Does tax-loss selling affect turn-of-the-year returns? Evidence from the 2003 capital gain tax regime change in Japan

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Abstract

Focusing on reduction of the capital gains tax rate in Japan, this paper examines whether tax-loss selling by individual investors affects turn-of-the-year returns. The capital gains tax reduction law decays benefits to realize capital losses and results in lower relationships between tax-loss selling and turn-of-the-year returns. Empirical findings in this study lend support for the prediction. Considering that stocks with larger capital losses (gains) are more (less) likely to be subject to tax-loss selling, I find that the long-short portfolio which longs in stocks with larger capital losses and shorts in stocks with larger capital gains yields higher turn-of-the-year returns in the pre-tax-reduction period than in the post-tax-reduction period.

JEL classification: G12, G14

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1. Introduction

Among some anomalies in the stock market, the tendency of small market capitalization stocks to yield abnormally high returns around the turn of the year, which is called the "January effect" or "turn-of-the-year effect", is one of the attention-paid phenomena and researchers seek what drives the phenomenon. Among some explanations the previous literature suggests, tax-loss selling is considered to be a main driver of the January effect. According to the tax-loss selling hypothesis, taxable individual investors are more likely to realize capital losses to defer tax burdened on capital gains before the tax year end (in most countries, December), which results in price depreciation at the year end and reversion toward the former level at the turn of the year. Actually, some empirical studies report results which are consistent with tax-loss selling of individuals in December. Dyl (1977) finds that trading volume in December is larger for losing stocks. Hvidkjaer (2006) reports that trading imbalance among small-size trades tend to be sell-initiated among losing stocks. In recent studies analyzing trading behaviors of individual investors (Badrinath and Lewellen (1991), Dyl and Maberly (1992), Grinblatt and Keloharju (2001), Odean (1998), Ritter (1988), and Ivkovic, Poterba, and Weisbenner (2005)), it is shown that individual investors realize capital losses around December.

However there are some alternative explanations for the January effect. The first one is the window dressing hypothesis. According to the window dressing hypothesis, institutional cash flow due to their window dressing drives price depreciation at the year end and that purchase-backs at the beginning of the year generate price appreciation.[1] The second one

[1]See Haugen and Lakonishok (1987) and Lakonishok et al. (1991).

postulates that the January effect is just a reflection of abnormally high rates of return for small cap stocks during the month of January. The third one points out that the January effect is associated with the release of unusual accounting information around the turn of the year. As described above, it has been still debated which is the main driver of the January effect. With out identifying ideal conditions in which the effect of tax-loss selling by individual investors is more prominent, it is difficult to conclude how tax-loss selling affects turn-of-the-year returns.[2]

There are at least two approaches employed in the literature to separate the effect of tax-loss selling from other effects. Sias and Starks (1997) focus on cross-sectional difference of ownership structure among stocks and examine whether stocks dominated by individual investors show abnormally higher return in January than those dominated by institutional investors. Among stocks which are mainly owned by individual investors, window dressing by institutional investors are less likely to occur. In their study, they find that the January effect is more prominent among individual-dominated stocks, which indicates that the January effect is driven by trading behaviors of individual investors. Starks, Yong, and Zheng (2006) present empirical evidence that tax-loss selling drives abnormally high returns in January by investigating return and volume patterns for municipal bond closed-end funds, which are held mostly by tax-sensitive individual investors. Poterba and Weisbenner (2001) focus on changes in the capital gain tax rules facing individual investors in the US and investigate the effect of the tax regime change on the return predictability by previous returns at the

[2]Givoly and Ovadia (1983), Reinganum (1983), Keim (1983), Roll (1983), and Lakonishok and Smidt (1986) posit a hypothesis that the daily return pattern for stocks in the US at the turn of the year is due to tax-loss selling.

year-end. They find that the return predictability by previous returns at the year-end is weaker when the capital gains law encourages individual investors to realize capital losses early in the year. Grinblatt and Moskowitz (2004) also find that tendency of stocks with larger capital losses to show higher turn-of-the-year returns than those with larger capital gains is stronger when capital gains tax rate is higher, which is consistent with the tax-loss selling hypothesis. Analyzing trading behaviors of Finish investors and the effect of their trading behaviors on stock prices, Grinblatt and Keloharju (2004) find that finish investors realize losses more than gains toward the end of December and that the trading pattern generates net tax-loss buying pressure which results in negative stock returns prior to the turn of the year and positive returns in January.

While there are a lot of studies investigating the role of tax-loss selling on turn-of-the-year returns using the US market, empirical studies analyzing the other market than the US are few. However, as there is variety among the capital gains tax laws in different countries than the US, it is beneficial to analyze the effect of tax-loss selling on turn-of-the-year returns under the different capital gains tax system. Taking advantage of the strength of the analysis in the different tax regime, this study analyzes how the capital gains tax reduction law in Japan impacts stock returns in January during the period from October 1999 to December 2010. There are some reasons why I focus on the Japanese market during this period. First, it is because that the Japanese government promoted deregulations on trades of financial commodities. In the 2003 tax reform, the Japanese governments reduced the capital gains tax rate from 20 percent to 10 percent.[3] Because capital gains tax on Japanese individual

[3]Before 1999, The Japanese individual investors face higher capital gains tax rate, 26 percent. Details on the capital gains tax system in Japan are described in Hayashida and Ono (2010).

