS ($\Delta\Delta EPS^{r}_{FY1a}$) and the forecasted EPS ($\Delta\Delta EPS^{e}_{FY1a(pre)}$ and $\Delta\Delta EPS^{e}_{FY1a(post)}$) in the year of index inclusion. All variables are defined in Table I. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

	ΔCAR40			*ΔCAR_AND*			*ΔCAR_EFD*		
Intercept	-1.25	-2.74	-2.83	**4.24**	**4.10**	**4.10**	**4.20**	**3.57**	**3.56**
t-stat	(-0.75)	(-1.50)	(-1.54)	**(8.55)**	**(7.54)**	**(7.49)**	**(4.54)**	**(3.52)**	**(3.49)**
$\Delta\Delta Size_{Pre1}$	-4.48			0.36			-4.28		
t-stat	(-0.73)			(0.20)			(-1.26)		
ΔRet_{Pre1}		**11.36**	**12.20**		1.27	1.45		4.01	4.61
t-stat		**(1.68)**	**(1.78)**		(0.63)	(0.71)		(1.07)	(1.20)
ΔRet_{Pre2}	**17.83**	**16.21**	**15.45**	1.03	0.80	0.40	**6.66**	6.22	5.14
t-stat	**(2.58)**	**(2.33)**	**(2.22)**	(0.50)	(0.39)	(0.19)	**(1.74)**	(1.61)	(1.32)
$\Delta\Delta EPS^{r}_{FY1a}$	-7.37	-9.67		**-4.80**	**-4.96**		**-10.44**	**-11.57**	
t-stat	(-0.93)	(-1.22)		**(-2.05)**	**(-2.10)**		**(-2.39)**	**(-2.63)**	
$\Delta\Delta EPS^{e}_{FY1a(pre)}$			-6.05			**-2.21**			**-5.19**
t-stat			(-1.41)			**(-1.72)**			**(-2.16)**
$\Delta\Delta EPS^{e}_{FY1a(post)}$			-2.73			-0.81			-0.84
t-stat			(-0.50)			(-0.50)			(-0.28)
R^2	2.42%	3.12%	3.27%	1.32%	1.43%	1.00%	3.11%	2.98%	2.45%

Table XII
Difference-in-difference Analysis of the Factor Betas

This table presents the difference-in-difference analysis of the betas in the Carhart (1997) 4-factor model. The differences between changes in the betas of the event and control stocks ($\Delta\Delta\beta$) are regressed on the differences between changes in the following characteristics of the event and control stocks: size in the pre-event year ($\Delta\Delta Size_{Pre1}$), average returns in the first year (ΔRet_{Pre1}) and in the second year (ΔRet_{Pre2}) before the event, the realized EPS ($\Delta\Delta EPS^{r}_{FY1a}$) and the forecasted EPS ($\Delta\Delta EPS^{e}_{FY1a(pre)}$ and $\Delta\Delta EPS^{e}_{FY1a(post)}$) in the year of index inclusion. The column heading "CRSP" indicates the betas from the specifications with the CRSP value-weighted market return. The column heading "SP" indicates the betas from the specifications with the S&P 500 index return. All variables are defined in Table I. The estimates significant at the 1%, 5% and 10% level are indicated in bold.

