# Factor exposures of foreign equity capital in domestic stock market

Lingxia Sun [a], Dong Wook Lee [a,*]

March 24, 2014

**Abstract**

This paper examines factor exposures of foreign equity capital in domestic stock market in order to understand its risk-taking behavior and sources of return in the market. Specifically, we examine the allocation of foreign equity capital, and its changes, within domestic market in relation to the market's characteristic-based factors—i.e., along the firm characteristics whose cross-sectional spreads are associated with an average-return differential. Using data from Korea for the period of 1999-2013, we find that foreign equity capital is strongly exposed to the idiosyncratic volatility (IVOL) factor. That is, cross-border equity capital is typically allocated to low-IVOL stocks and profits from the return differential between low- and high-IVOL stocks. We also find that foreign equity capital actively moves in (out of) low-IVOL stocks as their volatility gap against high-IVOL stocks widens (narrows). A portfolio that mimics the allocation of foreign equity capital across domestic stocks further confirms the conditional loading on the IVOL factor as the main source of return for foreigners. We discuss the comparative advantage of foreign equity capital in bearing this particular factor risk and the role of information asymmetries between locals and foreigners in this risk sharing.

**Keywords**: Foreign equity capital; Foreign investors; Factor loadings; Idiosyncratic volatility; Korea

**JEL classification**: F30; G11; G15

[a] Korea University Business School, Seoul, Korea

[*] Corresponding author. Associated Professor of Finance, Korea University Business School. Address: 523 Hyundai Motors Hall, Korea University Business School, An-am, Seong-buk, Seoul, Korea 136-701; Tel.: + 82.2.3290.2820; Email: donglee@korea.ac.kr (all lower case). We are grateful to Chelo-Won Yang and the seminar participants at Korea University Business School and the 2013 Fall KFA conference for comments. This paper is a significantly revised version of the earlier paper titled "Factor exposures of foreign investors: Are they well-informed as a portfolio investor?".

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## 1. Introduction

This paper examines factor exposures of foreign equity capital in domestic stock market in order to understand its risk-taking behavior and sources of return in the market. Specifically, we examine the allocation of foreign equity capital, and its changes, within domestic stock market in relation to the market's characteristic-based factors—i.e., along the firm characteristics whose cross-sectional spreads are associated with an average-return differential. By doing so, we attempt to advance our understanding of foreign equity investors beyond their well-known preference for certain firm characteristics (e.g., Kang and Stulz 1997; Dahlquist and Robertsson 2001). As detailed below, our analysis shows that foreign equity capital takes on a particular factor risk and profits from bearing that risk.

Before proceeding further, we justify our choice of working with factors and, in particular, the characteristic-based factors. Typically, a factor is understood as an aggregate phenomenon that affects all stocks and all investors (albeit in varying degrees) and thus whose uncertainty is not diversifiable. Combined with risk aversion, a stock's exposure to such uncertainty gives rise to an extra return to the stock, because the demand for the stock would otherwise be insufficient to clear the market. In other words, a stock's *loading* on a factor is an important source of return for the investor who holds the stock. Thus, if one is to investigate cross-border equity capital, then its factor loadings in domestic market—more precisely, the factor loadings of domestic stocks to which foreign equity capital is allocated—would be one sensible approach to understanding the behavior and performance of foreign equity investors.

While there are some obvious candidates for factors that are theoretically well motivated (e.g., consumption or economic growth), the empirical success is usually achieved by the factor-mimicking portfolios based on firm characteristics, such as SMB or HML (e.g., Fama and French 1993). Even though some characteristic-based factors might be arising from mispricing rather than risk aversion (e.g. Daniel, Hirshleifer, and Subrahmanyam 2005), those factors still remain a valid return source, as they guide investors to where to find a positive average return. After all, each of the characteristic-based factors constitutes a readily tradable investment strategy, meriting the title of the "investment"—as opposed to the "fundamental" —factor (e.g., Ang 2012). On these grounds, we choose to analyze foreign equity capital through its loadings on *characteristic-based* factors.

The motivation above leads us to a straightforward empirical analysis. We examine whether cross-border equity capital is "tilted" towards certain firm characteristics, in a way that the capital can profit from the average-return differentials associated with the cross-sectional spreads of those characteristics—i.e., the characteristic factor premiums. We also examine whether cross-border equity capital moves within the domestic market, in a way that the capital is tilted more towards a given firm characteristic when its factor premium grows larger.[1]

As such, our analysis sidesteps the typical criticism on the performance evaluation of foreign equity investors, namely, the sensitivity of "alpha" to the employed risk factors (see, e.g., Choe, Kho, and Stulz (2005; p.797)). It is because, instead of postulating a certain risk model and focusing on the excess return not explained by that model, we simply focus on what risk factors foreigners are exposed to. Put differently, the goal of our analysis is not to determine whether foreign equity capital is earning more than the risk premiums, but to find out what risk premiums foreigners are earning. Thus, our findings will be particularly useful in understanding the risk-taking behavior of foreign equity capital in domestic stock market. Our analysis is also instructive in understanding whether foreign equity investors are well-informed about the factor structure of domestic stock market and use their knowledge effectively, although it is silent about whether those foreign investors possess private information which would create a risk-adjusted excess return or alpha.

We conduct this analysis using data from Korea. Korea makes a good setting for this investigation, because foreign equity capital data are readily available for a large number of stocks over a long time-period, at very high frequencies. An added feature of the Korean stock market is that no restrictions are imposed on foreigners owning domestic stocks since the 1997-1998 Asian

[1] Later in this introduction, we detail how we address endogeneity inherent in this analysis.

Financial Crisis. It is also instructive that there are prior studies focusing on this particular market and they offer some robust findings on which we can build (e.g., Choe, Kho, and Stulz 1999, 2005). Among others, we build on the finding that, at the individual firm level, foreign equity investors are at an informational *dis*advantage relative to domestic investors (Choe, Kho, and Stulz 2005).[2]

Using data from Korea for the period from January 1999 to August 2013, we find that foreign equity capital is strongly exposed to the idiosyncratic volatility (IVOL) factor. That is, foreign equity capital is typically allocated to low-IVOL stocks and profits from the return differential between low- and high-IVOL stocks. We also find that foreign equity capital is conditionally loaded on an alternatively constructed IVOL factor, which is the return differential between low- and high-IVOL stocks with each of the two return legs scaled by its own idiosyncratic volatility (Frazzini and Pedersen 2014; Ang 2012).[3] More precisely, we find that foreign equity capital is loaded more on this *scaled* IVOL factor when its realization is positive than when it is negative. With the original, un-scaled IVOL factor, we find no evidence of such conditional exposures. It thus follows that foreign equity capital moves into (out of) low-IVOL stocks only when their volatility gap against high-IVOL stocks widens (narrows). In other words, foreign equity capital responds not to the signal in the price change per se but to the one in the volatility change. All of these results are robust to different data frequencies, namely, annual, semiannual, and quarterly frequencies.

We further ensure the robustness of our results using a portfolio approach. Specifically, we construct a portfolio using stocks to which foreign equity capital is allocated. We weight those stocks by their market capitalization held by foreign equity capital, so that the portfolio can mimic

[2] Studies examining other countries often reach the opposite conclusion. See, e.g., Grinblatt and Keloharju (2000) or Seasholes (2000).

[3] It is in the spirit of: $R_L/\sigma_L - R_H/\sigma_H$, where $R_i$ is the return on asset $i$ and $\sigma_i$ is the idiosyncratic volatility of asset $i$. We detail the construction of both the un-scaled and the scaled IVOL factors in Section 3.2 and in the Appendix.

the allocation of the capital across domestic stocks.[4] This *allocation-mimicking* portfolio enables us to examine the factor loadings of foreign equity capital at a higher data frequency by using the portfolio's monthly returns. The portfolio also aptly reveals the performance of foreign equity investors *as a whole* in domestic stock market.

We find that the factor loadings of this portfolio precisely mirror the earlier results. More precisely, the portfolio has a positive *un*conditional loading on the un-scaled IVOL factor (i.e., the return differential between low- and high-IVOL stocks) and it has a strong *conditional* loading on the scaled IVOL factor (i.e., the return differential between low- and high-IVOL stocks, with each leg scaled by its own IVOL). A closer examination of those results shows that the conditional loading on the scaled IVOL factor is the main source of return for foreign equity investors as a whole.

Immediately, the reader will wonder about the following scenarios regarding our results. One is the reverse causality, namely, that as foreign equity capital moves into (out of) low-IVOL stocks, those stocks experience a downward (upward) volatility pressure.[5] Such a volatility effect could generate the type of conditional factor loading we observe. To address this issue, we construct the so-called "purged" factor returns following Greenwood and Hanson (2012). Specifically, we exclude the stocks that foreigners actively trade vis-à-vis locals during a month from the factor return computation for that month (while keep using the original breakpoints that are based on all stocks). Consequently, the purged factor return is free from any volatility pressure stemming from foreigners' trading. With this alternative factor returns, we continue to find the exact same pattern as the one with the original factor returns.

The other scenario is that as some stocks experience a decrease in volatility, foreign equity capital flows into those stocks, thereby creating the conditional loading on the scaled IVOL factor

[4] Suppose, for example, that there are three stocks in a domestic market and the amount of foreign equity capital allocated to those stocks is, respectively, 100 million, 200 million, and 300 million local currencies. Then, the portfolio weights the three stocks by 100/600, 200/600, and 300/600, respectively.
[5] Any impact of foreign equity investors on corporate policies (e.g., dividend payments) is, however, likely to be diversified within a portfolio.

that we observe. We embrace this “volatility-chasing” interpretation with just one caveat. As reported above, foreign equity capital is conditionally loaded on the scaled IVOL factor but not on the un-scaled IVOL factor. Thus, it is only correct to state that foreign equity capital flows into the stocks whose volatility is falling but not necessarily to the stocks whose price rises. In other words, foreign equity capital responses to the signal embedded in volatility and not to the one in the price change per se. Given the slow-changing nature of volatility, it is not feasible to determine whether foreign equity capital possesses private information that enables it to move ahead of a volatility-changing event. (Such an event and the movement of foreign equity capital would probably be found to occur at the same time.) Still, what one can take away from our finding is that foreign equity investors “chase”—if they do—not just the price change in general but the volatility change in particular.

No doubt that our findings are stemming from the interaction between domestic and foreign equity capital. In other words, on the other side of foreign equity capital being long on low-volatility stocks, there is domestic equity capital holding high-volatility stocks. Section 4 provides a detailed discussion on this issue and below we offer a brief summary of that discussion. Absent much of firm-specific private information (e.g., Choe, Kho, and Stulz 2005), foreign investors cannot make a concentrated bet and instead need to construct a well-diversified portfolio. Thus, large firm-specific stock-return volatility, which is directly related to the stock’s lottery-type payoffs (Boyer, Mitton, and Vorkink 2010), is not the return source that foreigners can utilize. On the other hand, domestic equity capital has better access to firm-specific private information and thus it readily embraces firm-specific volatility as a profit opportunity. As a result, domestic equity capital is funneled to high-IVOL stocks, whereas foreign equity capital is directed to low-IVOL stocks. In words, the information asymmetries between locals and foreigners, at the individual stock level, affect the interaction between domestic and foreign equity capital in the dimension of firm-specific stock return volatility.

A more fundamental question is why low-IVOL stocks earn a higher average return than high-IVOL stocks, so that foreign equity capital profits from its holdings of those low-IVOL stocks. While there can be a rational vs. irrational approach to the source(s) of the IVOL factor premium (i.e., the outperformance of low-IVOL stocks over high-IVOL stocks), we choose to be agnostic about this issue (and we justify it in Section 4). Instead, we focus on a testable implication of our argument. To wit, our argument is that the potential for lottery-type payoffs of high-IVOL stocks is appreciated particularly by domestic equity investors and, as a result, low-IVOL stocks are left in the hands of foreign equity investors. Thus, our results are expected to be more pronounced when the marginal investors are locals, or conversely, the result should be weaker when foreign investors are at the margin and set the price. We confirm this implication using a portfolio that weights domestics stocks in proportion to the fraction of their *shares* held by foreign equity capital, an approach to giving more weights to the stocks whose marginal investors are more likely to be a foreigner. We find that the factor loadings of this portfolio are exactly the opposite to those of the earlier foreigner-mimicking portfolio. In sum, our results suggest that foreign equity capital earns the IVOL factor premium in exchange for yielding the lottery-type payoffs available in high-IVOL stocks to domestic equity capital.

This paper proceeds as follows. Section 2 describes our sample and data. Section 3 reports the empirical results and Section 4 interprets our results in the context of the interaction between domestic and foreign equity capital. Section 5 concludes the paper.