investors is treated separately from other forms of income, the tax reduction law directly affects trading behaviors around the turn of the year, which results in decaying benefits in realization of capital losses and weaker effects on turn-of-the-year returns. In addition, separation of capital gains tax from taxes on other forms of income generates another benefit. Under the consolidated income taxation system as the US, it is difficult to identify years when individual investors encounter higher tax rates. Actually, Grinblatt and Moskowitz (2004) focusing on the US market define years when individual investors are more likely to face higher tax rates than 20 percent as the higher tax rate regime in an arbitrary manner and examine the effect of tax rate difference on turn-of-the-year returns. Meanwhile, analyses of the Japanese market are easy to discriminate the era when individual investors face higher tax rates by dividing two periods before/after the tax reduction law being in effect, which is beneficial to examine the effect of tax-loss selling on turn-of-the-year returns more accurately. Furthermore, most Japanese institutional investors set their fiscal year ends as the end of March, which is an ideal condition to mitigate the effect of window dressing on turn-of-the-year returns. Lastly, I describe the reason to confine the sample period to the era ranging from October 1999. Individual investors in the Japanese market faced higher brokerage fees and a turnover tax on securities trading before this period. When investors trade securities, regardless of whether they realize capital gains/losses, they had to pay more than 1 percent brokerage fee in addition to 0.1 percent tax on their trading size. Under this situation, how much the highly rated brokerage fees and turnover tax law discourages tax-loss selling by individual investors is unknown, which leads to difficulty in comparing changes in turn-of-

the-year returns before and after the capital gains tax reduction law being in effect.[4] In addition, as Bank of Japan employed zero interest rate during this period, it is possible to compare turn-of-the-year returns before and after the tax reduction without considering time value of tax-loss selling benefits.[5] Thus, this study focuses on the period ranging from October 1999 to December 2010 when the effect of tax-loss selling on turn-of-the-year returns is less likely to be overwhelmed by the other effects. The contribution of this paper to the literature related to turn-of-the-year returns is that this paper can analyze the role of tax-loss selling in turn-of-the year returns in a more ideal setting than previous studies.

To examine whether tax-loss selling affects turn-of-the-year returns in the Japanese market, dividing the sample period into two periods before and after April 2003 when the capital gains tax reduction law being in effect, this paper analyzes how turn-of-the-year returns change in two different periods. If tax-loss selling has an important role in turn-of-the-year returns, higher turn-of-the-year returns in the pre-tax-reduction period is expected among stocks likely to be subject to tax-loss selling. In examinations, as in Jegadeesh and Titman (1993) and Fama (1998), I employ a rolling portfolio approach to test this prediction. I construct five portfolios according to the measure of unrealized capital gains which is defined in Grinblatt and Han (2005) and hold portfolios for 20 days. Stocks with larger capital losses are expected to be sold at the end of the year because of tax-loss selling benefits. After formation of the five portfolios, I construct a portfolio which longs in stocks with the largest capital losses and shorts stocks with the largest capital gains (the long-short portfolio

[4]Actually, according to the Tokyo Stock Exchange reports, trading volume by individual investor increases dramatically after the capital gains tax reduction law puts into effect.

[5]For example, Kang, Pekkala, Polk, and Ribeiro (2011).

based on capital gains). If the tax-loss selling hypothesis is a more compelling explanation for price appreciations in January, the long-short portfolio yields higher turn-of-the-year returns in the pre-tax-reduction period than in the post-tax-reduction period. In empirical examinations, I find evidence confirming this prediction. When holding period is 20 days, the long-short portfolio based on capital gains yields January returns of 43.4 bps per day in the pre-tax-reduction period with statistical significance, while it yields statistically insignificant January returns of 16.2 bps per day in the post-tax-reduction period. After considering some characteristics on capital gains and risk adjustments, the main result does not change. Furthermore, in robustness checks which consider short-term return reversals and model misspecifications, main results that the long-short portfolio based on capital gains yields statistically significant positive January returns in the pre-tax-reduction period do not change. This study lends empirical support for the hypothesis that tax-loss selling by tax-sensitive individual investors leads to appreciation of turn-of-the-year stock returns under the condition that difference of tax-loss selling benefits of individuals is more identifiable than Grinblatt and Moskowitz (2004).

The remainder of this paper is organized as follows. In the next section, first, I describe main variables used in this study and provide some summary statistics. Subsequently, I also introduce some empirical methodologies employed in this study. Section 3 reports empirical results on the relationship between tax-loss selling and the January effect. Conclusions are documented in the last section.

2. Data and methods

In this paper I analyze daily returns which are obtained from stock prices data provided by the Nikkei NEEDS. The data contain identification codes, industry codes (the Tokyo Stock Exchange criteria), stock prices, share outstanding, trading volume, and split and dividend adjusted stock returns on every listed stock. The sample period ranges from October 1999 to December 2010. Data on book values of equity are also obtained from the Nikkei NEEDS. Book values are the most recent value from the prior fiscal year reporting date. The book values are used to construct Fama-French (1993) three factors after calculating book-to-market ratios. Trading volume is used to calculate capital gains and in constructing a liquidity factor defined in Pastor and Stambaugh (2003). Data on tax rates are obtained from the National Tax Agency Statistical Annuals which are used to define pre- and post-tax-reduction periods. Although the tax reduction law becomes effective from January 2003, considering that the effect of tax-loss selling persists after tax reduction, I divide the sample period into two periods: the period from October 1999 to March 2003 and the period from April 2003 to December 2010.[6] As in many previous studies, I exclude financial firms and regulated utilities from the analysis. I also omit firms with stock prices lower than 50 yen to avoid the effect on the portfolio returns in which penny stocks are included. In the following subsections, I introduce how to construct a proxy for capital gains and empirical strategies to examine turn-of-the-year returns.

[6]If we change the breakpoint from March 2003 to January 2003 or February 2003, the empirical results in this study hold.

