The Anomalous Stock Market Behavior of Big and Low Book-to-Market Equity Firms in April: New Evidence from Japan

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Abstract: This paper shows that in Japan, big and low book-to-market equity firms experience higher risk-adjusted returns in April. We also reveal that volatility in April is significantly lower than in other months. Furthermore, we demonstrate that several trading strategies using this April effect can produce profitable returns, even after considering transaction costs. Moreover, additional analysis using the trading volume of financial institutions implies that the abnormally higher returns of big firms and low book-to-market equity firms appear to be derived not from the tax-loss selling effect but mainly from the dressing-up behavior of Japanese financial institutions at the end of the fiscal year.

Keywords: January effect, April effect, information and market efficiency, turn-of-the-year effect, sharpe ratio, tax-loss selling effect.

I. INTRODUCTION

Is there an anomaly in Japan similar to the well-known January effect in the US? The January effect was first documented by Rozeff and Kinney [1], Keim [2] and Reinganum [3]. Keim [2] found that about half of the annual size effect in the US can be attributed to January and that much of the January effect occurs during the first few trading days of the month. This January effect is considered to be one of the most prominent anomalies in finance. Reinganum [3] also confirmed that the US January effect holds during the first few trading days of the month in smaller-size portfolios. However, in Japan, the study of seasonal anomalies is quite limited. As far as we are aware, only two academic studies concern seasonal anomalies in Japan. First, Kato and Schallheim [31] found that the January effect also exists in Japan. Second, Gultekin and Gultekin [32] investigated 17 countries, including Japan, and also found evidence of an international January effect.

In comparison with the preceding US work and the two existing studies for Japan, our study differs in the following respects. First, we investigate larger-size portfolios, not smaller-size portfolios. Second, we analyze the lowest book-equity-to-market-equity (BE/ME) portfolios. It is typical for existing research on the January effect to consider firm size and the January effect, as in Keim [2], Reinganum [3], or Kato and Schallheim [31], among others. Hence, we have a different research perspective by considering the lowest-BE/ME portfolio. Third, we do not consider the January effect rather the April effect while paying attention to the risk-return trade-off. Thus, our paper is the first to document evidence of higher risk-adjusted returns in April for larger and lower-BE/ME firms in Japan. We refer to this phenomenon as the ‘April effect’.

Our main contributions are as follows. First, we provide new evidence that the biggest (largest firm size) portfolio of 25 size-ranked portfolios in Japan earns the highest risk-adjusted returns in April. Second, we also find that the lowest-BE/ME-ranked portfolio of 25 BE/ME-ranked portfolios exhibits relatively higher risk-adjusted returns in April. Third, we confirm that in these portfolios, volatility is lowest in April, and we confirm our findings from the viewpoint of the time-varying volatilities. Fourth, we suggest that this April effect in Japan is not because of the more well-known tax-loss selling hypothesis (as suggested by Reinganum [3], Branch [4], Poterba and Weisbenner [11], among others) but because of the dressing-up behavior of financial institutions at the end of the Japanese fiscal year. Finally, we also reveal that almost all trading strategies constructed using the April effect successfully beat the market.

The rest of this paper is organized as follows. Section II explains the data used. Section III includes the test methodology and the results. Section IV interprets the results, and Section V considers the profitability of trading strategies using the April effect. Section VI concludes the paper.

II. DATA

Our full sample period is from January 1982 to December 2007. First, we construct 25 size-ranked portfolios and BE/ME-ranked portfolios for the Japanese market. We use

1 Many studies concern the January effect in the US. These include Branch [4], Roll [5, 6], Blume and Stambaugh [7], Brauer and Chang [8], Sias and Starks [9], Grundy and Martin [10], Poterba and Weisbenner [11], Ait et al. [12], Vorkink [13], Grinblatt and Keloharju [14], Grinblatt and Moskowitz [15], Ng and Wang [16], Starks et al. [17], and Cooper et al. [18].