Panel A. Daily betas

	$\Delta\Delta\beta_{mrk}$				$\Delta\Delta\beta_{smb}$				$\Delta\Delta\beta_{hml}$				$\Delta\Delta\beta_{umd}$			
	CRSP		SP		CRSP		SP		CRSP		SP		CRSP		SP	
Intercept	0.04	0.01	**0.09**	0.06	**-0.22**	**-0.24**	**-0.18**	**-0.20**	-0.04	-0.07	0.01	-0.02	0.08	0.07	0.07	0.07
t-stat	(0.86)	(0.27)	**(1.73)**	(1.22)	**(-3.48)**	**(-3.39)**	**(-2.64)**	**(-2.71)**	(-0.47)	(-0.73)	(0.11)	(-0.19)	(0.81)	(0.69)	(0.75)	(0.65)
$\Delta\Delta Size_{Pre1}$	0.18	0.13	0.18	0.11	0.11	-0.01	0.14	-0.01	0.29	0.22	0.29	0.22				
t-stat	(1.05)	(0.71)	(1.05)	(0.59)	(0.46)	(-0.05)	(0.55)	(-0.04)	(0.88)	(0.63)	(0.86)	(0.59)				
ΔRet_{Pre1}													-0.47	-0.52	-0.46	-0.51
t-stat													(-1.36)	(-1.32)	-(-1.31)	(-1.29)
ΔRet_{Pre2}	0.08	0.10	0.01	0.03	**0.58**	**0.54**	**0.55**	**0.52**	0.32	0.38	0.24	0.30	**-1.01**	**-0.93**	**-1.01**	**-0.93**
t-stat	(0.40)	(0.46)	(0.03)	(0.17)	**(2.19)**	**(1.90)**	**(1.96)**	**(1.72)**	(0.86)	(0.96)	(0.62)	(0.73)	**(-2.82)**	**(-2.43)**	**(-2.80)**	**(-2.41)**
$\Delta\Delta EPS^{r}_{FY1a}$	**-0.42**		**-0.39**		**-1.45**		**-1.52**		0.16		0.17		0.03		0.06	
t-stat	**(-1.88)**		**(-1.77)**		**(-4.79)**		**(-4.73)**		(0.39)		(0.38)		(0.08)		(0.14)	
$\Delta\Delta EPS^{e}_{FY1a(pre)}$		-0.13		-0.12		**-0.45**		**-0.45**		0.07		0.08		-0.31		-0.29
t-stat		(-1.19)		(-1.14)		**(-2.95)**		**(-2.80)**		(0.32)		(0.35)		(-1.48)		(-1.42)
$\Delta\Delta EPS^{e}_{FY1a(post)}$		-0.08		-0.13		-0.72		-0.70		0.02		0.08		-1.22		-1.26
t-stat		(-0.19)		(-0.31)		(-1.24)		(-1.14)		(0.03)		(0.09)		(-1.53)		(-1.58)
R^2	1.3%	0.7%	1.2%	0.6%	7.5%	4.3%	7.2%	3.8%	0.6%	0.5%	0.4%	0.4%	3.5%	4.8%	3.4%	4.7%

Panel B. Weekly betas

	$\Delta\Delta\beta_{mrk}$				$\Delta\Delta\beta_{smb}$				$\Delta\Delta\beta_{hml}$				$\Delta\Delta\beta_{umd}$			
	CRSP		SP		CRSP		SP		CRSP		SP		CRSP		SP	
Intercept	0.04	0.02	-0.01	0.01	-0.07	-0.10	-0.06	-0.08	0.05	0.01	0.12	0.10	-0.01	-0.02	-0.03	-0.01
t-stat	(0.46)	(0.24)	(-0.06)	(0.10)	(-0.54)	(-0.71)	(-0.43)	(-0.52)	(0.30)	(0.07)	(0.67)	(0.51)	(-0.04)	(-0.10)	(-0.19)	(-0.04)
$\Delta\Delta Size_{Pre1}$	0.48	0.34	0.60	0.43	-0.21	-0.51	-0.12	-0.44	-0.01	-0.44	0.19	-0.17				
t-stat	(1.44)	(0.97)	(1.81)	(1.23)	(-0.45)	(-0.99)	(-0.23)	(-0.80)	(-0.01)	(-0.64)	(0.29)	(-0.25)				
ΔRet_{Pre1}													-0.53	-0.67	-0.83	-0.97
t-stat													(-1.05)	(-1.16)	(-1.51)	(-1.60)
ΔRet_{Pre2}	0.19	0.25	0.28	0.27	0.44	0.42	0.26	0.17	0.09	0.31	0.16	0.35	-0.38	-0.07	-0.43	-0.09
t-stat	(0.51)	(0.65)	(0.76)	(0.70)	(0.81)	(0.74)	(0.45)	(0.28)	(0.13)	(0.41)	(0.22)	(0.46)	(-0.73)	(-0.12)	(-0.75)	(-0.14)
$\Delta\Delta EPS^{r}_{FY1a}$	-0.32		-0.47		**-2.41**		**-2.65**		0.41		0.00		0.55		0.42	
t-stat	(-0.74)		(-1.11)		**(-3.93)**		**(-4.02)**		(0.49)		(0.00)		(0.92)		(0.65)	
$\Delta\Delta EPS^{e}_{FY1a(pre)}$		0.00		-0.03		**-0.71**		**-0.79**		0.42		0.07		-0.05		0.03
t-stat		(-0.01)		(-0.16)		**(-2.31)**		**(-2.41)**		(1.03)		(0.16)		(-0.17)		(0.10)
$\Delta\Delta EPS^{e}_{FY1a(post)}$		0.38		0.50		-0.28		0.53		-0.65		-0.71		-1.34		-0.58
t-stat		(0.48)		(0.64)		(-0.24)		(0.42)		(-0.42)		(-0.46)		(-1.14)		(-0.46)
R^2	0.8%	0.6%	1.4%	0.9%	4.9%	2.4%	5.0%	2.5%	0.1%	0.7%	0.04%	0.2%	0.8%	0.8%	1.1%	1.0%