2.1. Capital gain/loss

Before construction of testing portfolios according to capital gains, I introduce how to construct a measure for unrealized capital gains in this subsection. Following Grinblatt and Han (2005), a proxy for capital gain is defined as

$$\begin{aligned} g_t &= \frac{P_t - RP_t}{P_t} \\ \text{with } RP_t &= \phi^{-1} \sum_{n=0}^{250} \hat{V}_{t,t-n} P_{t-n} \\ \text{where } \hat{V}_{t,t-n} &= TO_{t,t-n} \prod_{\tau=1}^{n-1} (1 - TO_{t-n+\tau}) \\ \text{and } \phi &= \sum_{n=0}^{250} \hat{V}_{t,t-n}. \end{aligned}$$

In the equations, $P_{i,t}$ is the (split and dividend adjusted) close price of stock i at date t, $TO_{i,t}$ is the turnover ratio (daily trading volume divided by share outstanding) of stock i at date t. $RP_{i,t}$ is the reference point which weights close prices by turnover ratio. To understand the intuition behind the definition, I give an example. First, I assume that an investor hold some shares of stock i and additionally purchase $TO_{i,t-n} * share\ outstanding$ shares at $P_{i,t-n}$ at date t-n. Then, the investor sold $TO_{i,t-n+1} * share\ outstanding$ shares at date t-n+1. In this case, I consider that $1 - TO_{i,t-n+1}$ in shares purchased at t-n are sold at date t-n+1. Thus, $RP_{i,t}$ can be regarded as an average purchase price using a moving-average method. I judge whether investors face capital gains/losses calculating $g_{i,t}$.

Table 1 reports summary statistics of $g_{i,t}$, which consist of time-series average of cross-sectional mean, standard deviation, median, 20th and 80th percentile points in the entire period, the period from October 1999 to March 2003, and the period from April 2003 to December 2010. Comparing cross-sectional mean in the first period with that in the second

period, capital gains are more likely to be smaller in the first period. This tendency reflects the rising trends of the Japanese stock market during the period from October 1999 to March 2003. Table 1 also presents an interesting seasonality of capital gains. In any period, capital gains tend to be smaller in December and January. This tendency is thought to reflect the fact that stock prices depreciate toward the end of the year. As the capital gains are used to sort stocks, I also focus on the 20th and 80th percentile points of the capital gains. As shown in the last two columns of Table 1, the 20th percentile points of the capital gains show negative values in any period. The 80th percentile points of capital gains show positive values except in January during the first regime. This reflects that the capital gain defined in this study is suitable for capturing stocks which are more likely to be sold at losses around the year end. The number of firms used in this study ranges from 2,720 in October 1999 to 3,490 in August 2008.

Table 2 reports coefficients from Fama-MacBeth (1973) regressions of the daily capital gains on firm characteristic variables such as market capitalization (stock price * share outstanding), book-to-market ratio (net asset divided by market cap), cumulative market-adjusted returns (denoted as $r_{-20,-1}$ and $r_{-250,-21}$), turnover ratio in the previous 12 months, an interaction term between $r_{-250,-1}$ and the turnover ratio. In calculation of t-statistics, I employ Newey-West adjusted standard errors (Bartlett HAC estimator) with 20 lags.[7] As can be seen in Table 2, the coefficients on past returns show positive values and the effect is stronger with more recent performance. In addition, the coefficients on turnover rations show negative values. These two results reflect that the reference point defined above have

[7]If we change increase the number of lags from 20, the results do not change.

a characteristic to come closer to the recent stock price. The result that coefficients on market capitalization are positive implies that investors do not realize capital gains among large market capitalization stocks. The interaction term between turnover and 250 days cumulative past returns show negative values, which means that low (high) volume winners (losers) tend to have larger (smaller) capital gains. However, the tendency does not hold in January before the capital gains tax reduction law being in effect. This result indicates that individual investors realize capital losses by selling high volume losers, which results in reference points being closer to the recent stock prices.

2.2. Empirical strategy

In this subsection, I introduce empirical strategies to analyze the effect of tax-loss selling on turn-of-the-year returns before and after the tax reduction law being in effect. To examine the effect of tax-loss selling, first, I construct five testing portfolios according to capital gains at the previous date before the formation period and calculate each portfolio returns on a day-to-day basis. The reason why I sort according to capital gains is because stocks with larger capital losses (gains) are more (less) likely to be subject to tax-loss selling around the year end. I also construct a long-short portfolio that longs in the bottom 20 percent capital gains stocks and shorts in the top 20 percent capital gains stocks. Testing portfolios used in this study are equal-weighted.[8] This study employs a rolling portfolio approach. That is, I calculate overlapping returns on trading strategies which hold a series of portfolios which is selected in the current day as well as the previous k-day. K denotes the portfolio holding

[8]In the case of the Japanese market, because some firms (e.g., NTT docomo, Panasonic, Sony, and Toyota) have overwhelmingly larger market capitalization than other firms, when researchers employ value-weighting strategies, there is a possibility that idiosyncratic shocks of larger firms dominate the other effects. Thus, in this study, I employ equal-weighting strategies.

period.[9] Lastly, I run the following regression model.

$$\begin{aligned} r_{p,t} - r_{f,t} &= \alpha_0 FebNov_1 + \alpha_1 FebNov_2 + \alpha_2 Dec_1 + \alpha_3 Dec_2 + \alpha_4 Jan_1 + \alpha_5 Jan_2 \\ &\quad + \beta_1 Mkt_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 WML_t + \epsilon \end{aligned} \tag{1}$$

$r_{p,t}$ is a daily return of a testing portfolio. More specifically, we define as follows.

$$r_{p,t} = \frac{1}{K} \sum_{k=1}^{K} \frac{1}{N_{p,t-k}} \sum_{n=1}^{N_{p,t-k}} r_{i,t}, \quad p \in (CL, CG, CL - CG)$$

