NBER WORKING PAPER SERIES

TAX-LOSS TRADING AND WASH SALES

Mark Grinblatt
Matti Keloharju

Working Paper 8745
http://www.nber.org/papers/w8745

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 2002

We are grateful to Amit Goyal, Matti Ilmanen, Juhani Linnainmaa, and Harri Toivonen for superb research assistance, to the Academy of Finland and the UCLA Academic Senate for financial support, to Jay Ritter for many helpful discussions, and to both the editor, William Schwert and an anonymous referee for many useful comments on earlier drafts. A portion of this research was undertaken at Yale University, whose support we are appreciative of. We are especially indebted to Henri Bergström, Mirja Lamminpää, Tapio Tolvanen, and Lauri Tommila of the Finnish Central Securities Depositary for providing us with access to the data. The views expressed herein are those of the authors and not necessarily those of the National Bureau of Economic Research.

Tax-Loss Trading and Wash Sales
Mark Grinblatt and Matti Keloharju
NBER Working Paper No. 8745
January 2002
JEL No. G0, G1

ABSTRACT

An analysis of trades in the Finnish stock market around the turn of the year shows that Finnish investors tend to realize losses more than gains towards the end of December. They also buy back the same stocks they recently sold, with a repurchase rate that depends on the size of the capital loss and how close the sale is to the end of December. The resulting net buying pressure from these "wash sale" repurchases is greater for stocks with small market capitalizations and has a calendar pattern that is similar to that of stock returns.

Mark Grinblatt
UCLA
Anderson Graduate School of Management
110 Westwood Plaza
Los Angeles, CA 90095-1481
and NBER
Tel: 310-825-2508
Fax: 310-206-5455
mark.grinblatt@anderson.ucla.edu

Matti Keloharju
Helsinki School of Economics
Department of Accounting and Finance
Runeberginkatu 22-24
FIN-00100 Helsinki, Finland
Tel: +358 9-4313-8486
Fax: +358 9-4313-8678
matti.keloharju@hkkk.fi

1. Introduction

Most finance researchers suspect that tax-loss selling of stocks occurs at the end of the year, but there is little direct evidence that tax considerations actually motivate end-of-year trading in these securities. Moreover, while research hints that the January effect may be tied to December tax-loss selling, no one has documented that purchases after the turn of the year are linked to December sales. This paper presents a tax-loss sales analysis of the trades of household and institutional participants in the market for Finnish stocks. We use a unique data set to analyze the calendar pattern of tax-loss selling activity and repurchases of stock and document how this pattern relates to capital gains and losses on the stock, firm size, and stock return seasonalities.

The earliest arguments in the literature for the existence of tax-loss trading at the turn of the year are based on observed volume and return seasonalities. Dyl (1977) found that December trading volume is larger for losing stocks. Givoly and Ovadia (1983), Reinganum (1983), Keim (1983), Roll (1983), and Lakonishok and Smidt (1986) hypothesized that the daily return pattern for stocks in the United States at the turn of the year is due to tax-loss selling. Although the hypothesis itself is intriguing, return patterns per se are not compelling evidence that tax-loss trading takes place. International comparisons, for example, suggest that return patterns around the turn of the year are not necessarily indicative of tax-loss trading. Stocks in countries like Australia and Japan, despite having tax years that differ from the calendar year period used for taxation of most U.S. investors have turn-of-the-year return patterns that are similar to those of U.S. stocks.[1] Also, Chan (1986) found that stocks with large short-term gains have higher January returns.

There is more compelling evidence in Sias and Starks (1997), which is based on cross-sectional differences in individual vs. institutional ownership of the stock, and in both Poterba and

Weisbenner (2001) and Grinblatt and Moskowitz (2001), which are based on differences in the strength of January reversals associated with tax regimes. Nevertheless, a direct tie to the reversals and the behavior of investors is lacking from these papers.