2 Other anomalies documented in the US are the small-firm effect (Banz [19], Reinganum [20, 21], Roll [22], James and Edmister [23], Brown et al. [24], and Stoll and Whaley [25]), the value effect (Fama and French [26]), momentum returns (Jegadeesh and Titman [27], Rouwenhorst [28]), and return reversals (Jegadeesh and Titman [29], DeBondt and Thaler [30]).

3 We follow Fama and French [33] in constructing the two sets of 25 portfolios.
return data for the Tokyo Stock Exchange (TSE) First Section from the Japan Securities Research Institute (JSRI). We then compute the value-weighted returns of the biggest portfolio and the lowest-BE/ME portfolio, and use them in our analysis.

For the statistical tests in the next section, we compute the Sharpe ratio as \( SR_t = \frac{R_{p,t} - R_{f,t}}{\sigma} \), where \( R_{p,t} \) is the annualized return of the biggest portfolio or the lowest-BE/ME portfolio, \( R_{f,t} \) is the annual risk-free rate, and \( \sigma \) is the annualized volatility of portfolio returns. For the risk-free rate, we employ the yields of traded bonds with repurchase agreements (from the Japan Securities Dealers Association)\(^4\) from January 1982 to May 1984, and the one-month median rate of negotiable time certificates of deposit (CD) from the Bank of Japan for June 1984 to December 2007.\(^5\) We employ the annualized standard deviation of the portfolio’s returns during the whole sample period as the measure of volatility, \( \sigma \).

III. THE APRIL EFFECT

This section statistically tests for the April effect in the biggest and lowest-BE/ME portfolios in Japan. For the statistical tests, we use the Sharpe ratio (1):

\[
SR_t = \frac{R_{p,t} - R_{f,t}}{\sigma}. \tag{1}
\]

Table 1 provides the annualized monthly Sharpe ratios for the biggest of 25 portfolios. At the bottom of Table 1, the average values of the Sharpe ratio of the biggest portfolio are displayed, where April has the highest value of 1.843. Consequently, on average, the biggest portfolio in Japan earns the highest risk-adjusted returns in April.

Table 2 displays the annualized monthly Sharpe ratio for the lowest-BE/ME portfolio of 25 portfolios. At the bottom of Table 2, the average Sharpe ratios of the lowest-BE/ME portfolio are provided, and with the exception of 0.999 in January, the value of 0.953 in April is the highest. Hence, on average, the lowest-BE/ME portfolio earns the highest risk-adjusted returns in January and April.

Next, we describe the procedure and results of the statistical tests for the April effect. We use the following t-statistic \( T \) for the tests:

\[
T = \frac{AVG[SR_{April}] - AVG[SR_{other}]}{\sigma/\sqrt{n}}, \tag{2}
\]

where \( AVG[SR_{April}] \) is the average value of the April Sharpe ratios, \( AVG[SR_{other}] \) is the average value of the Sharpe ratios in other months, \( \sigma \) is the standard deviation of April’s Sharpe ratios, and \( n \) is the number of sample observations. The null hypothesis is \( H_0: AVG[SR_{April}] = AVG[SR_{other}] \); and the alternative is \( H_1: AVG[SR_{April}] > AVG[SR_{other}] \). Under the hypothesis, the t-statistic \( T \) has a t-distribution with degrees of freedom of \( n - 1 \). If April’s Sharpe ratio of the tested portfolio is statistically significantly higher than the Sharpe ratios in the other months using the above t-test, we reject the null.

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is lowest for all months. Therefore, the April effect found in the lowest-BE/ME portfolio in Japan is again a rather anomalous phenomenon from the viewpoint of the risk-return trade-off in standard financial theory.

We also perform t-tests using standard statistics to equation (2), for the volatility in April of both portfolios. The null hypothesis of the test is that the average volatility in April is the same as the other months. The alternative hypothesis is that the average volatility in April is lower than in other months. The results are shown in Table 5. Using Panel A, we can see that on average, the April volatility of the biggest portfolio in Japan is statistically significantly lower than other months at the 1% level with the exception of October. Similarly, Panel B shows that on average, the April volatility of the lowest-BE/ME portfolio in Japan is statistically significantly lower than other months with the exception of June and October.