K is a holding period and $N_{p,t-k}$ denotes the number of stocks included in a particular quintile portfolio sorted by capital gains at date $t-k$. $r_{f,t}$ is an overnight call rate at day t. $FebNov_i$, Dec_i, Jan_i are dummy variables for the period from February to November, December, and January respectively. i takes one (two) if the period belongs to the pre-(post-)tax-reduction period. Mkt_t is a value-weighted daily market return over the risk-free rate. SMB_t (small market cap minus big market cap) and HML_t (high book-to-market minus low book-to-market) are constructed from the method in Fama and French (1993).[10] WML_t (winners minus losers) is a momentum factor which are calculated as a similar way in Carhart (1997).[11] I estimate time-series coefficients in the above model. Coefficients α_i (i=0,1,c,5) is interpreted as a factor model alpha for each sample period. If the tax-loss

[9]There is someone who might wonder that the portfolio construction on a day-to-day basis might capture the other effects than tax-loss selling because testing portfolios in January are constructed from portfolios sorting by capital gains in January. However, the time-series average of Spearman correlations between capital gains and the lagged ones show strong persistency. When the lag is 20 days, the time-series average of Spearman correlation is more than 83.4 percent. Thus, if I construct portfolio on a month-to-month basis instead of a day-to-day basis, results do not change substantially.

[10]Following Fama and French (1993), SMB_t and HML_t are constructed using the 6 value-weight portfolios formed on size and book-to-market. Different from Fama and French (1993), market capitalization at the previous month and book-to-market at the most recent reporting are used to sort stocks. The monthly market capitalization breakpoint is the median TSE market equity and the monthly book-to-market breakpoints are 30th and 70th percentiles.

[11]I construct a momentum factor following the way described in French's website. I construct six value-weight portfolios formed on size and prior (2-12) returns. The monthly size breakpoint is the median TSE market equity. The monthly prior (2-12) return breakpoints are the 30th and 70th TSE percentiles.

selling hypothesis is more dominant, I expect negative and lower coefficients on Dec_1 than that on Dec_2 and positive and larger coefficients on Jan_1 than that on Jan_2.

3. Empirical results

The main question addressed in this study is whether turn-of-the-year returns are driven by tax-loss selling of individual investors. According to the tax-loss selling hypothesis, tax-loss selling of stocks with capital losses at the year-end leads to stock price appreciation around the turn of the year. To examine this prediction, I analyze how the capital gains tax reduction law in Japan affects stock return patterns around the turn of the year. This section reports factor model alphas of testing portfolios which are constructed according to capital gains defined in the previous section.

3.1. Raw returns

Table 3 reports raw returns on testing portfolios when the holding period is 20 days. T-statistics are described below the coefficients are computed using Newey-West adjusted standard errors with 14 lags.[12] The testing portfolios are divided into five portfolios according to raw capital gains (Panel A) or residual capital gains (Panel B). The focus on this study is how different turn-of-the-year returns are before and after the capital gains tax reduction law being in effect. I begin by reporting December and January returns of the lowest quintile portfolio which are more likely to be sold at capital losses in December. As can be seen in the first column in Panel of Table 3, stocks with larger capital losses shows negative December

[12]ACFs (PACFs, IACFs) of portfolio returns show that number of lags is less than 15 in most cases. Of course, there are some cases which imply that models should take larger lags than 15. However, as there is a possibility that robust standard errors cannot be calculated in a more accurate way due to the rage of the sample period, I set the number of lags as 14 which is a maximum number in the case of about 3,000 observations.

returns in the pre-tax-reduction period, while they show positive December returns in the post-tax-reduction period. However, both of them are not statistically significant. At the same time, stocks with larger capital losses shows positive January returns both in the pre- and post-tax-reduction periods. Only in the former period, January returns statistically significant values. This tendency also holds when I focus on Panel B of Table 3.

Subsequently, I report December and January returns of the portfolio which longs in the bottom 20 percent capital gains stocks and shorts in the top 20 percent capital gains stocks. The last column in Panel A of Table 3 shows that the long-short portfolio based on raw capital gains generates significant January returns only in the pre-tax-reduction period. While the long-short portfolio based on raw capital gains yields January returns of 43.3 bps with a t-statistic of 3.42 in the pre-tax-reduction period, it yields those of 16.2 bps with a t-statistic of 1.62 in the post-tax-reduction period. Panel B of Table 3 also shows similar tendencies. The long-short portfolio based on residual capital gains yield 17.8 bps per day in January with statistical significance in the pre-tax-reduction period, while the portfolio generates a smaller and statistically insignificant January return of 4.8 bps per day in the post-tax-reduction period. Although it is weak evidence for December returns, these results are consistent with the prediction that the capital gains tax reduction law discourages tax-loss selling and results in lower turn-of-the-year returns in the post-tax-reduction period.

3.2. Risk adjustment

Table 4 reports risk adjusted calendar-time alphas and factor loadings on the portfolios which longs in the bottom 20 percent capital gains stocks and shorts in the top 20 percent capital gains stocks. As shown in Table 4, even after risk adjustments, the long-short portfolio based on raw/residual capital gains generates significant January returns only in the pre-

tax-reduction period. For example, when stocks are sorted by residual capital gains, the long-short portfolio yields 16.2 bps per day in January with statistical significance in the pre-tax-reduction period, while the portfolio generates a smaller and statistically insignificant January return of 4.9 bps per day in the post-tax-reduction period. When I employ raw capital gains, I obtain similar results.