Several studies have provided direct data on investor behavior around the turn of the year. Odean (1998) notes that the difference between the proportion of stocks sold with capital gains and the proportion sold with capital losses is markedly different in December than in the rest of the year, (although even in December, gains are still realized more than losses). However, this December tempering of what has been referred to as the disposition effect[2] could also arise from the momentum effect documented by Jegadeesh and Titman (1993). Stocks that have declined throughout the year are likely to underperform other stocks. As Grinblatt and Moskowitz (2001) note, for stocks that have declined in value over the year, the momentum effect is about 2 ½ times larger in December than in the rest of the year and about an order of magnitude larger than the overall winner momentum effect. Stocks that have declined in value over the prior year tend to be those for which most investors have experienced capital losses. Hence, even in the absence of tax loss considerations, it may be rational to sell stocks in December that have declined in value.[3]

It is also possible to argue that December stock sales, particularly those in late-December (although Odean does not analyze intra-December sales), arise from window dressing. The end-of-year holiday season is often a time for recapping investment performance. The embarrassment of possessing a loser may be a psychological motivator for these sales, especially for institutions that must report to investors on their holdings.

---

[1] See, for example, Brown, Keim, Kleidon, and Marsh (1983) and Kato and Schallheim (1985).

[2] Shefrin and Statman (1985) first employed the term "disposition effect" for a tendency to hold onto losing investments. This effect is an application of Kahneman and Tversky's (1979) prospect theory. Evidence of the disposition effect has been documented by Odean (1998), Heath, Huddart, and Lang (1999), and Grinblatt and Keloharju (2001), among others, in a variety of contexts. The disposition effect can be regarded as the opposite of tax-loss selling in that investors are holding onto losing stocks more than they are holding onto winning stocks.

[3] This does not appear to be the case in Finland, as the momentum effect appears to be rather weak in December.

D'Mello, Ferris, and Hwang (2000) also provide compelling evidence on investor behavior around the turn of the year. In one portion of their study, they use transaction data to compare the 10 days prior to and after January 1 with trading in July. Their study infers whether the seller or the buyer is the initiator of a trade and then shows that stocks that have declined the most in the current and prior year from their high are subject to more selling pressure at the end of the calendar year. This selling pressure disappears at the new year. However, they still lack data on the actual gains and losses of investors. Without an analysis of volume at various prior price levels, it is still a large leap of faith to suggest that alternatives like those discussed above are not driving the observed December behavior.

Alternative explanations to tax-loss selling for the relatively stronger December sales of stocks with capital losses would not apply if, as we document, investors are repurchasing these very same stocks on the days that they sold them (and were not subject to wash sales penalties). In this case, it would be hard to argue that anything but tax considerations were the motivation for the sale. Past research on the turn-of-the-year effect, notably that in Ritter (1988), has presciently observed that there should be an exceptionally large number of wash sales – sales with an intention to repurchase in the immediate future – if tax-loss selling is occurring at the turn of the year. According to Ritter (1988, p. 715), "I am sure that the data would show that individuals who sell a given stock in December have a disproportionately high probability of reinvesting in that stock…" To date, there have been no studies to test this hypothesis. Finland, lacking all wash sales restrictions, and with a remarkable electronic database on the trades of all domestic investors, provides an ideal environment for analyzing the relation between the turn of the year and wash sales.

First, we analyze, on a daily basis, the proportion of stocks with gains that are realized and the proportion of stocks with losses that are realized in the 50 trading days around January 1 of the

years 1996-2000. We show that the ratio of these two proportions, aggregated over all Finnish households, decreases markedly in the last 8 trading days of December and then exhibits an abrupt increase in January, which commences precisely on the first trading day of January. We also convincingly document that the rate of repurchase is highly linked to the turn of the year and the size of the capital loss. This supports Ritter's hypothesis that repurchases are tied to tax-motivated sales, in this case to take advantage of the absence of wash sales restrictions in Finland.

Finally, we analyze the issue of demand pressure from repurchases. We demonstrate that the timing of repurchase activity as a fraction of volume in small stocks has much more of a turn of the year seasonal than the timing of repurchase activity for large stocks. We then show that net repurchase activity, the difference between repurchases on a given day associated with past sales and sales on that day that will eventually be repurchased, has a time series pattern that is remarkably similar to the time series of returns observed in late December and early January, particularly for small firms.