## 2. Sample and data

Our sample includes all common stocks in the KOSPI market, the Korean equivalent of New York Stock Exchange. As many as 1,079 stocks appear in our sample at least once during our study period. (The study period is detailed below in this section.) In a given month, the sample has more than 700 stocks. We include delisted stocks in the sample until they leave the market; hence, no survivorship bias. To ensure that the sample does not include the investment trusts, we refer to the company list from the Listed Company Association (a.k.a. TS2000 database constituents). We collect stock return, accounting, and foreign equity capital data from DataGuide. Stock returns are dividend-inclusive and are adjusted for stock splits and other capital events. Our study period begins in January 1999, a time when the restrictions on foreigners owning domestic stocks are completely lifted in the wake of the 1997-1998 Asian Financial Crisis. The study period ends in August 2013.

## 3. Empirical results

### *3.1. Foreign equity capital along firm characteristics ("Foreign spreads")*

To examine foreign equity capital in relation to firm characteristics and characteristic-based factors, we follow the methodology of Greenwood and Hanson (2012). Specifically, we compute the spread of a given firm characteristic, X, between the stocks to which foreign equity capital is most allocated and the stocks to which foreign equity capital is least allocated. We then call it the "foreign spread of characteristic X" or "X spread." Here is an example. The foreign spread of, say, size is the difference in size between two extreme groups of stocks sorted by the market capitalization held by foreign equity capital, which we call the "foreign market capitalization." More precisely, in each month, we sort all stocks into quintiles based on the end-of-month foreign market capitalization, and also independently sort those stocks into deciles based on firm size. Then, we compute the average firm-size decile value within each of the quintiles sorted by foreign market capitalization. Finally, the foreign spread of size is computed as the difference between the average size decile value in the top quintile and that in the bottom quintile of foreign market capitalization. Our main empirical investigation is to see whether the foreign spread of firm size is related to the corresponding factor return (i.e., the average-return differential between small and large stocks). Besides firm size, we consider six other firm characteristics, which are: book equity-to-market equity ratio (BM), share turnover, past-month return, past 2-to-6-month return, beta, and idiosyncratic volatility (IVOL). The construction of their spreads follows the same methodology as the one for size spread.

We begin by examining the summary statistics of those foreign spreads, which are reported in Panel A of Table 1. The ever-positive size spread clearly indicates that foreign equity capital prefers large-cap stocks and stays away from small-cap stocks. The BM spread is negative at all times, meaning that foreign equity capital is typically allocated to growth stocks. Finally, the foreign spread of IVOL is always negative, as foreigners normally hold low-IVOL stocks. Along other firm characteristics, however, there is no noticeable "tilt" of foreign equity capital: the spread oscillates between positive and negative values and stays near zero on average. Panel B reports the top-quintile leg of the foreign spread (i.e., the average decile values of a given firm characteristic within the top quintile foreign market-cap stocks). Those average decile values confirm the tilt of foreign equity capital towards large, growth, and low-IVOL stocks.

Table 1 also shows that foreign equity capital does move along some firm characteristics. Specifically, Panel A shows that the spread changes, as measured by the difference between the minimum and the maximum, are greater than 3 deciles, except for size and BM. Certainly, part of these changes are attributable to a given stock experiencing a change in its own characteristics. For example, a stock whose returns are volatile may belong to a loser-stock group in one month and a winner-stock group in another month. If foreign equity capital hold such stocks, the past-month or "reversal" spread will change without any actual movement of the capital along the winner-loser-stock dimension. However, such a scenario is highly unlikely with the cross-sectionally stable characteristics, such as share turnover and idiosyncratic volatility. Changes in their spreads are likely to be caused by the actual movements of foreign equity capital along those characteristics. Below in Section 3.3, we examine whether such movements of foreign equity capital are related to the corresponding factor returns.

### *3.2. Characteristic-based factors*

We construct seven factors that correspond to one of the seven characteristics we choose to examine. Each of those factors is basically the average-return differential between two extreme groups of stocks sorted by a given firm characteristic. Except for the size factor, we make each of the characteristic-based factors size-neutral in a similar manner to Fama and French (1993); the size factor itself is BM-neutral. Details of the factor construction are in the Appendix.

In constructing factors, we employ an additional method for the beta and IVOL factors, as in Frazzini and Pedersen (2014) and Ang (2012). In the case of beta, for example, this alternative method scales the return of high- and low-beta stocks by their own beta. By doing so, the method ensures that the resulting beta factor reflects not only the return difference but also the beta difference. In the same fashion, the alternative IVOL factor is the return on low-IVOL stocks minus the return on high-IVOL stocks, each of which is scaled by its own IVOL. As such, when the two groups of stocks have a wider IVOL difference, this scaled IVOL factor has a larger value even though the un-scaled factor may not. Prior studies motivate these scaled factors as a way to directly bet on beta or IVOL differences (e.g., Frazzini and Pedersen 2014; Ang 2012). While the volatility changes are closely related to price changes, there still is room for independent effects, and the scaled factors help isolate the volatility effect. Those factors are named BAB (for beta) and IVOL (for idiosyncratic volatility), whereas the un-scaled factors are named UBAB and UIVOL.

Table 2 reports the summary statistics of those characteristic factors, along with those of the market portfolio returns (a.k.a. “market factor”). The BM effect is clearly present in the Korean market, as the HML factor return is on average positive and significant. The significant premium accruing to the HML factor is robust to whether we rebalance it monthly (Panel A) or annually (Panel B). Besides the HML factor, the IVOL factor commands a sizable premium, regardless of whether it is scaled (IVOL) or not (UIVOL), and the premium is also robust between monthly and annual rebalancing, thereby attesting to a significant average-return differential between low- and high-IVOL stocks. We also note that incorporating the volatility difference into the factor makes the IVOL factor premium even larger. Unsurprisingly, the premium of the beta factor is sensitive to the way that it is constructed. Specifically, the un-scaled beta factor (UBAB) has no meaningful premium, which is consistent with the flat Security Market Line documented by prior studies(e.g., Fama and French 1992). Once it is scaled (BAB), there is a significant return differential between low- and high-beta stocks, consistent with the findings of Frazzini and Pedersen (2014).

Besides HML, BAB, IVOL, and UIVOL, the Korean stock market has a significant share-turnover factor premium. In other words, low-turnover stocks earn a higher return than high-turnover stocks, on average. The turnover factor premium in Korea has been documented by prior studies (e.g., Hahn and Yoon 2013) and we call this factor TO in our paper. During our study period, the size effect is absent in the Korean market and the reversal and the momentum effects are also missing in Korea. The lack of the momentum premium in Korea—and several other Asian markets—is well established in the literature (e.g., Rouwenhorst 1999; Chui, Titman, and Wei 2000; Hameed and Kusnadi 2002).

*3.3. Foreign spreads and factor returns*

3.3.1. Main analysis

We now associate the movements of foreign equity capital along certain firm characteristics—i.e., "foreign spreads"—with the corresponding factor returns. When foreign equity capital moves towards, say, low-volatility stocks and against high-volatility stocks, the volatility spread will become more negative. We want to examine whether this spread change in volatility is associated with a more positive volatility factor return—i.e., a larger return differential between low- and high-volatility stocks. Such an association would mean that foreign equity capital moves in a way that the volatility premium is better utilized. Specifically, we estimate the following regressions:

$$factor_{i,t} = \alpha + \beta * \Delta SP_{i,t} + \varepsilon_{i,t}$$

and (1)

$$factor_{i,t} = \alpha + \beta * \Delta SP_{i,t} + \gamma * control_t + \varepsilon_{i,t} ,$$

where $factor_{i,t}$ is the characteristic $i$-based factor return from time $t$-1 to $t$ and $\Delta SP_{i,t}$ is the change in foreign spread of characteristic $i$ from time $t$-1 to $t$. As a control variable, we include the size spread change. When $\Delta SP_{i,t}$ is the change in the size spread, we include the BM spread change as control. Of course, we also estimate the regressions without the size (BM) control and report their results. Considering the speed at which foreign equity capital moves, we relate annual, semi-annual, or quarterly changes in foreign spreads to the corresponding factor returns at the respective frequencies. The regression $t$-statistics are based on White (1980).

Table 3 reports the regression results. Note that the table only reports the coefficient on $\Delta SP_{i,t}$. Also note that Models (1) and (3) are the specification in which there is no size (BM) spread control, while Models (2) and (4) control for the change in size (BM) spread. On a different note, Models (1) and (2) use the monthly rebalanced factor returns, while Model (3) and (4) are with the annually rebalanced factor returns. Finally, the annual-, semiannual-, and quarterly-frequency results are reported in the left-end, middle, and right-end panels, respectively.

The most notable result in Table 3 is the negative association between the volatility spread and the scaled IVOL factor return. This finding is robust to using three data frequencies (across the left-end, the middle, and the right-end panels), and is not sensitive to the frequency at which the IVOL factor is rebalanced (Models (1) & (2) vs. (3) & (4)). It is also reassuring that controlling for size spread changes hardly affects the association between the volatility spread change and the scaled IVOL factor return (Models (1) & (3) vs. (2) & (4)). This result means that foreign equity capital flows to low-IVOL stocks and from high-IVOL stocks when the volatility gap between the two groups of stocks widens, *or* when their return differential enlarges for other reasons besides the volatility changes, *or both*.

Equally worth noting is the finding that the un-scaled IVOL factor is mostly *un*related to the change in IVOL spread. It thus follows that foreign equity capital moves to low-IVOL stocks and from high-IVOL stocks *only when* the volatility gap between low- and high-IVOL stocks widens; and *not when* their return differential enlarges for other reasons besides the volatility gap changes. Put differently, changes in return dispersion that are not associated with changes in volatility are not associated with foreign equity capital flows.

Besides the idiosyncratic volatility, there is no other firm characteristic whose spread change is reliably related to the corresponding factor return. While the reversal (REV) and momentum (MOM) factor returns are at times associated respectively with the spread change in past-month returns and in past 2-to-6-month returns, those associations are not robust to different specifications. It is likely that those intermittent associations are driven by the price changes in stocks to which foreign equity capital is allocated. For example, some stocks may have volatile returns and identify themselves as a loser stock in one month and a winner stock in another month; consequently, the foreign spread of past-month return could change even if foreign equity capital remains stable.

3.3.2. Robustness check with purged factor returns

The immediate question regarding our IVOL-related result above is to what extent the movements of foreign equity capital into low-IVOL and out of high-IVOL stocks affects the volatility gap between the two groups of stocks. To gauge the extent of this endogeneity, we repeat our analysis with the *purged* factors from which the stocks that foreigners actively trade are excluded, as in Greenwood and Hanson (2012). Specifically, we exclude the stocks that foreigners actively trade vis-à-vis locals during a month—as measured by changes in foreign ownership—from the factor return computation for that month, while keeping the original breakpoints that are based on all stocks. Consequently, the purged factor return is free from any effects stemming from the movements of foreign equity capital in the market.

As shown in Table 4, the negative relation of the volatility spread change to the scaled IVOL factor return is remarkably robust to using this alternative factor returns. The result thus means that the movement of foreign equity capital into low-IVOL (out of high-IVOL) stocks does not affect the volatility gap between the two groups of stocks. Instead, foreign equity capital follows the volatility changes or the movements of the capital occur simultaneously with the volatility changes.

3.3.3. Robustness check with residual factor returns

Another possible concern is whether the observed association is attributable to the IVOL factor. To address this concern, we replace the dependent variable in Eq. (1) with the residuals from the following regression.

$$factor_{i,t} = \alpha_i + \sum_{i \neq j} \beta_{ij} * factor_{j,t} + \varepsilon_{i,t}, \qquad (2)$$

where $factor_{i,t}$ is the return on factor $i$ in month $t$. Thus, the residuals from the above regression are part of factor $i$'s return that is unrelated to other factor returns. We estimate this regression for each factor using the original (i.e., not purged) factor returns at monthly frequencies. We employ this 2-stage approach because the data frequency of spread change is only up to quarterly and, hence, Eq. (1) cannot accommodate many regressors.

The results in Table 5 show that changes in the volatility spread are associated with the IVOL factor return that is independent of other factor returns. While the statistical significance weakens at times, it is attributable to the fact that the dependent variable is based on a variable whose mean is forced to be zero over the entire study period. As we compound this variable to construct the annual (May-April), the semiannual (May-September, October-April), and the quarterly (January-March, April-June, July-September, October-December) factor returns, a non-negligible amount of information loss is inevitable, especially in longer-horizon data. The stronger and ever-significant quarterly results, for which such information loss is less severe, indirectly support our conjecture and also ensure the robustness of the relationship between the IVOL spread change and the residual IVOL factor return.