Subsequently, I focus on factor loadings on the long-short portfolio. As shown in Panel A of Table 4, the long-short portfolio based on raw capital gains show higher factor sensitivities, which implies that January returns cannot be eliminated because of higher systematic risks. However, as can be seen in the last column in Panel B of Table 4, factor loadings on the long-short portfolio based on residual capital gains show economically and statistically less significant values than those on the long-short portfolio based on raw capital gains, which implies that exploiting the positive January return is realizable with a market-neutral position by constructing the long-short portfolio according to residual capital gains. As a whole, results presented in Panel A and B in Table 4 provide empirical support for the prediction that tax-loss selling drives appreciations of stock returns in January.

3.3. Short-term return reversal

From this paragraph, I focus on how the length of the holding period affects turn-of-the-year returns. As documented in Jegadeesh (1990), Lehman (1990), and Lo and MacKinlay (1990), stock returns tend to show reversals in the short run (at most one month). This short-term return reversals might be contributed to return patterns around the turn of the year. To show that results documented in Table 3 and 4 are not driven by short-term return reversals, I also construct rolling portfolio strategies skipping 5 or 10 days after the formation period.

Table 5 reports 4 factor model calendar-time alphas when testing portfolios are held for 20 days skipping 5 or 10 days after the formation period. Calendar-time alphas without skipping are also reported in Table 5. As shown in the table, there is a tendency that turn-of-the-year returns of the long-short portfolio based on capital gains get lower as the skipping periods get longer. January returns of the long-short portfolio based on raw capital gains in the pre-tax-reduction period drop from 31.3 bps per day to 21.2 bps per day when I change the skipping days from 0 days to 10 days. These results imply that January return spreads of the long-short portfolio based on raw capital losses might be driven by short-term return reversals. Panel B of Table 5 reports risk-adjusted January returns on testing portfolios for different holding periods when I employ residual capital gains. Although the long-short portfolio based on residual capital gains shows a similar tendency to those on raw capital gains, the rate of decline in turn-of-the-year returns on the long-short portfolio is milder in response to the length of the holding period. This is because I control the effect of short-term return reversals in the Fama-MacBeth regression of raw capital gains. Collectively, although short-term return reversals affect January returns, results in Table 5 also present empirical support for the tax-loss selling hypothesis.

3.4. Robustness 1: Different calendar-time alphas

As documented in Grinblatt and Keloharju (2004), stock prices appreciations among stocks with capital losses begin before the year-end. Thus, I change the periods of calendar-time dummies which are defined as the period ranging from the beginning of the current month to the end of that. Instead, I define the periods of calendar-time dummies as the periods ranging from 5 days before the end of the previous month to 5 days before the end of the current month. Using the newly defined calendar-time dummies, I conduct factor model

regression of the portfolio which longs in the bottom 20 percent capital gains stocks and shorts in the top 20 percent capital gains stocks.

Table 6 reports the regression results. Basically, I find similar tendencies even if I employ different calendar-time periods. However there is a little difference from previous results. For example, the long-short portfolio shows statistically significant January returns in the post-tax-reduction period in Panel A of Table 6. This also holds true for the pre-tax-reduction period. Inclusions of the last 5days at the year-end contribute to capturing the effect of tax-loss selling on turn-of-the-year returns in a more accurate manner. As can be seen in Panel B of Table 6, the same tendency is also observed in the long-short portfolio based on residual capital gains. In spite of these results, January returns on the long-short portfolio are lager in the pre-tax-reduction period than those in the post-tax-reduction period. Overall, results in Table 6 also support the tax-loss selling hypothesis.

3.5. Robustness 2: conditional factor model

In the previous subsection, I assume that factor loadings of testing portfolios do no change throughout the sample period. However, factor loadings might change because of change in risk attitudes of investors and there is a possibility that the change in investors' attitudes toward risks can explain abnormally high January returns of the long-short strategy based on capital gains. Considering the effect, I estimate a simple conditional factor model which accounts for changes in factor loadings in addition to changes in intercepts (alphas). More concretely, employing a similar way in Lewellen and Nagel (2006), I estimate conditional alphas and factor loadings of the long-short strategy based on capital gains in January, February-November, and December both in the pre- and post-tax-reduction periods. Results are reported in Table 7.

Panel A of Table 7 reports the subsample analysis when I sort stocks by raw capital gains. First, focusing on the first row in Panel A, the results confirm the tendency of Table 4 that the January return spread of the long-short strategy based on capital gains are more likely to be higher in the pre-tax-reduction period. To achieve highly returns with maintaining a market-neutral risk position, I also estimate conditional alphas and factor loadings of the long-short strategy based on residual capital gains, which are reported in Panel B of Table 7. As shown in the first row, the results also present the similar tendency observed in Panel A. Focusing on factor loadings on the long-short portfolio, the portfolios tend to have higher factor loadings on the market factor, the size factor, and the value/growth factor in December than in other months during both the pre- and post-tax-reduction period. The results imply that investors' trading behaviors around turn-of-the-year also affect return spreads such as SMB and HML in a similar way that tax-loss selling affects return spreads on the long-short strategy based on capital gains. As a whole, results presented in this subsection also confirm that tax-loss selling drives turn-of-the-year returns.

4. Conclusion

In this paper, focusing on the 2003 capital gains tax regime change in Japan which reduce the tax rate from 20 percent to 10 percent on capital gains, I examine whether tax-loss selling affects turn-of-the-year returns. As the tax reduction law decays benefits in realization of capital losses and results in weaker relationship between tax-loss selling and turn-of-the-year returns, the analysis of turn-of-the-year returns before and after the tax reduction law being in effect is beneficial to separate the effect of window dressing and that of tax-loss selling on turn-of-the-year returns.

If tax-loss selling has an important roles in turn-of-the-year returns, higher turn-of-the-year returns in the pre-tax-reduction period is expected among stocks with larger capital losses which are more likely to be subject to tax-loss selling. Empirical findings in this study lend support for the prediction that tax-loss selling affects turn-of-the-year returns.