Throughout much of the analysis, we assess whether window dressing is a plausible alternative explanation for our results. We do this both by studying the timing of repurchases and by analyzing the behavior of institutions in addition to households. If window dressing is what accounts for December's change in investment behavior, we would not observe nearly immediate repurchases of the same stock by investors in December (but we do observe such repurchases). Moreover, this hypothesis implies that investor groups known to be the most prone to window dressing, like finance and insurance institutions, should exhibit the greatest increases in the December sales of losing stocks of all investor groups. However, we find little evidence of a December change in investment behavior among finance and insurance institutions. (We do detect an increase in the tendency to sell losing stocks by nonfinancial corporations, but this increase is far more modest than that observed for households.). This suggests that groups less prone to

window dressing incentives, particularly households, also should not exhibit any changes in their investment behavior if window dressing is the primary cause of December changes in investment behavior. We reject the window dressing hypothesis because households exhibit dramatic increases in their propensity to sell losing stocks in December, while other groups more prone to window dressing do not. With similar arguments and evidence, we believe that our data show that the modest change in investment behavior observed among nonfinancial corporations also must be due to tax avoidance rather than window dressing.[4]

The organization of the paper is as follows. Section 2 describes the tax environment. Section 3 describes the data. Section 4 presents the results. Section 5 briefly concludes the paper.

2. The tax environment in Finland

We analyze daily data on the holdings and trades of all Finnish households and institutions in virtually all Finnish stocks. The data are from December 27, 1994 to May 26, 2000. During this sample period, there was a flat capital gains tax rate for all Finnish households and taxable institutions, irrespective of households' ordinary income tax rate, corporate profits (provided they are positive), or the length of the investment holding period: in 1994 and 1995, the capital gains tax rate was 25%, which was increased to 28% at the beginning of 1996, and to 29% at the beginning of 2000.[5] The capital gain/loss for tax purposes is computed, consistent with Finnish tax law, is:

$$\text{Min (sale price} - \text{purchase price, sale price} \times 70\%).^{6}$$

[4] D'Mello, Ferris, and Hwang (2000) also argue that window dressing could not be affecting their results. They show that small trades account for a larger proportion of volume at the end of the year and assume that small trades are not driven by window dressing.

[5] Households' ordinary income tax rates are much higher than the capital income rates: for high income individuals, the ordinary income tax rate is about 60%.

[6] For assets purchased prior to 1989, the formula is Min (sale price – purchase price, sale price × 50%). This alternative is irrelevant, as we have no data points in our sample for which this alternative applies.

A capital loss can be used to offset a capital gain in the year the loss is realized and in the three subsequent years. Other than the possibility of the capital gain offset on a current year or 3-year carryforward basis, there is no tax deduction for a capital loss per se. Kukkonen (2000), using tax data from a sample of wealthy Helsinki-based investors, documents that the effective average capital gains tax rate for all capital gains in 1995 was 10%, i.e. much lower than the 25% statutory tax rate prevailing at that time. Thus, like in the U.S. (see, for example, Poterba (1987) and Auerbach et al. (1998)), investors successfully reduce their tax bill by realizing capital losses, but these losses are insufficient for completely avoiding taxes.

There are no explicit wash sale constraints in Finland. There is a general rule in the tax law, similar to that in the United States, which allows the tax authorities to use their discretion in determining the tax if the actions of the tax subject lack an economic motive other than to evade taxes. In principle, some wash sales could be taxed using this rule, but in practice, this never occurs.

Our study separately looks at the behavior of financial and non-financial corporations. These institutions are taxed at the same capital gains rate as individuals. Several factors discourage them from engaging in wash sales. First, as in many other European countries, notably Germany and France, a Finnish corporation's reported and taxable income figures are virtually identical.[7] Hence, unlike corporations in the U.S., Finnish companies cannot engage in trading activity that realizes losses for the purpose of reducing taxes without appearing less profitable. Second, these institutions face laxer accounting restrictions than U.S. firms. Reducing taxable income by

[7] A limit on depreciation for tax purposes is the only notable exception.

realizing losses on assets owned is thus more costly than reducing reported (and taxable) income with seemingly innocuous bookkeeping practices.[8]

3. Data and methods

3.1. The FCSD register

The comprehensive data source employed in this study is the central register of shareholdings for Finnish stocks in the Finnish Central Securities Depository (FCSD). Practically all major publicly-traded Finnish companies have joined the register, and as of the beginning of 1995 (approximately, the start of our sample period), it covered 97% of the total market capitalization of Finnish stocks, 200 billion Finnish Markka (FIM) (at a time when the approximate exchange rate was 5 FIM/US$).