Figure 1
Market-adjusted Size around S&P 500 Index Inclusions

This figure plots the sample average market-adjusted size of the index-included stocks in consecutive 20-day intervals before and after index inclusion. Market-adjusted size is defined as firm size divided by average market size of all NYSE, AMEX and NASDAQ common stocks. The square in red indicates the average size in the 20-day interval preceding inclusion announcement.

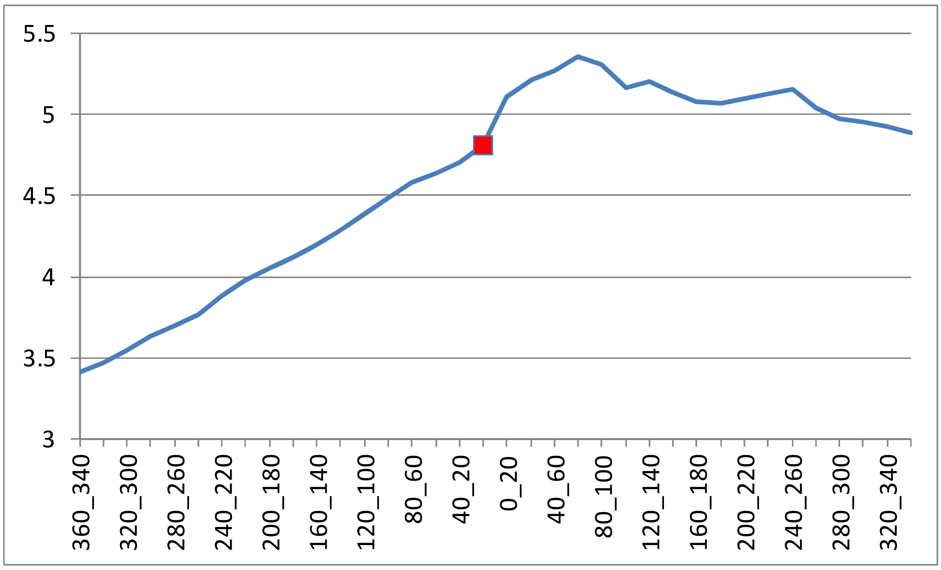
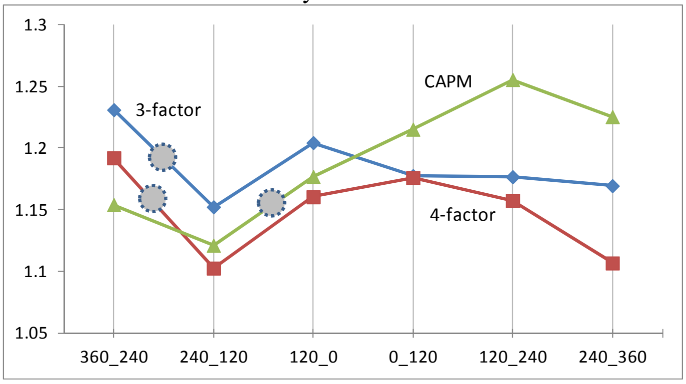