3.3.4. Robustness check with top-leg of foreign spread

To further investigate into the relation between the spread changes and factor returns, we separately examine the top quintile leg of the spread. Specifically, we associate the annual, semiannual, or quarterly change in the top foreign market-cap stocks' decile value for a given firm characteristic with the corresponding factor return. With this top-leg-only analysis, we want to see whether the negative relation between the IVOL spread changes and the IVOL factor returns is truly stemming from foreign equity capital moving along the dimension of idiosyncratic volatility. Since our top-leg-only analysis intentionally ignores half of those capital movements, the results are expected to be weaker.

Table 6 shows that the relation of the IVOL factor returns to the change in the top foreign market-cap stocks' decile value of IVOL are noticeably weaker. It thus follows that the earlier observed negative association between the IVOL spread change and the IVOL factor return is driven not only by foreign equity capital flowing into low-IVOL stocks but also the capital flowing out of high-IVOL stocks. In other words, foreign equity capital actively flows in the dimension of firm-specific return volatility.

*3.4. Foreigner-mimicking portfolio*

A potential issue in the preceding analysis is the low frequency of data. We improve on this problem by constructing a portfolio that mimics the allocation of foreign equity capital across domestic stocks and using the *monthly* return on this mimicking portfolio. Specifically, we weight domestic stocks by their market capitalization held by foreign equity capital ("foreign market capitalization"). For example, if there are three stocks in the market and their market capitalizations held by foreigners are, respectively, 100 million, 200 million, and 300 million local currencies, then those stocks are weighted respectively by 1/6 (i.e., 100 million divided by (100 million+200 million+300 million)), 2/6, and 3/6. That is, the portfolio replicates the way that foreign equity capital, which is worth 600 million altogether, is allocated across the three domestic stocks. We refer to this portfolio as FOREIGN. As a benchmark, we similarly construct a portfolio that mimics the asset allocation of *domestic* equity capital, and call this portfolio LOCAL. Finally, we examine the difference portfolio, FOREIGN minus LOCAL, which we name DIFF.

Table 7 reports the summary statistics of FOREIGN, LOCAL, and DIFF. To put their moments into perspective, we also examine the equally weighted portfolios of the top- and of the bottom-decile foreign-ownership stocks (i.e., those with a high or low fraction of *shares* held by foreign equity capital), which are named "D10_ew" and D1_ew", respectively. The equally weighted portfolios show that the stocks to which foreign equity capital is allocated earn a lower average return than other stocks (1.1% vs. 2.5% in a typical month), as noted by earlier studies (e.g., Jung, Lee, and Park 2009). Interestingly, however, no such difference in mean return is found between our two mimicking portfolios (i.e., FOREIGN and LOCAL). In fact, the mean return on FOREIGN is slightly higher than that on LOCAL. A closer examination of the mean returns on the portfolios suggests domestic equity investors hold stocks that earn a high return in isolation but, in aggregate, domestic investors are not taking full advantage of the high-return potential of those stocks.

We now turn to the regression analysis. As the portfolio returns are at monthly frequencies, this analysis includes all factor returns in the same regression instead of using the residual factor returns.

### *3.5. Regressions of foreigner-mimicking portfolio returns on factor returns*

#### 3.5.1. Unconditional regressions

We estimate the following regression:

$$R_{pt} = \alpha + \sum_i \beta_{pi} * factor_{it} + \varepsilon_{pt}, \tag{3}$$

where $R_{pt}$ is the excess returns on FOREIGN, LOCAL, or DIFF in month $t$, and $factor_{it}$ is factor $i$'s return in month $t$. We employ two specifications for this estimation. In the first specification, we include the scaled IVOL and beta factors (IVOL and BAB), while the second specification substitutes them for the un-scaled IVOL and beta factors (UIVOL and UBAB). Besides the two volatility factors, we include in both specifications MKT_RF (market factor), SMB (size factor), HML (BM factor), TO (turnover factor), REV (reversal factor), and MOM (momentum factor). Regression $t$-statistics are based on White (1980).

Table 8 shows the regression results. We find that FOREIGN is positively and unconditionally loaded on the un-scaled IVOL factor (UIVOL), whereas LOCAL has an unconditional and negative exposure to that factor. The difference between the two mimicking portfolios, DIFF, has a statistically significant loading on UVIOL. This result is consistent with that in Table 1, which is that foreign equity capital is typically allocated to low-IVOL stocks. The movement of foreign equity capital, which we have examined in the preceding spread analysis, is however not readily detectable in this unconditional regression. It is because foreign equity capital *moves* along the low- and high-IVOL stocks (as shown in Tables 3 through 6). Such a movement would be detected only when the loading is allowed to change. We thus turn to *conditional* regressions in the next sub-section.

Before the conditional regression analysis, we point out several other noteworthy observations in the unconditional regressions. First, the scaled IVOL factor is insignificantly related to FOREIGN in this unconditional regression. While FOREIGN is negatively exposed to the scaled IVOL when the factor is constructed with annual rebalancing, this unconditional loading is not robust to using the monthly rebalanced IVOL factor. This should not be surprising, because foreign equity capital is already found to move with the volatility difference between low- and high-IVOL stocks. Consequently, FOREIGN is expected to have a conditional loading on the scaled IVOL factor, but not an unconditional loading. Second, FOREIGN is negatively loaded on SMB, which indicates that foreign capital leans toward large stocks. Third, FOREIGN is negatively loaded on HML, which attests to foreigners' preference for growth stocks. Fourth, LOCAL shows the exact opposite exposure to SMB and to HML: it is positively exposed to both SMB and HML.

Finally, we stress that, in the specifications with the scaled IVOL factor, both FOREIGN and LOCAL have a significant intercept. Specifically, FOREIGN has an "alpha" of 0.5% per month with a *t*-statistic of 3.311 (3.778 with annually rebalanced factors). The alpha estimate of LOCAL is smaller in magnitude, at the order of -0.2% per month, but it is statistically significant with a *t*-statistic of -2.882 (-3.294 with annually rebalanced factors). With the un-scaled IVOL factor, the alpha estimate tends to shrink but it is still statistically significant with the annually rebalanced factors. This means that the employed factors and the unconditional loadings on those factors are not fully explaining the returns accruing to those mimicking portfolios. While it could be that we have omitted some important factors, it is also conceivable that the loadings on the employed factors are asymmetric between when the factor return is positive and when it is negative. This observation further warrants a conditional regression to which we now turn.

### 3.5.2. Conditional regressions

We estimate the following regression:

$$R_{pt} = \alpha + \sum_i \beta_{pi} * factor_{it} + \sum_i \gamma_{pi} * factor_{it} * factor\_up + \varepsilon_{pt}, \tag{4}$$

where $R_{pt}$ is the excess returns on FOREIGN, LOCAL, or DIFF in month $t$, and $factor_{it}$ is factor $i$'s return in month $t$. In addition, *factor_up* is a dummy variable that takes a value of 1 when the factor return in month $t$ is positive. This regression is a modified version of Grundy and Martin's (2001; p.48) specification.

Table 9 reports the results. The most important finding in this analysis is the conditional loading of FOREIGN on the scaled IVOL factor, but not on the un-scaled one. More precisely, the foreigner-mimicking portfolio is negatively loaded on IVOL when this factor has a negative realization; when IVOL has a positive return, the portfolio's loading is significantly different than when IVOL is negative. The portfolio that mimics domestic equity capital, namely, LOCAL, shows the exact opposite pattern. The conditional loading *only* on the scaled IVOL factor is completely consistent with the results of the spread analysis. Besides the scaled IVOL factor, FOREIGN is conditionally exposed to the turnover factor (TO). However, given the magnitude of the coefficients and the size of the factor premium, the conditional loading on IVOL is deemed the main source of return for foreign equity capital. Related, we also note that the intercept is now insignificant in all specifications. That is, the conditional factor loadings turn out to be useful in understanding the allocation of domestic and foreign equity capital and their performance.

No robust loadings on the past-return factors, namely, REV and MOM, might come as a surprise to some observers, since foreign equity investors are stereotyped as "momentum traders" in the literature. We remind the reader that such characterization is based mostly on the time-series result: when a domestic market rises, more equity capital flows into the market (e.g., Froot, O'Connell, and Seasholes 2001; Griffin, Nardari, and Stulz 2004). In the cross-section within a domestic market, there is little evidence of return chasing by foreigners.[6] In our conditional regression analysis, FOREIGN is positively loaded on REV only when this factor has a positive realization and is annually rebalanced. Similarly, FOREIGN is negatively loaded on MOM only

[6] For example, Dahlquist et al. (2001) find no evidence that foreigners prefers (and thus hold) stocks whose return was high recently. In fact, their paper has no mentioning of the "trend-chasing" behavior of foreign investors. Kang and Stulz (1997) also find no evidence of momentum trading by foreigners, as they find the "excess return" is not significant in the cross-sectional regression for foreign ownership. (They find that, in a random-effect panel regression, the variable becomes significant and positive.) While Kang, Lee, and Park (2010) find that foreigner tend to hold stocks that have performed well in recent past, such performance-contingent holdings are observed only when the performance is evaluated by a foreign benchmark. When a local benchmark is used, the opposite pattern is observed. It is true that Grinblatt and Kelohaju (2000) find that foreign investors are momentum traders. Note that their results are based on 16 Finnish stocks for a 2-year period (1995-1996). Of those 16 stocks, foreigners are found to buy more of winner stocks than loser stocks. Thus, their results are not readily generalized to the momentum trading based on the entire cross-section. In sum, our finding of no loading on MOM is not surprising.

when it is positive and rebalanced annually. Taken together, it is safe to conclude that there is little evidence that foreign equity capital is a return chaser in the cross-section of domestic stock market.

3.5.3. Robustness check with purged factor returns

As in the spread analysis, we employ the purged factor returns to ensure the robustness of our results. The goal of this robustness check is, again, to show that the observed conditional loading on the IVOL factor is not caused by foreign equity capital flowing into low-IVOL stocks and causing the volatility of those stocks to decrease further. Table 10 reports the regression results with the purged factors. To save space, we only report the results for the conditional regressions with the scaled IVOL factor. The results are qualitatively identical to those with the original factor returns. That is, there is strong evidence of the conditional loading on the scaled IVOL factor for FOREIGN. Besides, there is some indication that FOREIGN is conditionally loaded on MOM and on REV, while LOCAL is conditionally loaded on the monthly rebalanced MOM. The two mimicking portfolios show a conditional loading on HML, but only when this factor is rebalanced annually.

## 4. Why are foreigners better positioned to earn the IVOL factor premium?

In this section, we discuss why the IVOL factor premium is earned by foreign, as opposed to domestic, equity capital. That is, why do low-IVOL stocks end up being held by foreigners? In discussing this issue, we will also address the generalizability of our interpretations as our results are coming from a single country.

We view our results as stemming from the interaction between domestic and foreign equity capital. At least in the country that we study, foreign equity investors lack firm-specific private information (e.g., Choe, Kho, and Stulz 2005). Absent private information, foreign investors cannot make a concentrated bet and, instead, they need to construct a well-diversified portfolio. What this means is that large firm-specific stock-return volatility, which is directly related to the stock's expected lottery-type payoffs (Boyer, Mitton, and Vorkink 2010), is not the return source that foreigners can utilize. On the other hand, domestic equity capital has better access to firm-specific private information and therefore readily embraces firm-specific volatility as a profit opportunity. Consequently, domestic equity capital is led to high-IVOL stocks whereas foreign equity capital is directed to low-IVOL stocks. In words, the idiosyncratic volatility is the very dimension in which domestic and foreign equity investors are in different situations, and those different positions are stemming from the firm-level information asymmetries between locals and foreigners.

A question then arises as to why there is an average-return differential between low- and high-IVOL stocks. Since high-IVOL stocks underperform low-IVOL stocks, one can conjecture that the return differential occurs when the marginal investors are domestic investors who demand high-IVOL stocks. Temporarily withholding the issue of whether domestic investors bid up the prices of high-IVOL stocks rationally or irrationally, we first empirically verify this conjecture. We do so by constructing a portfolio in which domestic stocks are weighted by the fraction of their *shares* held by foreign equity capital, and examining the portfolio's loading on the IVOL factor. For example, if there are three stocks in the market and 10%, 30%, and 60% of their shares are held by foreigners, then this portfolio weights the three stocks by 1/10, 3/10, and 6/10, respectively. The idea is that, with a higher fraction of shares held by foreigners, the marginal investor is more likely to be a foreigner rather than a local. Thus, this portfolio can help gauge the price-setting role of foreigners—and that of locals as well—in the context of their exposures to the IVOL factor. As shown in Table 11, the loading of this portfolio on the scaled IVOL factor is exactly the opposite to the one with the portfolio that mimics the allocation of foreign equity capital (i.e., FOREIGN). That is, the earlier findings with FOREIGN are stemming from domestic equity investors being the price-setting, marginal investors.