The database is, to our knowledge, the first comprehensive panel on stockholdings in the world, and does not suffer from potential representativeness problems inherent in survey data or data from a single securities firm. Since the electronic records represent official certificates of ownership, the data also are very reliable. Details on this data set are reported in Grinblatt and Keloharju (2000, 2001).

We focus here on the household investors domiciled in Finland, and to some extent on nonfinancial corporations and finance/insurance institutions.[9] For the average stock, households account for 46-47% of domestic buy and sell volume in the first 25 trading days of the year. These numbers are larger for smaller stocks particularly at the end of the year. For example, in the last 8 trading days of December, households account for 37% of the domestic sell volume and 25% of the domestic buy volume of the largest third of stocks. However, they account for 61% of the sell

[8] For a description of Finnish earnings management practices, see Kasanen et al. (1996).

volume and 53% of the buy volume among the smallest third of stocks over this same event period. Over all trading days, including those outside of December and January, household investors accounted for 45% of the domestic trading volume in the smallest third of stocks and 28% of the domestic trading volume in the largest third of stocks.[10]

The Helsinki Stock Exchange (HEX), while far smaller than the major U.S. exchanges, does not appear to substantially differ in its regularities or trading practices from U.S. exchanges. For example, there is a January effect. Both large and small firms earn higher returns in January than they earn in the rest of the year. Moreover, like the U.S., there is a small firm premium and this premium is larger in January than it is during the rest of the year, on average.[11]

Martikainen (2000) describes the HEX as having both an upstairs and a downstairs (exchange floor) market. In the upstairs market, which accounts for a larger proportion of overall trading activity than in the U.S., trades are prearranged. Here, large traders typically contact a broker who then locates counterparties among their customers or by contacting other brokers. Since 1990 trading on the HEX downstairs market has taken place via an electronic order book. All orders typed in the system are displayed individually to all broker-dealers on the exchange.[12] Opening prices are fixed at 9:30 AM based on matching of the pre-open limit order book. Any remaining unmatched orders and subsequent downstairs orders then go into the book for the continuous trading session which ends at 6 PM. Our data are based on all trades in Finnish stocks by Finnish investors, irrespective of where the trades take place.

---

[9] The data aggregate holdings across brokerage accounts for the same investor, whether the shares are held in street name or not.

[10] Households accounted for 32% of the trading volume in the middle sized 1/3 of stocks. All of these figures are averages across all stocks of each stock's volume percentage. Volume weighting across stocks makes households account for 3 times the trading volume in the smallest third of stocks relative to the largest third of stocks.

[11] In addition to our own analysis, this has been confirmed by Berglund (1986, Tables 7.1 and 7.2). However, Berglund also finds that there is an even larger small firm premium in February, perhaps due to the small sample and normal statistical variation.

[12] Large orders are not routinely typed in the system to avoid depressing the price. Instead, the broker-dealer tries to find privately another customer to match the order with. See Booth et al (2002).

3.2. Computing capital gains and losses

Because data on holdings and transactions prior to December 27, 1994 are not available, we compute the capital gain or loss on a stock for a given investor only for those stocks that are acquired by open market purchase or equity offering within the sample period. For instance, a sale that takes place on January 30, 1996 with no intervening purchase between December 27, 1994 and January 30, 1996 is one for which we do not know the exact cost basis. Such a sale is eliminated from the analysis. A similar difficulty occurs when stock is acquired within the sample period by means other than a purchase on the exchange or an equity offering. This would include, for example, stock acquired via gifts or option exercise. Such acquired inventory also must be liquidated by sales before we can accurately compute the basis. Until that happens, sales of the stock are excluded from any analysis that requires a cost basis.

When multiple purchases of a stock occur, the basis for computing the capital gain or loss associated with the sale is computed using the FIFO method, properly adjusted for splits and stock dividends but not adjusted for cash dividends,[13] of the investor's inventory of stock acquired in the sample period. Thus, consider an investor who purchases 100 shares of Nokia A at 600 FIM on January 6, 1995 and then 200 shares of Nokia A at 900 FIM on February 10, 1995. A sale of 150 shares of Nokia A on December 21, 1995 by this same investor is assumed to consist of 100 shares purchased previously on January 6 and 50 shares purchased on February 10. Any existing holdings of Nokia A on December 27, 1994, plus holdings acquired since December 27, 1994 for which no purchase price is available need to have been sold before December 21, 1995 in order to establish this basis correctly. We would exclude the December 21 sale from any analysis requiring

[13] Dividends in Finland are taxed using an imputation system. This means that dividends are taxed only once at the corporate level; given that the corporate and capital gains/dividend tax rates are the same, there is no further tax at the

a basis if this were not the case.