First, I find that the long-short portfolio which longs in the bottom 20 percent capital gains stocks and shorts in the top 20 percent capital gains yields higher turn-of-the-year returns in the pre-tax-reduction period than in the post-tax-reduction period. This tendency holds even when I employ residual capital gains which consider the effect of previous returns, market capitalization, book-to-market, and turnover ratio. Second, considering the effect of short-term return reversal on turn-of-the-year returns, I construct strategies skipping 5/10 days after the formation period. In the analysis, I find a tendency that turn-of-the-year returns get lower as the skipping period gets longer. Although the profitability of the long-short portfolio based on capital gains weakens in response to the length of the holding period, turn-of-the-year returns of the long-short portfolio are still statistically significant in the pre-tax-reduction period. In the robustness check which changes calendar-time, I find that turn-of-the-year returns are abnormally higher in the pre-tax-reduction period with statistically and economically significance. The robustness check which accounts for the time-series change in factor loadings also confirms that the long-short portfolio based on capital gains yield higher turn-of-the-year returns in the pre-tax-reduction period.

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Table 1: Summary statistics of capital gains. This table reports summary statistics for the capital gains. The capital gain is defined as $g_t = \frac{P_t - RP_t}{P_t}$ where RP_t is the reference price weighted by trading probability which is assumed to correspond to the turnover ratio. The table reports the time-series average of the cross-sectional mean, median, standard deviation, and the 20th and 80th percentiles of the capital gains in each calendar time (February to November, December, and January) for the entire period, the period from October 1999 to March 2003 (Regime 1), and the period from April 2003 to December 2010 (Regime 2).

Period	Month	Mean	St. Dev.	Median	P20	P80
Entire	Feb-Nov	-0.107	0.452	-0.051	-0.222	0.065
	Dec	-0.162	0.353	-0.095	-0.307	0.042
	Jan	-0.165	0.467	-0.095	-0.305	0.043
Regime1	Feb-Nov	-0.163	0.686	-0.085	-0.282	0.039
	Dec	-0.246	0.463	-0.151	-0.413	0.001
	Jan	-0.254	0.724	-0.151	-0.408	-0.001
Regime2	Feb-Nov	-0.082	0.349	-0.037	-0.195	0.077
	Dec	-0.121	0.300	-0.067	-0.255	0.062
	Jan	-0.114	0.320	-0.062	-0.246	0.069

Table 2: Fama-MacBeth regressions of capital gains. This table reports coefficients from Fama-MacBeth regressions of the capital gains on firm characteristics. $R_{-20,-1}$ is the prior-month stock return, $R_{-250,-21}$ is the previous 1-year return skipping one month, ln(MCAP) is the log of market capitalization at the end of the previous month, Ln(BM) is the log of book-to-market ratio at the end of the previous month, and Turnover is the average turnover in the previous 12 months. Cross-sectional regressions are run every day and t-statistics are calculated using Newey-West adjusted standard errors with 14 lags which account for heteroskedasticity and autocorrelation. The reported R^2 is the time-series average of R^2 from the cross-sectional regressions. Regression results are reported in each calendar time (February to November, December, and January) for the entire period, the period from October 1999 to March 2003 (Regime 1), and the period from April 2003 to December 2010 (Regime 2).

	Entire	Regime 1			Regime 2		
Calendar time		FN	Dec	Jan	FN	Dec	Jan
$R_{-20,-1}$	1.041	1.235	1.282	1.337	0.928	0.919	0.947
	(20.05)	(11.01)	(8.16)	(5.11)	(15.39)	(5.76)	(5.31)
$R_{-250,-21}$	0.399	0.393	0.489	0.491	0.384	0.442	0.444
	(14.90)	(11.34)	(4.62)	(5.42)	(9.98)	(3.29)	(3.08)
ln(MCAP)	0.031	0.037	0.045	0.053	0.026	0.030	0.032
	(17.39)	(8.92)	(6.70)	(4.51)	(13.93)	(11.32)	(6.50)
ln(BM)	0.005	-0.030	0.009	-0.041	0.024	0.015	0.023
	(1.04)	(-2.24)	(0.45)	(-1.13)	(7.64)	(1.58)	(6.51)
Turnover	-0.113	-0.246	-0.296	-0.387	-0.031	-0.030	-0.032
	(-9.28)	(-10.87)	(-5.35)	(-6.63)	(-7.76)	(-4.36)	(-6.09)
$R_{-250,-1}$*Turnover	-0.025	-0.016	-0.053	0.032	-0.030	-0.034	-0.031
	(-4.88)	(-1.18)	(-2.52)	(0.81)	(-8.32)	(-3.63)	(-3.03)
R^2	0.384	0.289	0.423	0.302	0.428	0.455	0.424

Table 3: Raw returns on testing portfolios sorting by raw and residual capital gains. This table presents daily raw returns in each calendar time (February to November, December, and January) of the equal-weighted portfolios for the lowest and highest raw (Panel A)/residual (Panel B) capital gains quintiles and the equal-weighted portfolios that long the lowest capital gains quintile portfolio and short the largest capital gains quintile portfolio. Quintiles are formed on a day-to-day basis from October 1999 to December 2010 based on the capital gains at the previous date. Testing portfolios are held for 20 days after the formation period and returns on testing portfolios are computed by averaging the current day's return on the previous 20 days portfolios. $FebNov_i$, Dec_i, Jan_i are dummy variables for the period from February to November, December, and January respectively. i takes one (two) if the period belongs to the pre-(post-)tax-reduction period. Raw returns are reported in daily percentages and Newey-West adjusted t-statistics with 14 lags are shown below the coefficient estimates.