Indeed, there is no consensus on the source(s) of the average return differential between low- and high-IVOL stocks (e.g., Hou and Roh 2012). It could be that they irrationally bid up the price of those high-volatility stocks and cause a subsequent correction (i.e., a drop in price). Or, it might be occurring in the rational setting, in which the preference for lottery-type payoffs of high-IVOL stocks is priced and affects their expected returns. We do not take a stand between those two alternative explanations. Instead, we argue that the particular type of information asymmetries between locals and foreigners makes foreigners better positioned to take on this factor risk *and/or* to exploit this mispricing. More specifically, if the high-IVOL stocks are overvalued by locals, then foreigners are in a better position to exploit this mispricing because they are relatively immune to the psychological bias responsible for those misevaluations. That is, it is because foreigners do not consider themselves to be at an informational advantage and thus stay away from jackpot-like high-IVOL stocks. And it is *not* because foreign equity investors are smarter or more sophisticated. What if the lottery-type payoffs of high-IVOL stocks are rationally priced and thus reduce their equilibrium expected return relative to that of low-IVOL stocks? If so, then foreigners are again better positioned to earn this factor premium, because foreigners are willing to yield the potential for large payoffs of high-IVOL stocks to domestic investors in return for the higher average return on low-IVOL stocks.

Our interpretation is very closely related to Ang (2012) in his discussion on factor investing. According to Ang, the investor does not care whether a given factor premium arises rationally or not. What is relevant for her is whether she is able to take advantage of this cross-sectional return dispersion. That is, the question for her is whether she is any different from the marginal or price-setting investor who causes this return dispersion to arise in the first place. If the factor premium is due to the marginal investor's, say, overconfidence, then the question is whether she is not subject to such a behavioral mistake. If the factor premium is the genuine risk premium, then the question for her is whether she can better handle the "bad times" associated with this particular risk. In accordance with Ang (2012), our argument is that the inferior access to firm-specific private information puts foreigners in a better position to utilize the difference in average return between low- and high-IVOL stocks, compared to locals who have superior access to firm-specific private information. The informational disadvantage of foreign equity investors discourages them from holding high-IVOL stocks and also makes their foregoing of the jackpot-like payoffs of high-IVOL stocks less costly.

The interpretation above is also consistent with one of our findings, namely, that domestic equity capital has an unconditional exposure to the value factor. More specifically, the portfolio that replicates the asset allocation of domestic equity capital (LOCAL) is positively loaded on the BM factor, unconditionally. This is consistent with the notion that domestic equity investors as a whole specialize in mispriced stocks with their superior access to firm-specific private information.

While our results are based on a single country, our interpretations have a broader implication. To the extent that there are information asymmetries between locals and foreigners in terms of their access to firm-level private information, our interpretation is applicable to other countries. Also, unless foreign equity investors dominate the domestic stock market and set the prices of all domestic stocks (which is very unlikely), the patterns we find in Korea are expected to be present in other countries.

## 5. Conclusions

This paper examines factor exposures of foreign equity capital in domestic stock market, using data from Korea for the period from 1999 to 2013. Our findings are: (1) foreign equity capital is typically allocated to low-IVOL stocks, thereby earning the return differential between low- and high-IVOL stocks; and (2) foreign equity capital flows more into low-IVOL stock when their volatility gap against high-IVOL stocks widens, and vice versa. We find those results both by directly examining foreign equity capital and its flows within the market and by examining the portfolio that mimics the allocation and movements of foreign equity capital.

We interpret our results as an outcome of the interaction between domestic and foreign equity capital that have differential access to firm-specific private information. Specifically, with better access to firm-specific private information, domestic equity capital is attracted to high-IVOL stocks that have the potential for lottery-type payoffs. In contrast, foreign equity capital lacks such an informational edge at the individual firm level and is therefore directed to low-IVOL stocks. While the source of the return differential between low- and high-IVOL stocks is not obvious, our results suggest that foreign equity capital is better positioned to exploit this return differential, either because foreigners are not subject to the psychological biases responsible for the overvaluation of high-IVOL stocks, or because foreigners are willing to yield the potential for lottery-type payoffs of high-IVOL stocks to locals, or both. After all, it is true that foreign equity investors do not consider themselves to be informationally advantaged at the individual firm level and thus passing up some jackpot-type payoffs in some stocks is not as painful to them as it is to locals who think they have some private information.

## Appendix. Factor construction

Through the analyses, the market portfolio is proxied by value-weighted average returns on all stocks listed in the KOSPI market, rebalanced monthly. The market factor, MKT_RF, is accordingly constructed as returns on the market portfolio in excess of monthly call rates.

Other factor portfolios constructed in Korean stock market are separately mimicking the following firms' characteristics. SMB is based on market capitalization on firms' common equity. HML is mimicking firms' BE/ME ratio, which is computed as (shareholders' equity – preferred stocks)/market capitalization on common equity, where shareholders' equity is in the most recent year end to the market capitalization. TO is a factor portfolio mimicking turnover rate, which is computed as accumulated trading volume in each month divided by the average number of common shares outstanding in that month. REV is a mimicking portfolio based on firms' past-month return. MOM is a momentum factor based on firms' cumulative returns over the past 5 months, allowing for one-month gap between the ranking period and computation period. According to Frazzini and Pedersen (2014) and Ang (2012), we construct a scaled BAB factor (Betting-Against-Beta) mimicking firms' beta, and a scaled IVOL factor based on firms' idiosyncratic volatility.[7] By comparison, we also construct un-scaled UBAB and UIVOL factors. Firms' pre-ranking betas and idiosyncratic volatility are estimated by running the market model over a rolling 36-month window for each stock, where beta is the coefficient on the market factor, and idiosyncratic volatility is the standard deviation of the regression residuals. Only stocks which have at least 36 observations are included in the regression.

We construct size-neutral factor portfolios rebalanced monthly or annually, following Fama and French (1992, 1993), and Greenwood and Hanson (2012). Specifically, the set of monthly rebalanced size-neutral factors are constructed in the following ways. In each month t, all stocks

[7] According to Frazzini and Pedersen (2014), and Ang (2012), a BAB (Betting-Against-Beta) factor is a portfolio holding low-beta assets and shorting high-beta assets, which has a positive average return. Ang (2012) proposes a VOL (volatility) factor, which is based on firms' idiosyncratic volatility. The construction of VOL is in a similar way to BAB factor.

are sorted into two groups (Small and Big) based on the median of all listed stocks' market capitalization in month t, then an independent sorting is done based on firms' another characteristic denoted as X, where X stands for BE/ME ratio, turnover rate, past one-month return, past five-month cumulative return with one-month between the ranking period and the computation period, beta, and idiosyncratic volatility. In constructing HML factor, we drop stocks with non-positive common equity. In constructing TO factor, we exclude stocks with non-positive turnover rate. Stocks are independently sorted into three groups (High 30%, Medium 40%, and Low 30%) based on X. By intersecting the two groups of size and three groups of X, six portfolios are constructed, which are SH, SM, SL, BH, BM, BL. Value-weighted average returns on each portfolio are computed in each month, whereas beta weighted and volatility weighted portfolio returns are separately calculated in the case of constructing scaled BAB factor and scaled IVOL factor. Finally, SMB is the size factor constructed in the intersection of three groups based on BE/ME, computed as [(SH+SM+SL)/3 - (BH+BM+BL)/3]. HML and MOM are computed as [(SH+BH)/2 – (SL+BL)/2], which is High minus Low. TO, REV, BAB (scaled factor) and UBAB (un-scaled factor), and IVOL (scaled factor) and UIVOL (un-scaled factor) are computed as [(SL+BL)/2 - (SH+BH)/2], which is Low minus High. Particularly, UBAB and UIVOL are constructed in Fama and French (1992, 1993)'s way, whose returns are value weighted and un-scaled. Following Frazzini and Pedersen (2014) and Ang (2012), we also compute a scaled BAB factor as follows:

$$
\begin{aligned}
BAB_{t+1} &= \{\frac{R(SH)_{t+1} - R_f}{\beta(SH)_t} + \frac{R(BH)_{t+1} - R_f}{\beta(BH)_t}\}/2 \\
&- \{\frac{R(SL)_{t+1} - R_f}{\beta(SL)_t} + \frac{R(BL)_{t+1} - R_f}{\beta(BL)_t}\}/2
\end{aligned}
$$

where, $R(p)_{t+1}$ is the average return on each portfolio weighted by ranked beta(t), and $\beta(p)_t$ is average betas of each portfolio weighted by beta(t); p stands for SH, BH, SL and BL. A scaled IVOL factor is calculated as follows:

$$IVOL_{t+1} = \sigma_{target} * \{\frac{R(SH)_{t+1} - R_f}{\sigma(SH)_t} + \frac{R(BH)_{t+1} - R_f}{\sigma(BH)_t}\}/2$$
$$- \sigma_{target} * \{\frac{R(SL)_{t+1} - R_f}{\sigma(SL)_t} + \frac{R(BL)_{t+1} - R_f}{\sigma(BL)_t}\}/2$$

where, $R(p)_{t+1}$ is average return on each portfolio weighted by ranked ivol(t), and $\sigma(p)_t$ is average ivols of each portfolio weighted by ivol(t); p stands for SH, BH, SL and BL. $\sigma_{target}$ is the target volatility and set to be 10%. [8] We admit that the setting of the target volatility is rather arbitrary. We also tried to set the target to be 5% or 15%, in which cases the results are not changed much.

Finally, to make the results comparable, we also construct a set of annually rebalanced size-neutral factors. Those annually rebalanced factors are rebalanced at the end of April each year.[9] Specifically, in April of year t, we sort all stocks into two groups based on their market capitalization at the end of April, and independently sort stocks into three groups based on another characteristic as following. In constructing HML, we drop stocks with non-positive book value of common equity, and sort stocks based on the previous year-end BE/ME ratio in year t-1. In constructing TO, we exclude stocks with non-positive turnover rate, and sort stocks based on the average monthly turnover rate over one-year period from May of year t-1 to April of year t. In constructing REV, we sort stocks based on firms' monthly returns in April of year t. In the construction of MOM, we sort stocks based on firms' five-month cumulative returns which are accumulated from November of year t-1 to March of year t. In the construction of BAB and UBAB, and IVOL and UIVOL, we independently sort stocks based on firms' average betas and idiosyncratic volatility over one-year period from May of year t-1 to April of year t. Thereafter, in each case six portfolios are constructed by intersection. Weighted returns on each portfolio are

[8] Ang (2012) arbitrarily sets the target volatility to be 15% in US stock market.
[9] We assume that in the KOSPI market all firms' annual statements are officially disclosed and publicly accessible by all investors at the end of April, thus we rebalance the factors in April each year. This is in line with Hahn and Yoon (2013). Kim et al. (2012), however, in their paper do the April-March cycle for portfolio rebalancing, by assuming that investors are informed of accounting information at the end of March.

computed in each month from May of year t to April of year t+1. At the end of April in year t+1, all portfolios are re-ranked. The computation of each portfolio is the same as the monthly factors.

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Table 1

Summary statistics of foreign spreads

The table reports summary statistics of foreign equity capital along certain firm characteristics, which we call "foreign spreads." Foreign spreads are computed in the following ways. In each month t, we sort all stocks into quintiles based on the end-of-month market capitalization held by foreign equity capital (a.k.a. the "foreign market capitalization"), then we independently sort all stocks into deciles based on firms' characteristic X, where X stands for the total market capitalization, BE/ME ratio, turnover ratio, the current-month return, past 1-to-5-month return, beta, or idiosyncratic volatility. Thereafter, we compute the average decile value of X in each quintile sorted by foreign market capitalization. Finally, foreign spread of X (SP_X) is computed as the difference between the average decile value of X in the top quintile and that in the bottom quintile of foreign market capitalization. Panel A reports summary statistics for the monthly constructed foreign spread of X over the sample period. Panel B are summary statistics of characteristic X's average decile value in the top quintile of foreign market capitalization.