Figure 2
Factor Betas around S&P 500 Index Inclusions

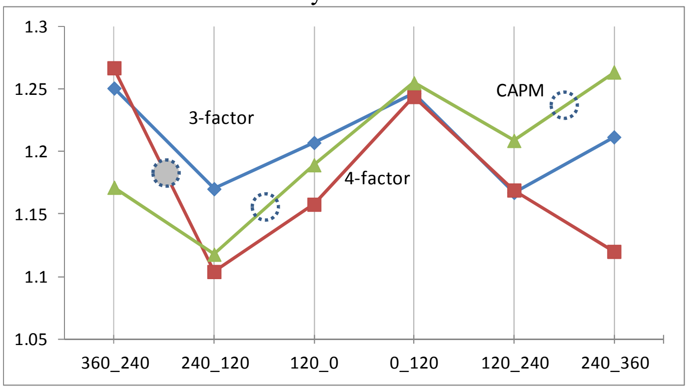
This figure shows the cross-sectional averages of the factor betas estimated in consecutive non-overlapping 120-day windows before and after the day of addition announcement. The pre-inclusion estimation windows are 360_240, 240_120, 120_0, and the post-inclusion windows are 0_120, 120_240, 240_360, where "0" indicates the event (inclusion announcement) day. The betas from the specifications with the CRSP value-weighted market return are presented in Panel A. The betas from the specifications with the S&P 500 return are in Panel B. The plots of the market (or S&P 500) beta include estimates from the 1-, 3- and 4-factor models. The plots for the SMB and HML betas include estimates from the 3- and 4-factor models. The plots for the momentum betas present the estimates from the 4-factor models. To indicate statistical significance of changes in the betas in the consecutive estimation intervals, the lines connecting these intervals are marked with a shaded circle in case of significance at the 5% and 1% levels and with an unshaded circle in case of significance at the 10% level only.