To consider further the situation of risk, in Figs. (3) and (4), we depict the fitted volatilities of a time-varying EGARCH (exponential generalized autoregressive conditional heteroscedasticity) model of the biggest and the lowest-BE/ME portfolios. Fig. (3) displays the volatility in March, April, and December of the biggest portfolio. Fig. (4) provides the volatilities of the lowest-BE/ME portfolio in January, March, April, October, and November. All months in Figs. (3) and (4) have the highest returns in our full-sample period, as shown in Figs. (1) and (2). Based on these graphs, we can again appreciate that the biggest and lowest-BE/ME portfolios have the lowest risk in April from the perspective of time-varying risk. Accordingly, we can see that in both the biggest and lowest-BE/ME portfolios, the lower volatility and higher excess returns underlie the higher Sharpe ratios in April.

2. Is the April Effect in Japan Derived from Tax-Loss Selling?

We now move on to the second perspective, the tax-loss selling effect. If the higher Sharpe ratios of the biggest-size and lowest-BE/ME portfolios in Japan are indeed evidence of a tax-loss selling effect as suggested in the US, then returns should decline in March (the end of the Japanese fiscal year) and increase in April. What is the actual situation?

The respective risk and return in each month for the biggest and lowest-BE/ME portfolios in Figs. (1) and (2),
clearly indicate that the higher returns in March continue until April. This pattern of higher successive returns in March and April in both portfolios is also statistically significant. This is because in the test of the April effect conducted in Table 3, we were unable to reject the null hypothesis of no difference between the Sharpe ratios in March and April. On the basis of this evidence, we suggest that the April effect in Japan is not derived from the tax-loss selling effect.\(^1\)

\(^1\) Reinganum [3] concluded that in the US, "...while potential tax-loss selling may explain the extraordinary returns witnessed at the beginning of January, potential tax-loss selling does not seem capable of explaining the entire anomalous return behavior of small firms in January." (p. 102) Ac-
As shown in Fig. (5), the yen trading volume of financial institutions in Japan is highest in March followed by April. Fig. (6) provides the average share of financial institutions in total trading volume. Yet again, April follows March. Using these findings, we can see that Japanese financial institutions trade more in March when the fiscal year ends. We suggest that this is then consistent with a turn-of-the-year effect (Roll [6]). More specifically, Japanese financial institutions generally trade bigger stocks more than smaller stocks and more-reputable stocks more than less-reputable stocks. More-reputable stocks generally have higher market values; thus, they also generally have a lower BE/ME. Therefore, we suggest that because of the turn-of-the-year effect, Japanese financial institutions trade more bigger-size and lower-BE/ME stocks in March and April.

However, what is the exact reason for Japanese financial institutions trading these stocks in March and April? We suggest that their aim is not to reduce their tax payments by selling value-decreasing stocks in March but rather to dress up accordingly, tax-loss selling is not even regarded as a perfect justification for the US January effect.

The turn-of-the-year effect is generally interpreted as evidence of a shift in the demand and supply for stocks around the turn of the year.

How then can we interpret Japan’s April effect? For an alternative, we provide Figs. (5, 6). Fig. (5) exhibits the average trading volume (the sum of the buy and sell amounts) of financial institutions in the TSE First Section. The sample period of the trading volume is the maximum available period from January 1986 to December 2007. Fig. (6) provides the average share of the trading volume of financial institutions in total trading volume in the TSE First Section. The sample period is identical to Fig. (5).

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However, what is the exact reason for Japanese financial institutions trading these stocks in March and April? We suggest that their aim is not to reduce their tax payments by selling value-decreasing stocks in March but rather to dress up accordingly, tax-loss selling is not even regarded as a perfect justification for the US January effect.