Panel A: Foreign spreads

| Stats | SP_size | SP _btm | SP _to | SP _rev | SP _mom | SP _beta | SP _ivol |
|---|---|---|---|---|---|---|---|
| N | 176 | 176 | 176 | 176 | 176 | 176 | 176 |
| Mean | 6.608 | -2.169 | -0.407 | 0.494 | 0.895 | 1.264 | -2.911 |
| Std dev | 0.432 | 0.569 | 0.811 | 1.117 | 1.201 | 0.849 | 0.599 |
| Min | 5.489 | -3.449 | -2.529 | -2.525 | -1.814 | -0.199 | -4.217 |
| Median | 6.820 | -2.194 | -0.329 | 0.561 | 0.914 | 1.174 | -3.083 |
| Max | 7.152 | -0.817 | 1.489 | 3.224 | 3.700 | 3.512 | -1.130 |

Panel B: Firms' characteristics in the top quintile of foreign market capitalization

| Stats | SP_size | SP _btm | SP _to | SP _rev | SP _mom | SP _beta | SP _ivol |
|---|---|---|---|---|---|---|---|
| N | 176 | 176 | 176 | 176 | 176 | 176 | 176 |
| Mean | 8.238 | 2.786 | 4.402 | 4.796 | 4.999 | 5.100 | 2.812 |
| Std dev | 0.138 | 0.391 | 0.624 | 0.694 | 0.801 | 0.585 | 0.336 |
| Min | 7.843 | 2.079 | 2.885 | 2.853 | 3.208 | 4.070 | 2.143 |
| Median | 8.301 | 2.745 | 4.483 | 4.820 | 5.046 | 4.992 | 2.758 |
| Max | 8.377 | 4.020 | 5.739 | 6.681 | 6.683 | 6.286 | 3.699 |

Table 2

Summary statistics of the market and double-sorted factor portfolios

The table reports summary statistics of two sets of factor portfolios. Monthly and annually rebalanced factors are respectively reported in panel A and B. MKT_RF, rebalanced monthly, proxies for excess market returns, which are value-weighted average monthly returns on all listed stocks in excess of monthly call rates. Other monthly rebalanced factors are constructed based on independent double sortings in the following ways. In each month t, all stocks are sorted into two groups (Small and Big) based on the median of end-of-month market capitalization of all listed stocks in month t, then all stocks are independently sorted into three groups (High 30%, Medium 40%, and Low 30%) based on firms' another characteristic denoted as X, where X stands for BE/ME ratio, turnover rate, past-month return, past 2-to-6-month cumulative return, beta, and idiosyncratic volatility. By intersection of the two size-based groups and three X-based groups, six portfolios are constructed: SH, SM, SL, BH, BM, BL. Value-weighted average returns on each portfolio are computed in the following month t+1. Particularly, as elaborated in Appendix II, beta weighted and volatility weighted portfolio returns are separately calculated in constructing scaled BAB factor and IVOL factor. Finally, SMB is the size factor with the intersection of three groups based on BE/ME, computed as [(SH+SM+SL)/3 - (BH+BM+BL)/3]. HML (BE/ME based factor) and MOM (momentum factor) are computed as High minus Low, that is, [(SH+BH)/2 – (SL+BL)/2]. TO (turnover ratio based factor), REV (reversal factor based on past one-month return), BAB and UBAB (scaled and un-scaled Betting-Against-Beta factor), IVOL and UIVOL (scaled and un-scaled idiosyncratic volatility factor) are computed as Low minus High, that is, [(SL+BL)/2 - (SH+BH)/2]. The annually rebalanced factors are rebalanced at the end of April each year, following the same computation method as above.

Panel A: Summary statistics of monthly rebalanced factor portfolios

| Stats | MKT_RF | SMB | HML | TO | REV | MOM | BAB | IVOL | UBAB | UIVOL |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 176 | 176 | 176 | 176 | 176 | 176 | 176 | 176 | 176 | 176 |
| Mean | 0.008 | -0.001 | 0.020 | 0.007 | 0.003 | 0.001 | 0.024 | 0.022 | 0.001 | 0.018 |
| Std dev | 0.077 | 0.057 | 0.045 | 0.052 | 0.055 | 0.050 | 0.099 | 0.052 | 0.052 | 0.052 |
| Min | -0.226 | -0.163 | -0.165 | -0.158 | -0.128 | -0.207 | -0.332 | -0.167 | -0.208 | -0.133 |
| Median | 0.009 | -0.005 | 0.019 | 0.011 | 0.004 | 0.001 | 0.025 | 0.020 | 0.003 | 0.017 |
| Max | 0.226 | 0.224 | 0.219 | 0.205 | 0.332 | 0.166 | 0.418 | 0.211 | 0.235 | 0.213 |
| T value | 1.350 | -0.176 | 5.921 | 1.666 | 0.744 | 0.362 | 3.259 | 5.684 | 0.232 | 4.436 |

Panel B: Summary statistics of annually rebalanced factor portfolios

| Stats | MKT_RF | SMB | HML | TO | REV | MOM | BAB | IVOL | UBAB | UIVOL |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 176 | 176 | 176 | 176 | 176 | 176 | 176 | 176 | 176 | 176 |
| Mean | 0.008 | 0.000 | 0.014 | 0.010 | -0.001 | 0.002 | 0.021 | 0.018 | 0.001 | 0.013 |
| Std dev | 0.077 | 0.058 | 0.045 | 0.050 | 0.038 | 0.042 | 0.087 | 0.052 | 0.045 | 0.052 |
| Min | -0.226 | -0.162 | -0.156 | -0.216 | -0.131 | -0.106 | -0.269 | -0.179 | -0.133 | -0.196 |
| Median | 0.009 | -0.005 | 0.013 | 0.009 | -0.002 | 0.003 | 0.017 | 0.012 | 0.001 | 0.011 |
| Max | 0.226 | 0.269 | 0.146 | 0.195 | 0.219 | 0.133 | 0.283 | 0.277 | 0.132 | 0.206 |
| T value | 1.350 | -0.099 | 3.996 | 2.669 | -0.221 | 0.691 | 3.193 | 4.655 | 0.358 | 3.201 |

## Table 3

## Regressions of cumulative factor returns on contemporaneous changes of foreign spreads

The table reports regression results from regressing annually, semi-annually, and quarterly cumulative factor returns on contemporaneous changes of foreign spreads. We compute annual, semi-annual, and quarterly factor returns by separately compounding monthly returns at annual frequency ending in April of each year, at semi-annual frequency ending in April or October of each year, and at quarterly frequency using March, June, September and October as breakpoints. We accordingly compute contemporaneous annual, semi-annual, and quarterly changes in foreign spreads. Changes of foreign spreads are computed as ΔSP_X (t+1) = SP_X (t+1) –SP_X (t), where X stands for market capitalization, BE/ME ratio, turnover ratio, the current-month return, past 1-to-5-month cumulative return, beta, and idiosyncratic volatility. In model (1) and (2) are results of monthly rebalanced factors. In model (3) and (4) are results of annually rebalanced factors. Under each set of factors, cumulative factor returns based on characteristic X are regressed on the relative changes of foreign spreads of X. Two specifications are estimated, the first including only ΔSP_X, which is shown in model (1) and (3), the second controlling ΔSP_size, while controlling ΔSP_btm in the case of regressions on ΔSP_size, shown in model (2) and (4). Particularly, ΔSP_beta and ΔSP_ivol are coefficients from separate regressions of scaled BAB and IVOL, whereas $\Delta SP\_beta^{U}$ and $\Delta SP\_ivol^{U}$ at the bottom are coefficients from separate regressions of un-scaled BAB and IVOL. Robust t-statistics are reported in brackets. * and ** indicate the 5% and 1% significance level respectively.

| | Annual returns and changes of foreign spreads | | | | Semi-annual returns and changes of foreign spreads | | | | Quarterly returns and changes of foreign spreads | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Monthly rebalanced | | Annually rebalanced | | Monthly rebalanced | | Annually rebalanced | | Monthly rebalanced | | Annually rebalanced | |
| Model | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| ΔSP_size | -0.484 | -0.329 | -0.278 | -0.099 | -0.270 | -0.127 | -0.191 | -0.028 | -0.260** | -0.074 | -0.219** | -0.034 |
| | [-1.906] | [-1.185] | [-0.977] | [-0.340] | [-1.776] | [-0.970] | [-0.915] | [-0.139] | [-3.097] | [-1.250] | [-2.824] | [-0.658] |
| ΔSP_btm | -0.322* | -0.228 | -0.241* | -0.198 | -0.073 | 0.016 | -0.123* | -0.070 | -0.021 | -0.006 | -0.025 | -0.015 |
| | [-2.488] | [-1.432] | [-2.757] | [-1.489] | [-1.313] | [0.144] | [-2.157] | [-0.905] | [-0.437] | [-0.120] | [-0.528] | [-0.284] |
| ΔSP_to | -0.015 | -0.018 | -0.000 | -0.008 | 0.010 | -0.002 | 0.002 | -0.009 | 0.038 | 0.037 | 0.028* | 0.025* |
| | [-0.794] | [-0.745] | [-0.017] | [-0.463] | [0.366] | [-0.070] | [0.089] | [-0.379] | [1.932] | [1.884] | [2.394] | [2.185] |
| ΔSP_rev | 0.045* | 0.038 | -0.032 | -0.031 | -0.018 | 0.002 | -0.006 | -0.019 | -0.019 | -0.018 | -0.007 | -0.008 |
| | [2.221] | [2.163] | [-0.839] | [-0.689] | [-1.231] | [0.134] | [-0.283] | [-1.262] | [-1.196] | [-1.137] | [-1.285] | [-1.292] |
| ΔSP_mom | 0.045* | 0.045 | 0.059 | 0.059 | 0.028* | 0.030* | 0.041* | 0.045* | 0.009 | 0.008 | 0.002 | 0.001 |
| | [2.235] | [2.022] | [1.967] | [2.062] | [2.436] | [2.684] | [2.264] | [2.319] | [1.110] | [1.042] | [0.257] | [0.103] |
| ΔSP_beta | -0.229 | -0.304 | -0.206 | -0.296* | 0.003 | -0.005 | -0.022 | -0.027 | 0.069 | 0.060 | 0.037 | 0.025 |
| | [-1.400] | [-1.737] | [-1.572] | [-2.324] | [0.018] | [-0.040] | [-0.177] | [-0.231] | [0.980] | [0.892] | [0.591] | [0.399] |
| ΔSP_ivol | -0.293** | -0.432** | -0.313* | -0.481** | -0.254** | -0.327** | -0.305** | -0.419** | -0.117* | -0.113* | -0.108* | -0.105* |
| | [-3.074] | [-6.489] | [-2.648] | [-4.263] | [-3.327] | [-5.640] | [-2.799] | [-3.804] | [-2.325] | [-2.238] | [-2.229] | [-2.154] |
| $\Delta SP\_beta^{U}$ | -0.090 | -0.064 | -0.092 | -0.090 | -0.081 | -0.080 | -0.048 | -0.049 | 0.003 | 0.005 | 0.026 | 0.028 |
| | [-1.765] | [-1.180] | [-1.575] | [-1.564] | [-2.013] | [-1.950] | [-1.221] | [-1.571] | [0.155] | [0.275] | [1.305] | [1.300] |
| $\Delta SP\_ivol^{U}$ | 0.137 | 0.144 | 0.162* | 0.172 | 0.126 | 0.123 | 0.128** | 0.130** | 0.045 | 0.047 | 0.038 | 0.042 |
| | [1.188] | [1.283] | [2.223] | [2.037] | [1.926] | [1.865] | [2.844] | [2.937] | [1.243] | [1.302] | [0.963] | [1.109] |
| Obs in each regression | 15 | 15 | 15 | 15 | 29 | 29 | 29 | 29 | 58 | 58 | 58 | 58 |

Table 4

Regressions of cumulative purged-factor returns on contemporaneous changes of foreign spreads

The table reports regression results from regressing annually, semi-annually, and quarterly cumulative purged-factor returns on contemporaneous changes of foreign spreads. In the construction of purged factors, we first rank all stocks into deciles based on foreign ownership change ratio, which is computed as FOCR=($FO_t$ - $FO_{t-1}$) / $FO_{t-1}$; then we exclude those stocks in the top and bottom deciles, using the remaining stocks to construct the seven mimicking portfolios in the same ways as not purged ones. Purged factors are rebalanced either monthly or annually. We compute annual, semi-annual, and quarterly factor returns by separately compounding monthly returns at annual frequency ending in April of each year, at semi-annual frequency ending in April or October of each year, and at quarterly frequency using March, June, September and October as breakpoints. We accordingly compute contemporaneous annual, semi-annual, and quarterly changes in foreign spreads. Changes of foreign spreads are computed as ΔSP_X (t+1) = SP_X (t+1) – SP_X (t). In model (1) and (2) are results of monthly rebalanced factors. In model (3) and (4) are results of annually rebalanced factors. Under each set of factors, cumulative factor returns based on characteristic X are regressed on the relative changes of foreign spreads of X. Two specifications are estimated, the first including only ΔSP_X shown in model (1) and (3), the second controlling ΔSP_size, while controlling ΔSP_btm in the case of regressions on ΔSP_size, shown in model (2) and (4). Robust t-statistics are reported in brackets. * and ** indicate the 5% and 1% significance level respectively.