Panel A. Factor Betas in Specifications with the CRSP Market Return

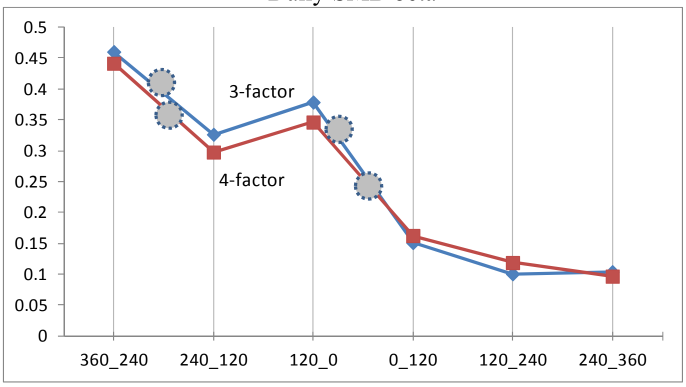
Daily Market beta



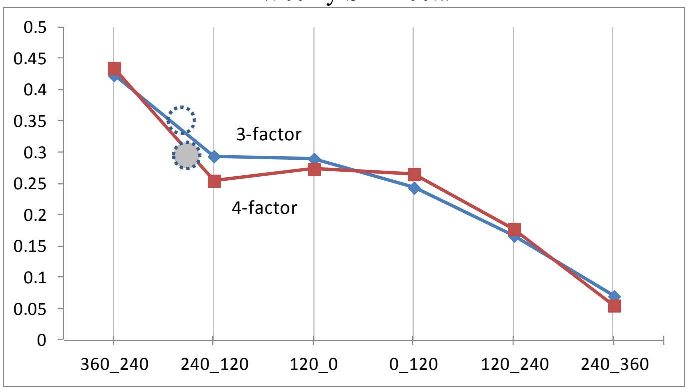
Weekly Market beta



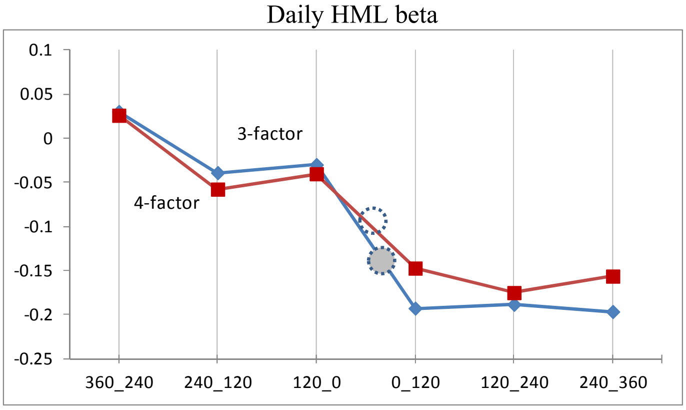
Daily SMB beta



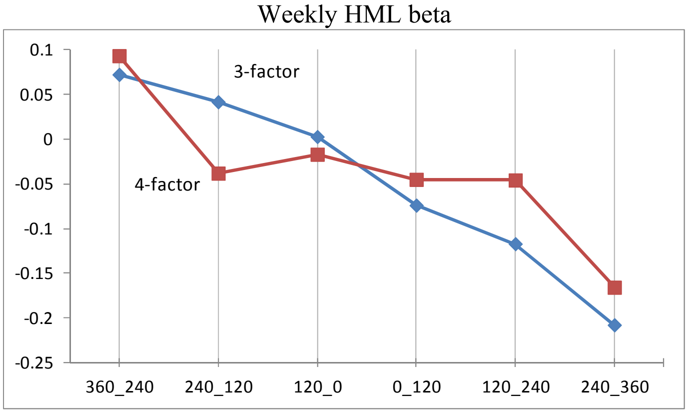
Weekly SMB beta



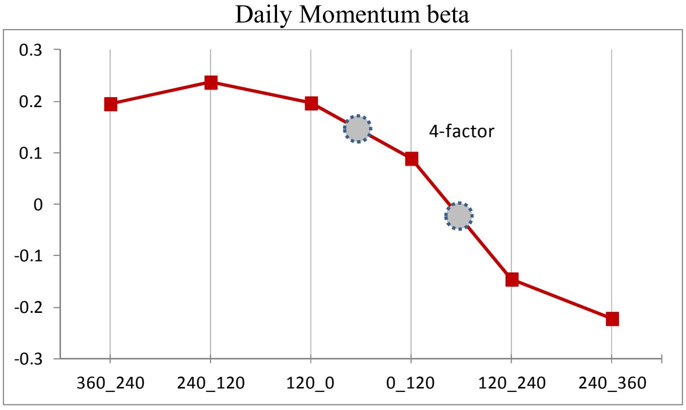
Daily HML beta



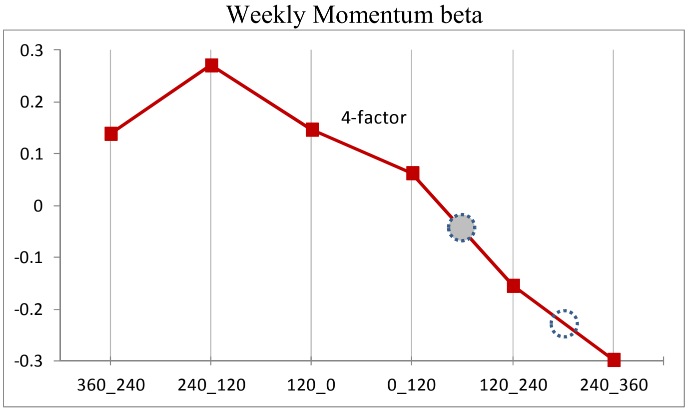
Weekly HML beta



Daily Momentum beta

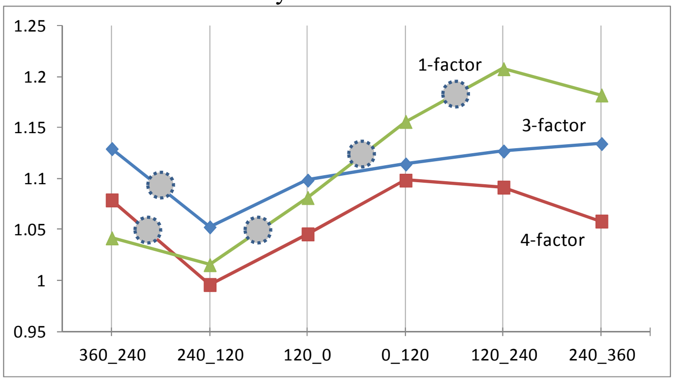