The turn-of-the-year effect is generally interpreted as evidence of a shift in the demand and supply for stocks around the turn of the year.

Table 4. Test for the January Effect in the Lowest-BE/ME Portfolio: The Case in Japan from January 1982 to December 2007

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<tbody>
<tr>
<td>t-statistic</td>
<td>4.540**</td>
<td>6.301**</td>
<td>7.135**</td>
<td>3.100**</td>
<td>0.027</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>11.514**</td>
<td>4.392**</td>
<td>0.598</td>
<td>8.226**</td>
</tr>
<tr>
<td>p-value</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
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Notes: This table provides the t-statistics and p-values for the January effect in Japan. The null hypothesis is that the average Sharpe ratios in January is equal to the average in the other months. The alternative hypothesis is that the average Sharpe ratio in January is larger than the average in the other months. The sample period is from January 1982 to December 2007. ** and * denote that the values are statistically significant at the 5% and 10% level, respectively.

Table 5. Test for the level of Risk in April of the Biggest and the Lowest-BE/ME Portfolio: The Case in Japan from January 1982 to December 2007

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<tbody>
<tr>
<td>t-statistic</td>
<td>2.015**</td>
<td>1.794**</td>
<td>3.026**</td>
<td>1.576*</td>
<td>0.265</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>8.600**</td>
<td>2.944**</td>
<td>0.320</td>
<td>4.988**</td>
</tr>
<tr>
<td>p-value</td>
<td>0.027</td>
<td>0.042</td>
<td>0.003</td>
<td>0.064</td>
<td>0.396</td>
<td>0.000</td>
<td>0.000</td>
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<td>0.000</td>
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<td>0.000</td>
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</tbody>
</table>

Notes: This table provides the t-statistics and p-values for volatility in April in Japan. The null hypothesis is that the average time-varying volatilities are equal to the average of the other months. The alternative hypothesis is that the average value of the time-varying volatilities in April is lower than the average value of other months. The sample period is from January 1982 to December 2007. ** and * denote that the values are statistically significant at the 5% and 10% level, respectively.
very well not only the higher returns of the biggest-size and lowest-BE/ME portfolios in March and April in Japan but also the higher trading volume of Japanese financial institutions in March and April. Therefore, as an original contribution, we interpret the April effect in Japan as a combination of a turn-of-the-year effect and a dressing-up effect.

Fig. (2). Risk and return relation of the lowest-BE/ME portfolio in Japan.

Fig. (3). EGARCH monthly volatility of the biggest-size portfolio.

V. TRADING STRATEGIES USING THE APRIL EFFECT

Based on the evidence presented so far, this section clarifies whether trading strategies using the April effect are profitable.

1. Biggest-Size Portfolio

As shown in Fig. (1), the biggest-size portfolio in Japan earns higher returns in March, April, and December. Hence, we implement four strategies for the biggest portfolio, which
we refer to as the ‘April strategy’, the ‘March/April strategy’, the ‘April/December strategy’, and the ‘March/April/December strategy’.

The ‘April strategy’ is a trading rule that we buy the biggest portfolio at the end of March and sell it at the end of April. Using this strategy, we can obtain the April return of the biggest portfolio. The ‘March/April strategy’ is a trading rule that we buy the biggest portfolio at the end of February and sell it at the end of April. Using this strategy, we can obtain the returns of the biggest portfolio in March and April. The ‘April/December strategy’ is a trading rule that we buy the biggest portfolio at the end of March and sell it at the end of April, and buy the portfolio again at the end of November and sell it at the end of December. Using this strategy, we can obtain the returns of the biggest portfolio in March, April, and December.