| Model | Annual returns and changes of foreign spreads | | | | Semi-annual returns and changes of foreign spreads | | | | Quarterly returns and changes of foreign spreads | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Monthly rebalanced | | Annually rebalanced | | Monthly rebalanced | | Annually rebalanced | | Monthly rebalanced | | Annually rebalanced | |
| | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| ΔSP_size | -0.523 | -0.386 | -0.255 | -0.024 | -0.261 | -0.128 | -0.192 | -0.008 | -0.235** | -0.044 | -0.215** | -0.039 |
| | [-2.139] | [-1.458] | [-0.884] | [-0.081] | [-1.596] | [-0.851] | [-0.914] | [-0.041] | [-2.819] | [-0.704] | [-2.814] | [-0.722] |
| ΔSP_btm | -0.326* | -0.227 | -0.250* | -0.221 | -0.081 | 0.005 | -0.128 | -0.081 | -0.018 | -0.002 | -0.028 | -0.017 |
| | [-2.690] | [-1.424] | [-2.473] | [-1.506] | [-1.406] | [0.051] | [-1.989] | [-0.924] | [-0.357] | [-0.034] | [-0.542] | [-0.318] |
| ΔSP_to | 0.006 | 0.003 | -0.008 | -0.013 | 0.012 | -0.001 | 0.002 | -0.007 | 0.041 | 0.040 | 0.033* | 0.029* |
| | [0.215] | [0.095] | [-0.579] | [-0.739] | [0.480] | [-0.049] | [0.070] | [-0.324] | [1.982] | [1.938] | [2.385] | [2.182] |
| ΔSP_rev | 0.055* | 0.051 | -0.029 | -0.025 | -0.010 | 0.010 | 0.001 | -0.017 | -0.019 | -0.016 | -0.006 | -0.007 |
| | [2.313] | [2.175] | [-0.915] | [-0.591] | [-0.744] | [0.592] | [0.055] | [-1.178] | [-1.060] | [-0.993] | [-1.004] | [-1.096] |
| ΔSP_mom | 0.049* | 0.049* | 0.061 | 0.061 | 0.033* | 0.038** | 0.048* | 0.052* | 0.008 | 0.007 | 0.005 | 0.003 |
| | [2.252] | [2.204] | [2.037] | [2.071] | [2.596] | [3.203] | [2.322] | [2.234] | [1.054] | [0.956] | [0.562] | [0.390] |
| ΔSP_beta | -0.186 | -0.274 | -0.162 | -0.256* | 0.020 | 0.012 | -0.004 | -0.010 | 0.069 | 0.060 | 0.026 | 0.016 |
| | [-1.111] | [-1.564] | [-1.337] | [-2.337] | [0.143] | [0.096] | [-0.036] | [-0.088] | [1.024] | [0.935] | [0.424] | [0.256] |
| ΔSP_ivol | -0.275** | -0.410** | -0.252* | -0.408** | -0.240** | -0.312** | -0.258* | -0.359** | -0.108* | -0.104* | -0.096* | -0.094* |
| | [-3.362] | [-6.859] | [-2.338] | [-3.832] | [-3.244] | [-5.882] | [-2.588] | [-3.585] | [-2.220] | [-2.138] | [-2.135] | [-2.068] |
| Obs in each regression | 15 | 15 | 15 | 15 | 29 | 29 | 29 | 29 | 58 | 58 | 58 | 58 |

Table 5

Regressions of cumulative residual returns on contemporaneous changes of foreign spreads

The table reports regression results from regressing annually, semi-annually, and quarterly cumulative residual returns on contemporaneous changes of foreign spreads. Residual returns are the residuals from regressing each factor on the remaining 7 factors over the period of Jan 1998 to August 2013. We compute annual, semi-annual, and quarterly residual returns by separately compounding monthly residual returns at annual frequency ending in April of each year, at semi-annual frequency ending in April or October of each year, and at quarterly frequency using March, June, September and October as breakpoints. We accordingly compute contemporaneous annual, semi-annual, and quarterly changes in foreign spreads. Changes of foreign spreads are computed as ΔSP_X (t+1) = SP_X (t+1) –SP_X (t). In model (1) and (2) are results of monthly rebalanced factors. In model (3) and (4) are results of annually rebalanced factors. Under each set of factors, cumulative factor returns based on characteristic X are regressed on the relative changes of foreign spreads of X. Two specifications are estimated, the first including only ΔSP_X shown in model (1) and (3), the second controlling ΔSP_size, while controlling ΔSP_btm in the case of regressions on ΔSP_size, shown in model (2) and (4). Robust t-statistics are reported in brackets. * and ** indicate the 5% and 1% significance level respectively.

| | Annual returns and changes of foreign spreads | | | | Semi-annual returns and changes of foreign spreads | | | | Quarterly returns and changes of foreign spreads | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Monthly rebalanced | | Annually rebalanced | | Monthly rebalanced | | Annually rebalanced | | Monthly rebalanced | | Annually rebalanced | |
| Model | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| ΔSP_size | -0.018 | 0.042 | 0.057 | 0.120 | 0.045 | 0.145 | 0.082 | 0.144 | -0.097 | -0.088 | -0.017 | 0.022 |
| | [-0.065] | [0.148] | [0.257] | [0.489] | [0.257] | [0.797] | [0.601] | [1.085] | [-1.659] | [-1.327] | [-0.407] | [0.506] |
| ΔSP_btm | -0.145 | -0.097 | -0.175** | -0.150 | -0.014 | 0.032 | -0.107* | -0.076 | -0.022 | -0.026 | -0.033 | -0.027 |
| | [-1.930] | [-1.129] | [-3.223] | [-1.964] | [-0.464] | [0.445] | [-2.604] | [-1.526] | [-0.734] | [-0.801] | [-1.179] | [-0.878] |
| ΔSP_to | 0.007 | 0.006 | -0.008 | -0.014 | 0.002 | -0.012 | -0.007 | -0.021 | 0.021 | 0.021 | 0.009 | 0.006 |
| | [0.237] | [0.175] | [-0.404] | [-0.651] | [0.084] | [-0.543] | [-0.383] | [-1.090] | [1.303] | [1.304] | [0.897] | [0.599] |
| ΔSP_rev | 0.039 | 0.047 | -0.022 | -0.032 | -0.013 | -0.003 | -0.007 | -0.013 | -0.017 | -0.016 | 0.002 | 0.001 |
| | [1.468] | [1.534] | [-1.133] | [-1.915] | [-0.855] | [-0.134] | [-0.613] | [-1.041] | [-1.085] | [-1.063] | [0.442] | [0.237] |
| ΔSP_mom | -0.005 | -0.005 | 0.027 | 0.027 | -0.007 | -0.013 | 0.021* | 0.020* | 0.006 | 0.006 | -0.000 | -0.002 |
| | [-0.718] | [-0.642] | [1.710] | [1.810] | [-0.399] | [-0.811] | [2.664] | [2.438] | [0.716] | [0.733] | [-0.041] | [-0.308] |
| ΔSP_beta | -0.004 | -0.014 | 0.006 | -0.008 | -0.011 | -0.011 | -0.034 | -0.034 | 0.049 | 0.046 | 0.014 | 0.009 |
| | [-0.044] | [-0.159] | [0.099] | [-0.139] | [-0.220] | [-0.235] | [-0.890] | [-0.920] | [1.370] | [1.369] | [0.689] | [0.456] |
| ΔSP_ivol | -0.067* | -0.047 | -0.109** | -0.096 | -0.037 | -0.015 | -0.088** | -0.072* | -0.078** | -0.078** | -0.053* | -0.055** |
| | [-2.523] | [-1.840] | [-3.187] | [-1.886] | [-1.158] | [-0.360] | [-2.861] | [-2.183] | [-3.315] | [-3.355] | [-2.463] | [-2.814] |
| Obs in each regression | 15 | 15 | 15 | 15 | 29 | 29 | 29 | 29 | 58 | 58 | 58 | 58 |

Table 6

Regressions of cumulative factor returns on contemporaneous changes of firms' characteristics in the top foreign market-cap quintile

The table reports regression results from regressing annually, semi-annually, and quarterly cumulative factor returns on contemporaneous changes of firms' characteristics in the top quintile of foreign market capitalization. We compute annual, semi-annual, and quarterly factor returns by separately compounding monthly returns at annual frequency ending in April of each year, at semi-annual frequency ending in April or October of each year, and at quarterly frequency using March, June, September and October as breakpoints. We accordingly compute contemporaneous annual, semi-annual, and quarterly changes in firms' characteristics decile value in the top quintile of foreign market capitalization. Changes of firms' characteristics are computed as ΔSP_X (t+1) = SP_X (t+1) –SP_X (t). In model (1) and (2) are results of monthly rebalanced factors. In model (3) and (4) are results of annually rebalanced factors. Under each set of factors, cumulative factor returns based on characteristic X are regressed on the relative changes of the average decile value of characteristic X in the top quintile of foreign market capitalization. Two specifications are estimated, the first including only ΔSP_X shown in model (1) and (3), the second controlling ΔSP_size, while controlling ΔSP_btm in the case of regressions on ΔSP_size, shown in model (2) and (4). Robust t-statistics are reported in brackets. * and ** indicate the 5% and 1% significance level respectively.

| | Annual returns and changes | | | | Semi-annual returns and changes | | | | Quarterly returns and changes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Monthly rebalanced | | Annually rebalanced | | Monthly rebalanced | | Annually rebalanced | | Monthly rebalanced | | Annually rebalanced | |
| Model | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) |
| ΔSP_size | -1.469 | -0.612 | -1.735** | -0.837 | -1.263* | 0.142 | -1.537** | 0.214 | -1.165** | -0.383 | -1.076** | -0.240 |
| | [-1.938] | [-0.704] | [-3.589] | [-1.213] | [-2.289] | [0.194] | [-2.778] | [0.309] | [-3.273] | [-1.932] | [-3.089] | [-1.196] |
| ΔSP_btm | -0.078 | -0.349 | -0.151 | -0.265 | 0.182 | 0.176 | -0.035 | -0.020 | -0.023 | 0.036 | -0.019 | 0.030 |
| | [-0.381] | [-1.125] | [-1.181] | [-1.471] | [0.851] | [0.745] | [-0.243] | [-0.147] | [-0.307] | [0.600] | [-0.262] | [0.424] |
| ΔSP_to | -0.013 | -0.014 | 0.020 | 0.018 | 0.033 | 0.016 | 0.013 | -0.003 | 0.059* | 0.045 | 0.048* | 0.029 |
| | [-0.287] | [-0.300] | [0.415] | [0.375] | [0.698] | [0.397] | [0.324] | [-0.091] | [2.061] | [1.744] | [2.609] | [1.799] |
| ΔSP_rev | 0.082* | 0.082* | -0.040 | -0.041 | -0.019 | -0.012 | -0.014 | -0.013 | -0.027 | -0.020 | -0.010 | -0.009 |
| | [2.277] | [2.203] | [-0.633] | [-0.600] | [-0.898] | [-0.548] | [-0.593] | [-0.472] | [-1.362] | [-1.355] | [-1.171] | [-1.109] |
| ΔSP_mom | 0.060* | 0.039 | 0.069 | 0.058 | 0.033 | 0.035 | 0.053 | 0.049 | 0.005 | 0.002 | -0.003 | -0.006 |
| | [2.226] | [1.273] | [1.584] | [1.590] | [1.745] | [1.886] | [1.994] | [1.685] | [0.422] | [0.194] | [-0.269] | [-0.515] |
| ΔSP_beta | -0.152 | -0.347 | -0.129 | -0.274 | 0.213 | 0.219 | 0.040 | 0.029 | 0.127 | 0.113 | 0.086 | 0.053 |
| | [-0.503] | [-0.863] | [-0.492] | [-0.817] | [0.655] | [0.626] | [0.159] | [0.109] | [1.037] | [0.967] | [0.875] | [0.550] |
| ΔSP_ivol | -0.359 | -0.376 | -0.255 | -0.174 | -0.202 | -0.206 | -0.106 | -0.099 | -0.167 | -0.196 | -0.141 | -0.173 |
| | [-2.138] | [-1.230] | [-1.299] | [-0.397] | [-1.157] | [-1.031] | [-0.566] | [-0.405] | [-1.324] | [-1.555] | [-1.141] | [-1.416] |
| Obs in each regression | 15 | 15 | 15 | 15 | 29 | 29 | 29 | 29 | 58 | 58 | 58 | 58 |