The price associated with the purchase or sale is generally the actual price the investor paid or received. For the first three months of the sample period, the actual purchase prices are not available. In these cases, we use the closing price of the stock on the Helsinki Stock Exchange as the price for determining the basis for the realized capital gain or loss. For comparison purposes, some of our analysis also employs the potential capital gains and losses on some stock positions that are not sold. For these hypothetical gains or losses, referred to as "paper gains and losses," we employ closing prices from the Helsinki Stock Exchange for the sale price.

3.3. High frequency trading and netting

To reduce the influence of high frequency traders on our results, the sample deliberately excludes all household investors who execute more than 300 trades over the sample period (although this filter has little qualitative impact on our results). In the analysis of holding period capital gains and losses in Sections 4.1 and 4.3, we also net all same-day trades in the same stock by the same investor, which further reduces the impact of high frequency trading. For example, a sale of 300 shares of Nokia A at 11 AM and a sale of 200 shares of Nokia A at 1 PM by the same investor would be treated as a single sale of 500 shares at the share-weighted price. Similarly, a sale of 300 shares of Nokia A at 10 AM followed by that investor's same-day purchase of 200 shares of Nokia A would be treated as a single sale of 100 shares of Nokia A. We separately analyze wash sales with a different netting procedure. In the remainder of Section 4, which focuses on wash sales, we necessarily net intraday buys and intraday sells separately.[14]

---

investor level. Tax exempt investor categories do not get any extra tax credit for dividends. As such, dividend taxation is irrelevant for our analysis and we exclude dividends from capital gain and capital gain return computations.

[14] Separate netting of purchases and sales allows us to measure wash sales activities that consist of sales and repurchases executed on the same day. Given that transactions are stamped by the day, and not by hour or minute, it is impossible to determine whether the sale occurs before the purchase (i.e., a repurchase) or after the purchase. We

4. Results

4.1. The calendar pattern of realized gains and losses

Odean (1998) shows that investors trading through a U.S. discount brokerage house realize a larger proportion of gains than losses, but temper this difference in proportions in December. This finding, as we will shortly see applies to Finland as well. However, a daily breakdown of this pattern around the turn of the year is more insightful than a monthly analysis. Figure 1, on a daily basis, plots the ratio used in Odean (1998)

$$\frac{\#\text{ of stocks with realized gains}}{\#\text{ of stocks with realized gains} + \#\text{ with paper gains}} \Big/ \frac{\#\text{ of stocks with realized losses}}{\#\text{ of stocks with realized losses} + \#\text{ with paper losses}}$$

for households' stockholdings on days on which a sale takes place. Stocks with paper (unrealized) gains are those stocks in an investor's portfolio on the day of an actual sale (of some other stock) with a purchase price below the closing price of the stock for that day. Hence, suppose that on December 20, 1995, the aggregation of all household investors who sell stock on that day has 1,000 stock positions (counting the same stock held by two different investors as two stock positions, etc.) and there are sales of 400 of the stock positions, 300 with gains and 100 with losses. Moreover, of the remaining 600 stock positions, suppose that 400 have paper gains and 200 have paper losses. Then the numerator in the above formula is 300/700 and the denominator 100/300, making the ratio 1.286.

Figure 1 displays this ratio on each of 50 trading days around January 1, averaged over the five years in our sample. The analysis is based on a total of 37,716 realized losses, 297,359

---

assume that a purchase occurs after the sale when both take place on the same day. While this assumption may lead to a somewhat inflated estimate of repurchase activity, it is unlikely to have any systematic effect on the variation in

unrealized losses, 184,993 realized gains, and 481,968 unrealized gains.[15] The ratio clearly declines over the course of December; with the decline being virtually monotonic in the last ten trading days of that month; then, there is a dramatic shift in the graph on January 1 towards a larger ratio.