Table 6 displays the profits obtained using the above-mentioned strategies. Panel A provides the raw returns of the four strategies, and Panel B details their excess return over the market return. For market return, we employ the value-weighted average return of all stocks listed on the TSE First Section, as provided by the JSRI. We also show the results for three different sample periods: the full-sample period from January 1982 to December 2007, an earlier subsample period from January 1982 to December 1994, and a later subsample period from January 1995 to December 2007. All returns in Table 6 are after deducting transaction costs. In terms of the transaction costs, following Stoll and Whaley [35] and Billingsley and Chance [36], we use 0.85% for a round-trip transaction.9

Table 6 has the following features. First, the ‘April strategy’ produces positive profits not only in raw returns but also in excess returns. In particular, Panel B shows that the

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### Table 6. Profits for the Biggest Portfolio from Investment Strategies Using the April Effect: The Case of Japan from January 1982 to December 2007

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Panel A Raw Return</th>
<th>Panel B Excess Return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transaction Times</td>
<td>Average Yearly Return</td>
</tr>
<tr>
<td>April</td>
<td>26</td>
<td>26.348</td>
</tr>
<tr>
<td>March/April</td>
<td>26</td>
<td>28.147</td>
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<tr>
<td>April/December</td>
<td>52</td>
<td>27.441</td>
</tr>
<tr>
<td>March/April/December</td>
<td>52</td>
<td>27.993</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Average Yearly Market Return</th>
<th>Average Yearly Excess Return</th>
<th>Gross Excess Return</th>
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<tbody>
<tr>
<td>Average Yearly Market Return</td>
<td>21.873</td>
<td>24.234</td>
<td>359.552</td>
</tr>
<tr>
<td>Average Yearly Excess Return</td>
<td>24.234</td>
<td>24.234</td>
<td>359.552</td>
</tr>
<tr>
<td>Gross Excess Return</td>
<td>24.234</td>
<td>24.234</td>
<td>359.552</td>
</tr>
</tbody>
</table>

Notes: ‘Transaction times’ is the number of transactions of each strategy in each sample period. ‘Average yearly return’ is the average annual percentage return from each strategy over each sample period. ‘Gross return’ is the gross percentage return from each strategy for each sample period. ‘Average yearly market return’ is the annual percentage return of the weighted average return of TSE First Section listed stocks in each sample period. ‘Average yearly excess return’ is the annual percentage excess return from each strategy over each sample period. ‘Gross excess return’ is the gross percentage excess return over the weighted average return of TSE First Section listed stocks from each strategy for each sample period.

9 For example, see Billingsley and Chance [36, p. 28].
of 21.873 percent for the later subsample period, even after taking transaction costs into account. We also note that as March and April are successive months, the ‘March/April strategy’ has smaller transaction costs because of the smaller number of transactions involved.

2. Lowest-BE/ME Portfolio

We now move on to the case of the April effect in the lowest-BE/ME portfolio in Japan. As shown in Fig. (2), the lowest-BE/ME portfolio in Japan earns higher returns in January, March, April, October, and November. Hence, we implement 11 strategies, which we refer to as the ‘April strategy’, the ‘January/April strategy’, the ‘March/April strategy’, the ‘April/October strategy’, the ‘April/November strategy’, the ‘January/April/October strategy’, the ‘January/April/November strategy’, the ‘March/April/October strategy’, the ‘March/April/November strategy’, and the ‘April/October/November strategy’.

The transaction rule for each strategy is the same as discussed earlier, and again, we employ a cost of 0.85% for a round-trip transaction following Stoll and Whaley [35] and Billingsley and Chance [36]. We prove the profit results in Table 7. Once again, Panel A provides the raw returns of the strategies, and Panel B shows the excess returns over the market return. For market return, we again employ the value-weighted average return of all stocks listed on the TSE First Section (from the JSRI). The sample periods in Table 7 are the same as in Table 6.