Table 7

Summary statistics of foreign and local portfolios

The table reports summary statistics of foreign and local portfolio returns in excess of monthly call rates. FOREIGN is a portfolio whose returns are weighted by foreign market capitalization. LOCAL is a portfolio whose returns are weighted by local market capitalization. DIFF is the difference between the two, computed as FOREIGN minus LOCAL. Portfolios sorted by foreign ownership are also reported. In each month, all stocks are sorted into deciles based on end-of-month foreign ownership; in the subsequent month, equally weighted average returns are computed for each decile. D1_ew and D10_ew respectively denote the bottom and the top decile, and Diff_ew is the difference between the two portfolios, computed as D10_ew minus D1_ew.

| Stats | FOREIGN | LOCAL | DIFF | D1_ew | D10_ew | Diff_ew |
|---|---|---|---|---|---|---|
| N | 176 | 176 | 176 | 176 | 176 | 176 |
| Mean | 0.010 | 0.007 | -0.000 | 0.025 | 0.011 | -0.017 |
| Std dev | 0.076 | 0.078 | 0.025 | 0.099 | 0.070 | 0.067 |
| Min | -0.191 | -0.248 | -0.063 | -0.350 | -0.245 | -0.235 |
| Median | 0.013 | 0.006 | -0.003 | 0.016 | 0.015 | -0.008 |
| Max | 0.275 | 0.228 | 0.098 | 0.342 | 0.292 | 0.154 |
| T value | 1.756 | 1.228 | -0.193 | 3.355 | 2.136 | -3.395 |
| Avg # of stocks | 646 | 712 | | 75 | 71 | |

Table 8

Unconditional regressions of foreign and local portfolios on factor portfolios

The table reports unconditional regression results from regressing foreign and local portfolio returns on two sets of factor portfolio returns, monthly rebalanced size-neutral factors and annually rebalanced factors. In Panel A are regressions on MKT_RF, SMB, HML, TO, REV, and scaled BAB and IVOL. In Panel B, regressors are MKT_RF, SMB, HML, TO, REV, and un-scaled UBAB and UIVOL. The dependent variables are separately FOREIGN, LOCAL and DIFF. Robust t-statistics are reported in brackets. * and ** indicate the 5% and 1% significance level respectively.

Panel A: Regressions on scaled BAB and IVOL factors

| | Regressions on monthly rebalanced factors | | | Regressions on annually rebalanced factors | | |
|---|---|---|---|---|---|---|
| Model | (1) | (2) | (3) | (1) | (2) | (3) |
| Dept Vars | FOREIGN | LOCAL | DIFF | FOREIGN | LOCAL | DIFF |
| Constant | 0.005** | -0.002** | 0.003 | 0.005** | -0.002** | 0.004* |
| | [3.311] | [-2.882] | [1.676] | [3.778] | [-3.294] | [1.987] |
| MKT_RF | 0.946** | 1.018** | -0.076 | 0.985** | 1.010** | -0.028 |
| | [14.893] | [49.702] | [-0.929] | [15.939] | [49.800] | [-0.354] |
| SMB | -0.105* | 0.043* | -0.152* | -0.078 | 0.039* | -0.120* |
| | [-2.474] | [2.365] | [-2.573] | [-1.871] | [2.451] | [-2.133] |
| HML | -0.124** | 0.050** | -0.178** | -0.123** | 0.062** | -0.188** |
| | [-3.593] | [3.149] | [-3.681] | [-3.351] | [3.568] | [-3.528] |
| TO | 0.042 | -0.019 | 0.057 | 0.057 | -0.020 | 0.073 |
| | [0.797] | [-1.030] | [0.830] | [1.013] | [-1.282] | [1.048] |
| REV | 0.063 | -0.020 | 0.082 | 0.036 | -0.011 | 0.045 |
| | [1.245] | [-1.197] | [1.237] | [0.760] | [-0.625] | [0.707] |
| MOM | -0.050 | 0.025 | -0.078 | 0.027 | -0.011 | 0.038 |
| | [-1.655] | [1.883] | [-1.793] | [0.803] | [-0.819] | [0.821] |
| BAB | 0.011 | 0.003 | 0.008 | 0.041 | -0.008 | 0.049 |
| | [0.518] | [0.295] | [0.266] | [1.493] | [-0.693] | [1.313] |
| IVOL | -0.019 | 0.010 | -0.021 | -0.137* | 0.043* | -0.173* |
| | [-0.367] | [0.480] | [-0.292] | [-2.527] | [2.068] | [-2.418] |
| Obs | 176 | 176 | 176 | 176 | 176 | 176 |
| Adj. $R^2$ | 0.958 | 0.993 | 0.241 | 0.960 | 0.993 | 0.272 |

| Panel B: Regressions on un-scaled UBAB and UIVOL factors | | | | | | |
|---|---|---|---|---|---|---|
| | Regressions on monthly rebalanced factors | | | Regressions on annually rebalanced factors | | |
| Model | (1) | (2) | (3) | (1) | (2) | (3) |
| Dept Vars | FOREIGN | LOCAL | DIFF | FOREIGN | LOCAL | DIFF |
| Constant | 0.002 | -0.000 | -0.001 | 0.003* | -0.001* | 0.001 |
| | [1.596] | [-0.960] | [-0.454] | [2.568] | [-2.091] | [0.731] |
| MKT_RF | 0.969** | 1.016** | -0.046 | 0.950** | 1.025** | -0.072 |
| | [32.703] | [115.198] | [-1.233] | [29.540] | [102.606] | [-1.746] |
| SMB | -0.056* | 0.032** | -0.089* | -0.069* | 0.034** | -0.102* |
| | [-2.329] | [2.852] | [-2.594] | [-2.273] | [2.615] | [-2.372] |
| HML | -0.145** | 0.065** | -0.211** | -0.148** | 0.070** | -0.218** |
| | [-4.905] | [6.884] | [-5.545] | [-4.354] | [5.085] | [-4.622] |
| TO | -0.030 | 0.017 | -0.050 | -0.032 | 0.028 | -0.064 |
| | [-0.705] | [1.120] | [-0.896] | [-0.651] | [1.782] | [-1.003] |
| REV | 0.089* | -0.031** | 0.119* | 0.019 | -0.003 | 0.021 |
| | [2.318] | [-2.709] | [2.426] | [0.501] | [-0.221] | [0.396] |
| MOM | -0.078** | 0.041** | -0.120** | 0.015 | -0.003 | 0.019 |
| | [-2.880] | [3.898] | [-3.261] | [0.481] | [-0.253] | [0.432] |
| UBAB | 0.003 | -0.006 | 0.013 | -0.030 | 0.017 | -0.043 |
| | [0.101] | [-0.475] | [0.274] | [-0.722] | [1.146] | [-0.771] |
| UIVOL | 0.199** | -0.087** | 0.286** | 0.124** | -0.070** | 0.194** |
| | [4.597] | [-7.499] | [5.370] | [2.654] | [-4.519] | [3.186] |
| Obs | 176 | 176 | 176 | 176 | 176 | 176 |
| Adj. $R^2$ | 0.970 | 0.995 | 0.468 | 0.961 | 0.994 | 0.307 |

Table 9

Conditional regressions of foreign and local portfolios on factor portfolios

The table reports regression results from regressing foreign and local portfolio returns on monthly and annually rebalanced factor returns and their interactive terms (factor_UP). Factors' interactive terms are products of factor returns multiplied by an indicator, which is equal to one when the contemporaneous factor return is positive and equal to zero otherwise. In Panel A are regressions on MKT_RF, SMB, HML, TO, REV, and scaled BAB and IVOL, along with their interactive terms. In Panel B, regressors are MKT_RF, SMB, HML, TO, REV, and un-scaled UBAB and UIVOL, along with each factor’s interactive term. The dependent variables are separately FOREIGN, LOCAL and DIFF. Robust t-statistics are reported in brackets. * and ** indicate the 5% and 1% significance level respectively.

Panel A: Regressions on scaled BAB and IVOL factors

| | Regressions on monthly rebalanced factors | | | Regressions on annually rebalanced factors | | |
|---|---|---|---|---|---|---|
| Model | (1) | (2) | (3) | (1) | (2) | (3) |
| Dept Vars | FOREIGN | LOCAL | DIFF | FOREIGN | LOCAL | DIFF |
| Constant | -0.004 | 0.001 | -0.007 | 0.001 | -0.001 | -0.001 |
| | [-1.334] | [0.839] | [-1.919] | [0.300] | [-1.012] | [-0.152] |
| MKT_RF | 0.971** | 1.006** | -0.036 | 0.953** | 1.015** | -0.061 |
| | [16.462] | [45.631] | [-0.450] | [9.481] | [33.299] | [-0.473] |
| SMB | -0.194** | 0.077** | -0.270** | -0.129 | 0.069* | -0.198* |
| | [-2.716] | [2.633] | [-2.720] | [-1.872] | [2.356] | [-2.065] |
| HML | -0.137 | 0.060* | -0.195 | -0.003 | 0.008 | -0.009 |
| | [-1.576] | [2.089] | [-1.782] | [-0.039] | [0.295] | [-0.095] |
| TO | -0.096 | 0.026 | -0.123 | -0.098 | 0.021 | -0.119 |
| | [-1.607] | [1.114] | [-1.493] | [-1.362] | [0.822] | [-1.241] |
| REV | -0.074 | 0.013 | -0.085 | -0.027 | -0.000 | -0.027 |
| | [-1.102] | [0.562] | [-0.971] | [-0.315] | [-0.000] | [-0.231] |
| MOM | 0.082 | -0.030 | 0.111 | 0.043 | -0.028 | 0.078 |
| | [1.588] | [-1.561] | [1.611] | [0.724] | [-1.204] | [0.944] |
| BAB | 0.026 | 0.000 | 0.030 | 0.090 | -0.029 | 0.124 |
| | [0.891] | [0.022] | [0.708] | [1.363] | [-1.340] | [1.435] |
| IVOL | -0.227** | 0.098** | -0.321** | -0.255** | 0.112** | -0.368** |
| | [-2.794] | [2.654] | [-2.765] | [-2.985] | [3.351] | [-3.135] |
| MKT_UP | -0.073 | 0.025 | -0.101 | 0.004 | 0.005 | -0.004 |
| | [-0.944] | [0.916] | [-0.985] | [0.046] | [0.155] | [-0.035] |
| SMB_UP | 0.137 | -0.057 | 0.188 | 0.053 | -0.044 | 0.094 |
| | [1.717] | [-1.841] | [1.732] | [0.713] | [-1.306] | [0.882] |
| HML_UP | 0.005 | -0.008 | 0.005 | -0.207* | 0.090* | -0.304* |
| | [0.047] | [-0.226] | [0.032] | [-2.216] | [2.305] | [-2.351] |
| TO_UP | 0.259** | -0.083* | 0.337* | 0.264** | -0.068* | 0.328** |
| | [2.707] | [-2.148] | [2.558] | [2.941] | [-2.256] | [2.797] |
| REV_UP | 0.234* | -0.058 | 0.287* | 0.069 | -0.008 | 0.072 |
| | [2.405] | [-1.686] | [2.220] | [0.513] | [-0.168] | [0.402] |
| MOM_UP | -0.305** | 0.124** | -0.428** | -0.054 | 0.039 | -0.106 |
| | [-3.282] | [3.490] | [-3.448] | [-0.567] | [0.926] | [-0.786] |
| BAB_UP | -0.033 | 0.008 | -0.048 | -0.062 | 0.029 | -0.098 |
| | [-0.770] | [0.437] | [-0.789] | [-0.867] | [1.124] | [-1.025] |
| IVOL_UP | 0.317** | -0.128** | 0.450** | 0.200* | -0.101** | 0.308* |
| | [3.486] | [-3.162] | [3.494] | [2.207] | [-2.799] | [2.500] |
| Obs | 176 | 176 | 176 | 176 | 176 | 176 |
| Adj. $R^2$ | 0.967 | 0.994 | 0.386 | 0.963 | 0.994 | 0.333 |