Weekly Momentum beta

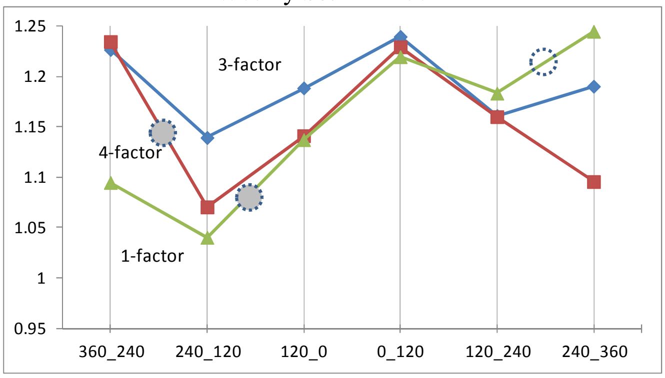


Panel B. Factor betas in Specifications with the S&P 500 Return

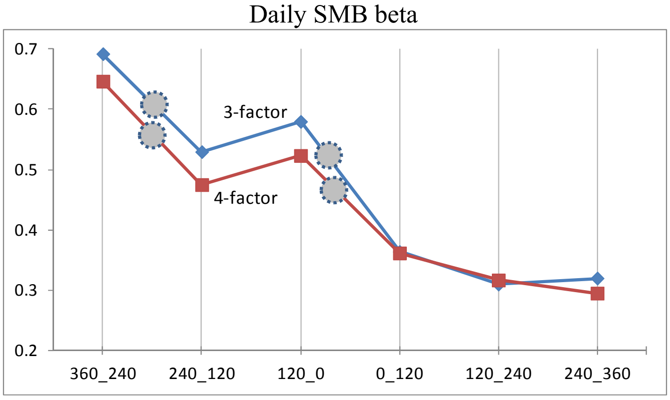
Daily S&P 500 beta



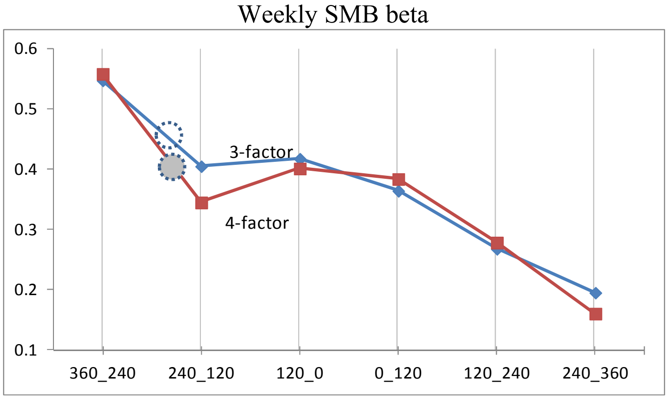
Weekly S&P 500 beta



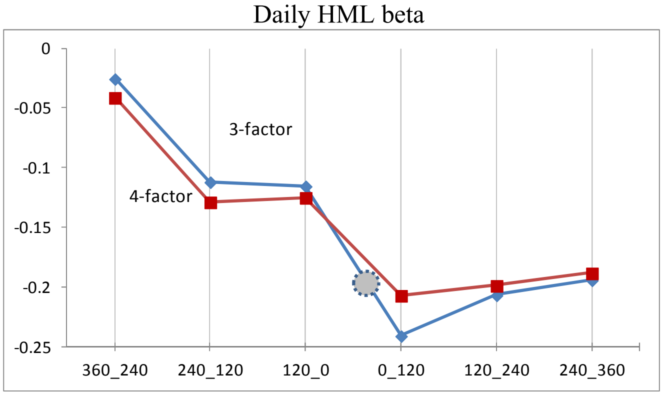
Daily SMB beta



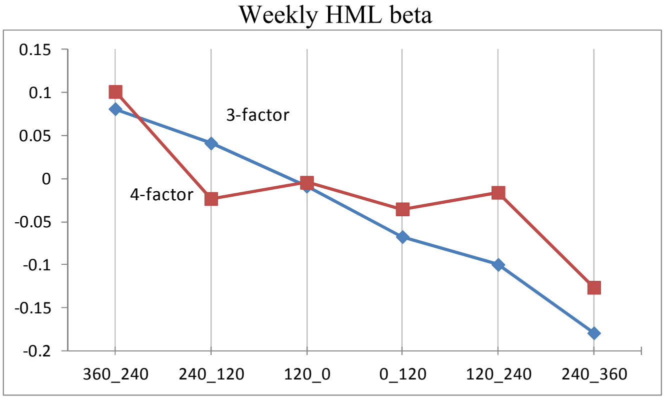
Weekly SMB beta



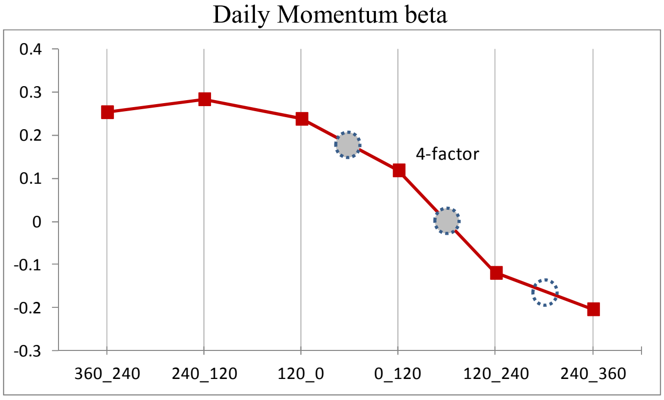
Daily HML beta



Weekly HML beta



Daily Momentum beta



Weekly Momentum beta