Table 7. Profits for the Lowest-BE/ME Portfolio from Investment Strategies Using the April Effect: The Case of Japan from January 1982 to December 2007

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<tr>
<td></td>
<td>Transaction Times</td>
<td>Average Yearly Return</td>
<td>Gross Return</td>
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<tr>
<td>April</td>
<td>26</td>
<td>18.245</td>
<td>474.379</td>
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<tr>
<td>January/April</td>
<td>52</td>
<td>19.316</td>
<td>502.217</td>
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<td>March/April</td>
<td>26</td>
<td>19.668</td>
<td>511.372</td>
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<td>April/October</td>
<td>52</td>
<td>18.896</td>
<td>491.283</td>
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<tr>
<td>April/November</td>
<td>52</td>
<td>18.044</td>
<td>469.134</td>
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<tr>
<td>January/March/April</td>
<td>52</td>
<td>19.624</td>
<td>510.233</td>
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<tr>
<td>January/April/October</td>
<td>78</td>
<td>18.826</td>
<td>489.474</td>
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<tr>
<td>January/April/November</td>
<td>78</td>
<td>18.258</td>
<td>474.708</td>
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<tr>
<td>March/April/October</td>
<td>52</td>
<td>19.344</td>
<td>502.944</td>
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<tr>
<td>March/April/November</td>
<td>52</td>
<td>18.776</td>
<td>488.177</td>
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<tr>
<td>April/October/November</td>
<td>52</td>
<td>18.828</td>
<td>489.518</td>
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Notes: ‘Transaction times’ is the number of transactions of each strategy in each sample period. ‘Average yearly return’ is the annual percentage return from each strategy over each sample period. ‘Gross return’ is the gross percentage return from each strategy for each sample period. ‘Average yearly excess return’ is the annual percentage excess return from each strategy over the weighted average return of the TSE First Section listed stocks in each sample period. ‘Gross excess return’ is the gross percentage excess return over the weighted average return of TSE First Section listed stocks for each strategy for each sample period.
Table 7 provides the profitability of the lowest-BE/ME portfolio in Japan using our strategies. First, in terms of both raw and excess returns, the ‘April strategy’ produces positive profits in all three sample periods (Panel A). Second, Panels A and B show that all 10 combined strategies provide positive profits in the full-sample period. Focusing on the later subsample period, all 10 combined strategies except for the ‘January/April strategy’ also yield positive excess returns (Panel B of Table 7). Of all 11 strategies, in our full-sample period, the best performer is the ‘March/April strategy’, as for the biggest portfolio analyzed earlier. This has an average annual excess return of 10.091 percent. In the later subsample period, the best performer is the ‘March/April/November strategy’, earning an average annual excess return of 29.716 percent. As above, by combining the April effect with other seasonal monthly anomalies in Japan, we can consistently obtain positive profits over market return. We also note that not only the ‘April strategy’ but also any strategy including the ‘March/April strategy’ is a profitable strategy in Japan.

VI. CONCLUSIONS

This paper examined the April effect in big and low-BE/ME firms in Japan for the first time. We computed well-known Sharpe ratios and statistically evidenced the April effect in Japan. More concretely, our contributions in this paper are as follows.

- First, we provide new evidence that the biggest portfolio of 25 size-ranked portfolios in Japan earns the highest risk-adjusted returns in April. The existing studies of the January effect often connect this with a small-size effect. Thus our evidence and approach are quite different from that found in the existing literature.

- Second, we find that the lowest-BE/ME-ranked portfolio of 25 BE/ME-ranked portfolios also exhibits relatively higher risk-adjusted returns in April in Japan. This is also a new finding, because BE/ME portfolios were not generally analyzed from the perspective of seasonal anomalies.

- Third, we find that in both kinds of portfolios, volatilities are the lowest in April. This phenomenon is obtained from the viewpoint of time-varying volatilities.

- Fourth, we suggest that the Japanese April effect is not because of the well-known tax-loss selling effect but rather the combined influence of a turn-of-the-year effect and a dressing-up effect. This is because the larger transactions of Japanese financial institutions are made around the end of the Japanese fiscal year.

- Fifth, we also find that almost any trading strategy using this April effect can beat the market. This evidence is then highly suggestive in a business context as we demonstrate that profits can be obtained by using these trading strategies even after considering transaction costs.

As our evidence implies, because investor behavior is different in every country, the characteristics of stock markets should be independently and carefully researched using data in each country.

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