Panel B: Regressions on un-scaled UBAB and UIVOL factors

| | Regressions on monthly rebalanced factors | | | Regressions on annually rebalanced factors | | |
|---|---|---|---|---|---|---|
| Model | (1) | (2) | (3) | (1) | (2) | (3) |
| Dept Vars | FOREIGN | LOCAL | DIFF | FOREIGN | LOCAL | DIFF |
| Constant | -0.001 | -0.000 | -0.003 | 0.001 | -0.001 | -0.001 |
| | [-0.423] | [-0.041] | [-1.104] | [0.190] | [-0.711] | [-0.358] |
| MKT_RF | 0.978** | 1.011** | -0.029 | 0.952** | 1.021** | -0.063 |
| | [24.316] | [66.232] | [-0.523] | [18.210] | [58.425] | [-0.911] |
| SMB | -0.103 | 0.048* | -0.146 | -0.100 | 0.056* | -0.152 |
| | [-1.893] | [2.214] | [-1.959] | [-1.743] | [2.263] | [-1.885] |
| HML | -0.181* | 0.087** | -0.264** | -0.033 | 0.024 | -0.052 |
| | [-2.245] | [3.415] | [-2.629] | [-0.497] | [0.830] | [-0.556] |
| TO | -0.136* | 0.047* | -0.184* | -0.168* | 0.046 | -0.214 |
| | [-2.479] | [2.255] | [-2.496] | [-2.047] | [1.580] | [-1.956] |
| REV | -0.057 | 0.003 | -0.057 | -0.099 | 0.028 | -0.126 |
| | [-1.031] | [0.147] | [-0.797] | [-1.150] | [0.868] | [-1.080] |
| MOM | 0.016 | -0.001 | 0.018 | 0.017 | -0.015 | 0.039 |
| | [0.291] | [-0.054] | [0.236] | [0.321] | [-0.683] | [0.516] |
| UBAB | 0.077 | -0.017 | 0.094 | 0.043 | 0.005 | 0.036 |
| | [1.430] | [-0.634] | [1.190] | [0.597] | [0.184] | [0.376] |
| UIVOL | 0.168* | -0.081** | 0.251** | 0.083 | -0.032 | 0.117 |
| | [2.431] | [-3.108] | [2.691] | [1.047] | [-1.070] | [1.101] |
| MKT_UP | -0.025 | 0.012 | -0.040 | -0.011 | 0.014 | -0.029 |
| | [-0.398] | [0.546] | [-0.485] | [-0.139] | [0.547] | [-0.285] |
| SMB_UP | 0.057 | -0.024 | 0.072 | 0.047 | -0.032 | 0.074 |
| | [0.808] | [-0.830] | [0.748] | [0.615] | [-0.969] | [0.692] |
| HML_UP | 0.059 | -0.032 | 0.083 | -0.191 | 0.080* | -0.279* |
| | [0.525] | [-0.938] | [0.591] | [-1.942] | [2.085] | [-2.096] |
| TO_UP | 0.194* | -0.054 | 0.243 | 0.235* | -0.034 | 0.263 |
| | [2.129] | [-1.420] | [1.935] | [2.142] | [-0.922] | [1.838] |
| REV_UP | 0.219** | -0.050 | 0.261* | 0.166 | -0.040 | 0.199 |
| | [2.766] | [-1.861] | [2.534] | [1.425] | [-0.933] | [1.263] |
| MOM_UP | -0.216* | 0.093* | -0.310* | -0.016 | 0.025 | -0.054 |
| | [-2.312] | [2.426] | [-2.446] | [-0.185] | [0.655] | [-0.440] |
| UBAB_UP | -0.102 | 0.015 | -0.117 | -0.104 | 0.016 | -0.113 |
| | [-1.427] | [0.453] | [-1.133] | [-0.937] | [0.409] | [-0.768] |
| UIVOL_UP | 0.008 | -0.000 | 0.007 | 0.060 | -0.055 | 0.112 |
| | [0.091] | [-0.011] | [0.060] | [0.548] | [-1.427] | [0.787] |
| Obs | 176 | 176 | 176 | 176 | 176 | 176 |
| Adj. $R^2$ | 0.975 | 0.996 | 0.538 | 0.964 | 0.994 | 0.357 |

Table 10

Conditional regressions of foreign and local portfolios on purged-factor portfolios

The table reports regression results from regressing foreign and local portfolio returns on the purged-factor returns and their interactive terms (factor_UP). Purged factors are rebalanced either monthly or annually, constructed in the same ways as not-purged factors, except that the stocks in the top and bottom deciles of foreign ownership change ratios are excluded from the double-sorted factor portfolios. Factors' interactive terms are products of factor returns multiplied by an indicator, which is equal to one when the contemporaneous factor return is positive and equal to zero otherwise. The dependent variables are separately FOREIGN, LOCAL and DIFF. Robust t-statistics are reported in brackets. * and ** indicate the 5% and 1% significance level respectively.

| | Regressions on monthly rebalanced factors | | | Regressions on annually rebalanced factors | | |
|---|---|---|---|---|---|---|
| Model | (1) | (2) | (3) | (1) | (2) | (3) |
| Dept Vars | FOREIGN | LOCAL | DIFF | FOREIGN | LOCAL | DIFF |
| Constant | -0.003 | 0.001 | -0.007 | -0.001 | -0.001 | -0.003 |
| | [-1.203] | [0.679] | [-1.764] | [-0.218] | [-0.579] | [-0.671] |
| MKT_RF | 0.958** | 1.014** | -0.056 | 0.933** | 1.024** | -0.091 |
| | [16.332] | [46.709] | [-0.710] | [11.979] | [43.498] | [-0.911] |
| SMB | -0.190** | 0.083** | -0.272** | -0.162* | 0.084** | -0.247** |
| | [-3.018] | [3.248] | [-3.110] | [-2.525] | [3.167] | [-2.790] |
| HML | -0.140 | 0.063** | -0.203 | -0.035 | 0.027 | -0.060 |
| | [-1.650] | [2.733] | [-1.974] | [-0.665] | [1.233] | [-0.830] |
| TO | -0.079 | 0.021 | -0.101 | -0.112 | 0.020 | -0.131 |
| | [-1.524] | [1.027] | [-1.416] | [-1.597] | [0.824] | [-1.410] |
| REV | -0.070 | 0.013 | -0.079 | -0.045 | -0.007 | -0.038 |
| | [-0.912] | [0.576] | [-0.821] | [-0.502] | [-0.224] | [-0.316] |
| MOM | 0.076 | -0.034 | 0.110 | 0.017 | -0.016 | 0.037 |
| | [1.706] | [-1.867] | [1.806] | [0.308] | [-0.690] | [0.482] |
| BAB | 0.062 | -0.012 | 0.079 | 0.087 | -0.028 | 0.119 |
| | [1.606] | [-0.815] | [1.511] | [1.568] | [-1.470] | [1.624] |
| IVOL | -0.261** | 0.113** | -0.372** | -0.183* | 0.083** | -0.262** |
| | [-3.176] | [3.091] | [-3.208] | [-2.522] | [2.834] | [-2.608] |
| MKT_UP | -0.061 | 0.020 | -0.082 | -0.024 | 0.014 | -0.042 |
| | [-0.801] | [0.737] | [-0.812] | [-0.306] | [0.468] | [-0.390] |
| SMB_UP | 0.135 | -0.063* | 0.190* | 0.075 | -0.053 | 0.126 |
| | [1.925] | [-2.244] | [1.982] | [1.024] | [-1.669] | [1.227] |
| HML_UP | 0.010 | -0.003 | 0.008 | -0.223* | 0.084* | -0.314* |
| | [0.089] | [-0.089] | [0.056] | [-2.410] | [2.394] | [-2.522] |
| TO_UP | 0.230** | -0.074* | 0.299* | 0.281** | -0.064* | 0.338** |
| | [2.732] | [-2.157] | [2.587] | [2.927] | [-2.032] | [2.725] |
| REV_UP | 0.230* | -0.058 | 0.280 | 0.098 | -0.003 | 0.098 |
| | [1.993] | [-1.596] | [1.870] | [0.731] | [-0.055] | [0.539] |
| MOM_UP | -0.265** | 0.127** | -0.390** | 0.009 | 0.009 | -0.010 |
| | [-3.335] | [3.910] | [-3.610] | [0.099] | [0.212] | [-0.075] |
| BAB_UP | -0.086 | 0.024 | -0.116 | -0.058 | 0.022 | -0.085 |
| | [-1.477] | [1.098] | [-1.481] | [-0.976] | [0.952] | [-1.057] |
| IVOL_UP | 0.360** | -0.152** | 0.515** | 0.196* | -0.091** | 0.291* |
| | [3.579] | [-3.604] | [3.701] | [2.282] | [-2.655] | [2.492] |
| Obs | 176 | 176 | 176 | 176 | 176 | 176 |
| Adj. $R^2$ | 0.966 | 0.994 | 0.378 | 0.965 | 0.994 | 0.363 |

Table 11

Unconditional and conditional regressions of foreign ownership-based portfolio

The table reports regression results of foreign ownership-based portfolio. Model (1) and (2) are respectively regressed on monthly and annually rebalanced factors. Robust t-statistics are reported in brackets.

| | Unconditional regressions on original factors | | Conditional regressions on original factors | | Conditional regressions on purged factors | |
|---|---|---|---|---|---|---|
| Model | (1) | (2) | (1) | (2) | (1) | (2) |
| Constant | -0.003* | -0.000 | -0.001 | 0.000 | -0.001 | -0.000 |
| | [-2.206] | [-0.162] | [-0.396] | [0.017] | [-0.443] | [-0.088] |
| MKT_RF | 0.828** | 0.798** | 0.720** | 0.648** | 0.764** | 0.641** |
| | [15.026] | [11.029] | [12.531] | [8.746] | [13.265] | [8.194] |
| SMB | 0.256** | 0.247** | 0.420** | 0.455** | 0.436** | 0.410** |
| | [4.560] | [4.603] | [5.941] | [5.691] | [6.057] | [5.073] |
| HML | 0.286** | 0.236** | 0.286** | 0.286* | 0.252* | 0.231* |
| | [4.942] | [3.958] | [2.732] | [2.553] | [2.480] | [2.482] |
| TO | -0.008 | -0.085 | 0.022 | -0.104 | 0.030 | -0.107 |
| | [-0.210] | [-1.424] | [0.339] | [-1.104] | [0.497] | [-1.141] |
| REV | 0.022 | 0.024 | -0.092 | -0.114 | -0.081 | -0.065 |
| | [0.576] | [0.411] | [-1.756] | [-0.994] | [-1.447] | [-0.659] |
| MOM | -0.077* | -0.032 | -0.064 | 0.005 | -0.105 | 0.036 |
| | [-2.055] | [-0.661] | [-1.038] | [0.055] | [-1.550] | [0.374] |
| BAB | 0.116** | 0.109** | 0.125** | 0.134* | 0.127** | 0.131 |
| | [4.084] | [2.952] | [2.640] | [2.438] | [2.677] | [1.708] |
| IVOL | 0.049 | 0.111 | 0.278** | 0.303* | 0.223* | 0.309* |
| | [0.830] | [1.321] | [2.788] | [2.437] | [2.181] | [2.434] |
| MKT_UP | | | 0.215** | 0.343** | 0.171 | 0.322** |
| | | | [2.653] | [3.082] | [1.939] | [2.766] |
| SMB_UP | | | -0.274** | -0.300** | -0.266** | -0.233* |
| | | | [-3.049] | [-2.880] | [-3.035] | [-2.206] |
| HML_UP | | | 0.014 | -0.037 | 0.063 | 0.011 |
| | | | [0.103] | [-0.237] | [0.480] | [0.074] |
| TO_UP | | | -0.043 | 0.085 | -0.037 | 0.064 |
| | | | [-0.392] | [0.652] | [-0.367] | [0.477] |
| REV_UP | | | 0.150 | 0.154 | 0.127 | 0.100 |
| | | | [1.790] | [1.013] | [1.400] | [0.690] |
| MOM_UP | | | 0.015 | -0.090 | 0.072 | -0.127 |
| | | | [0.145] | [-0.680] | [0.683] | [-0.931] |
| BAB_UP | | | 0.000 | -0.034 | -0.015 | -0.003 |
| | | | [0.001] | [-0.482] | [-0.257] | [-0.034] |
| IVOL_UP | | | -0.337** | -0.318* | -0.285* | -0.342* |
| | | | [-2.774] | [-1.997] | [-2.210] | [-2.200] |
| Obs | 176 | 176 | 176 | 176 | 176 | 176 |
| Adj. $R^2$ | 0.945 | 0.921 | 0.951 | 0.929 | 0.948 | 0.924 |