	Panel A: raw CG			Panel B: residual CG		
	CL	CG	CL-CG	CL	CG	CL-CG
$FebNov_1$	0.015	-0.031	0.047	-0.013	-0.013	0.000
	(0.23)	(-0.89)	(0.95)	(-0.25)	(-0.31)	(-0.01)
$FebNov_2$	0.036	0.026	0.010	0.031	0.026	0.004
	(0.75)	(0.83)	(0.33)	(0.75)	(0.75)	(0.31)
Dec_1	-0.231	-0.108	-0.123	-0.241	-0.165	-0.076
	(-1.43)	(-1.60)	(-1.06)	(-1.79)	(-1.71)	(-1.45)
Dec_2	0.191	0.204	-0.013	0.208	0.160	0.048
	(1.80)	(3.27)	(-0.18)	(2.31)	(2.18)	(1.00)
Jan_1	0.402	-0.031	0.433	0.274	0.096	0.178
	(2.83)	(-0.40)	(3.42)	(2.18)	(1.12)	(2.27)
Jan_2	0.179	0.017	0.162	0.123	0.075	0.048
	(1.02)	(0.15)	(1.62)	(0.77)	(0.63)	(0.85)

Table 4: Risk adjusted returns on LS portfolios sorted by raw and residual capital gains. This table presents daily factor model adjusted returns in each calendar time (February to November, December, and January) and factor loadings for the equal-weighted portfolios for the lowest and highest raw (Panel A)/residual (Panel B) capital gains quintiles and the equal-weighted portfolio that longs the lowest capital gains quintile portfolio and shorts the largest capital gains quintile portfolio. Quintiles are formed on a day-to-day basis from October 1999 to December 2010 based on the residual capital gains at the previous date. Testing portfolios are held for 20 days after the formation period and returns on testing portfolios are computed by averaging the current day's return on the previous 20days portfolios. $FebNov_i$, Dec_i, Jan_i are dummy variables for the period from February to November, December, and January respectively. i takes one (two) if the period belongs to the pre-(post-)tax-reduction period. Mkt_t is a value-weighted daily market return over the risk-free rate. SMB_t (small market cap minus big market cap) and HML_t (high book-to-market minus low book-to-market) are factors constructed from the method in Fama and French (1993). WML_t (winners minus losers) is a momentum factor which are calculated as a similar way in Carhart (1997). Alphas are reported in daily percentages and Newey-West adjusted t-statistics with 14 lags are shown below the coefficient estimates.

	Panel A: raw CG			Panel B: residual CG		
	CAPM	FF	FF+MOM	CAPM	FF	FF+MOM
$FebNov_1$	0.055	0.027	0.055	0.006	0.001	0.006
	(1.19)	(0.68)	(1.74)	(0.29)	(0.07)	(0.31)
$FebNov_2$	0.008	-0.012	0.004	0.003	0.000	0.003
	(0.27)	(-0.47)	(0.21)	(0.21)	(-0.02)	(0.19)
Dec_1	-0.121	-0.081	0.001	-0.075	-0.069	-0.054
	(-1.06)	(-0.89)	(0.01)	(-1.43)	(-1.52)	(-1.17)
Dec_2	-0.041	-0.082	-0.006	0.027	0.021	0.034
	(-0.61)	(-1.49)	(-0.10)	(0.60)	(0.48)	(0.79)
Jan_1	0.437	0.345	0.313	0.181	0.168	0.162
	(3.51)	(3.25)	(3.82)	(2.30)	(2.30)	(2.23)
Jan_2	0.177	0.109	0.113	0.059	0.049	0.049
	(1.87)	(1.36)	(1.78)	(1.16)	(1.01)	(1.06)
Mkt	0.151	0.412	0.315	0.110	0.148	0.131
	(4.44)	(9.26)	(8.49)	(6.34)	(5.06)	(4.59)
SMB		0.476	0.492		0.067	0.070
		(7.35)	(9.14)		(2.02)	(2.17)
HML		0.444	0.163		0.070	0.020
		(6.64)	(3.03)		(1.55)	(0.45)
WML			-0.459			-0.082
			(-12.91)			(-3.73)
Adj. R^2	0.057	0.219	0.411	0.096	0.108	0.129

Table 5: Calendar-time alphas k-days skipping after the formation period. This table presents daily 4-factor model calendar-time alphas on the portfolio that longs the lowest (raw/residual) capital gains quintile portfolio and short the largest (raw/residual) capital gains quintile portfolio. Testing portfolios are held for 20 days after the formation period and 0, 5 and 10 days skipping 5 days after the formation period. Returns on testing portfolios are computed by averaging the current day's return on the previous 20 days portfolios. Calendar-time alphas are reported in daily percentages and Newey-West adjusted t-statistics with 14 lags are shown below the coefficient estimates. Panel A (B) of the table reports results when I sort stocks by raw (residual) capital gains.

	Panel A: Panel A: raw CG			Panel B: residual CG		
	non-skip	skip 5-days	skip 10days	non-skip	skip 5-days	skip 10days
$FebNov_1$	0.055	0.009	0.006	0.006	-0.015	-0.014
	(1.74)	(0.29)	(0.20)	(0.31)	(-0.76)	(-0.75)
$FebNov_2$	0.004	-0.011	-0.009	0.003	-0.012	-0.010
	(0.21)	(-0.51)	(-0.46)	(0.19)	(-0.89)	(-0.78)
Dec_1	0.001	-0.053	-0.056	-0.054	-0.101	-0.115
	(0.01)	(-0.73)	(-0.87)	(-1.17)	(-2.07)	(-2.23)
Dec_2	-0.006	-0.012	0.002	0.034	0.021	0.010
	(-0.10)	(-0.21)	(0.03)	(0.79)	(0.50)	(0.23)
Jan_1	0.313	0.239	0.212	0.162	0.141	0.128
	(3.82)	(3.14)	(2.99)	(2.23)	(2.21)	(2.14)
Jan_2	0.113	0.086	0.071	0.049	0.031	0.023
	(1.78)	(1.39)	(1.21)	(1.06)	(0.66)	(0.49)

Table 6: Different calendar-time alphas on LS portfolios sorted by raw and residual capital gains. This table presents daily 4-factor model adjusted returns in each calendar time (February to November, December, and January) for the equal-weighted portfolios for the lowest and highest raw (Panel A)/residual (Panel B) capital gains quintiles and the equal-weighted portfolio that longs the lowest capital gains quintile portfolio and shorts the largest capital gains quintile portfolio. Different from previous tables, each calendar time is defined as the period from 5 days before the end of the previous month to 5 days before the end of the current month. Quintiles are formed on a day-to-day basis from October 1999 to December 2010 based on the residual capital gains at the previous date. Testing portfolios are held for 20 days after the formation period and returns on testing portfolios are computed by averaging the current day's return on the previous 20days portfolios. $FebNov_i$, Dec_i, Jan_i are dummy variables for the period from February to November, December, and January respectively. i takes one (two) if the period belongs to the pre-(post-)tax-reduction period. Alphas are reported in daily percentages and Newey-West adjusted t-statistics with 14 lags are shown below the coefficient estimates.

	Panel A: raw CG			Panel B: residual CG		
	Raw	FF	FF+MOM	Raw	FF	FF+MOM
$FebNov_1$	0.035	0.019	0.050	-0.004	-0.002	0.004
	(0.72)	(0.48)	(1.59)	(-0.20)	(-0.09)	(0.17)
$FebNov_2$	0.008	-0.014	0.005	0.003	-0.002	0.002
	(0.25)	(-0.54)	(0.22)	(0.19)	(-0.11)	(0.13)
Dec_1	-0.139	-0.069	-0.001	-0.080	-0.064	-0.052
	(-0.99)	(-0.61)	(-0.01)	(-1.10)	(-0.96)	(-0.79)
Dec_2	-0.067	-0.122	-0.075	0.039	0.012	0.021
	(-0.90)	(-2.05)	(-1.35)	(0.83)	(0.28)	(0.49)
Jan_1	0.581	0.423	0.379	0.232	0.201	0.193
	(4.53)	(3.29)	(3.89)	(2.82)	(2.54)	(2.42)
Jan_2	0.260	0.185	0.198	0.080	0.076	0.078
	(2.54)	(2.61)	(2.58)	(1.39)	(1.57)	(1.59)

Table 7: Conditional alphas and factor loadings on the long-short portfolios. This table presents daily 4-factor model adjusted returns in each calendar time (February to November, December, and January) for the equal-weighted portfolios for the lowest and highest raw (Panel A)/residual (Panel B) capital gains quintiles and the equal-weighted portfolio that longs the lowest capital gains quintile portfolio and shorts the largest capital gains quintile portfolio. Different from previous tables, each calendar time is defined as the period from 5 days before the end of the previous month to 5 days before the end of the current month. Quintiles are formed on a day-to-day basis from October 1999 to December 2010 based on the residual capital gains at the previous date. Testing portfolios are held for 20 days after the formation period and returns on testing portfolios are computed by averaging the current day's return on the previous 20days portfolios. $FebNov_i$, Dec_i, Jan_i are dummy variables for the period from February to November, December, and January respectively. i takes one (two) if the period belongs to the pre-(post-)tax-reduction period. Alphas are reported in daily percentages and Newey-West adjusted t-statistics with 14 lags are shown below the coefficient estimates.

Calendar time	Panel A: Regime 1 (high tax)			Panel B: Regime 2 (low tax)		
	Feb-Nov	Dec	Jan	Feb-Nov	Dec	Jan
Panel A: raw capital gain overhang						
Intercept	0.045	0.066	0.261	0.012	-0.089	0.084
	(1.51)	(1.02)	(2.92)	(0.56)	(-2.00)	(1.42)
Mkt	0.384	0.694	0.745	0.260	0.581	0.295
	(5.71)	(4.40)	(5.75)	(4.93)	(3.74)	(2.99)
SMB	0.425	0.696	0.691	0.457	0.749	0.602
	(7.39)	(4.71)	(3.18)	(5.41)	(4.44)	(4.96)
HML	0.254	0.435	0.468	0.017	0.580	0.329
	(3.05)	(3.54)	(3.93)	(0.21)	(2.73)	(3.75)
WML	-0.556	-0.714	-0.616	-0.429	-0.153	-0.504
	(-12.22)	(-6.32)	(-5.15)	(-8.41)	(-1.28)	(-5.09)
Panel B: residual capital gain overhang						
Intercept	-0.005	-0.005	0.130	0.012	-0.005	0.064
	(-0.24)	(-0.19)	(2.62)	(0.90)	(-0.15)	(1.48)
Mkt	0.187	0.422	0.353	0.069	0.285	0.216
	(4.28)	(6.17)	(3.55)	(2.24)	(3.79)	(2.83)
SMB	0.028	0.289	0.140	0.024	0.187	0.059
	(0.68)	(4.43)	(1.30)	(0.60)	(2.77)	(0.68)
HML	0.123	0.304	0.350	-0.153	0.221	-0.042
	(1.65)	(5.42)	(2.71)	(-3.61)	(2.21)	(-0.75)
WML	-0.154	-0.250	-0.152	-0.063	0.000	-0.064
	(-5.90)	(-4.78)	(-2.46)	(-1.87)	(0.00)	(-0.95)