The ratio is substantially smaller before the turn of the year, particularly just before it, than in any of the 25 trading days after the turn of the year. For example, the smallest average ratio in the 25 trading days after the turn of the year, i.e., event days [0,24] is 2.29, occurring on day + 6. This ratio is still larger than any of the values on the 14 trading days prior to the turn of the year (event days [-14,-1]). Moreover, the last 7 trading days of December have the 7 lowest ratios within the 50-day event window. This is clearly consistent with tax-loss selling at the end of the year.[16]

Consistent with this graph, Table 1 Panel A reports the numerator, denominator, and difference between the numerator and denominator of the household investor ratio for three groupings of days. The rightmost column of Table 1 Panel A formally tests whether the last third of the 25-day window prior to the turn of the year, as represented by the event window [-8,-1], is associated with a smaller difference between the proportion of gains realized and the proportion of losses realized than the event windows [-25,-9] and [0,24]. The overall *z*-values for the five turns of the year of -19.86 (vis-à-vis event window [-25,-9]) and –28.38 (vis-à-vis event window [0,24]) confirm that the event window [-8,-1] differs significantly from the two other event windows.[17]

---

repurchase activity around the turn of the year.

[15] We weight each year equally in this calculation because the number of transactions increase dramatically over time and we do not want our results to primarily be dominated by the turn of the year for 1999-00.

[16] Over all months, this ratio greatly exceeds one, averaging 2.28 for households with no more than 300 trades over the sample period. Moreover, on a month-by-month basis this ratio is lower in December than at other times of the year. This is consistent with the disposition effect being tempered by tax-loss selling in December.

[17] Under the null hypothesis, each year's difference in proportions is asymptotically normally distributed with a mean of zero and a standard error given by:

$$\sqrt{\frac{PGR_i(1-PGR_i)}{n_{irg}+n_{ipg}}+\frac{PLR_i(1-PLR_i)}{n_{irl}+n_{ipl}}+\frac{PGR_j(1-PGR_j)}{n_{jrg}+n_{jpg}}+\frac{PLR_j(1-PLR_j)}{n_{jrl}+n_{jpl}}},$$

Panel B reports analogous statistics for nonfinancial corporations and for finance/insurance institutions. As can be seen in Panel B, nonfinancial corporations exhibit a modest increase in their tendency to sell losing stocks in the last 8 trading days of the year, as evidenced both by the relatively high value for the proportion of losses realized and the relatively low value in the difference in proportions of winners sold versus losers sold. However, as Panel C shows, there is no significant change in the difference in proportions for finance and insurance institutions over the same 8-day period. Since finance and insurance institutions represent the group most prone to window dressing incentives, it seems unlikely that window dressing would be the primary source of the change in investment behavior observed in Panels A and B.

4.2. Wash sales analysis

The "last-minute" timing of the household investors' relatively greater sales of stocks with capital losses, documented in Table 1 Panel A and Figure 1, is consistent with tax losses altering the usual pattern of sales. Typically, investors are more than two times more likely to realize gains than losses, which is consistent with the disposition effect. However, in the last 8 trading days of the year, the propensity to realize gains relative to losses declines to the point where investors are about equally likely to realize gains as losses on the day prior to the turn of the year. Then, investors abruptly reverse this pattern at the beginning of the new year and return (throughout January) to selling winners about 3 times more often than they sell losers.

---

where, for a given event window designated by the subscript *i* or *j*, PGR is the proportion of gains realized for that year, PLR is the proportion of losses realized in that year, n_{rg}, n_{pg}, n_{rl}, and n_{pl} are the number of realized gains, paper gains, realized losses, and paper losses, respectively. The overall *z*-value for the average difference of proportions is the ratio of the average difference in proportions divided by the standard deviation of the average. The standard deviation of the average (the standard error for the overall *z)* is the square root of $1/25^{th}$ of the sum of the squared standard errors given above. These, as well as later tests, implicitly assume that the observations are independent of each other.

It would be unreasonable to think that expectations about near term returns alone could be driving such a change in investment behavior. For one, such changes in behavior are not observed at other times of the year. Moreover, the historical returns from Finland, in contrast to those from the U.S., suggest that investors with foresight about future returns as a motivation should, if anything, sell their losers at the beginning of January and not in December.[18]

Window dressing, as discussed in the introduction, is still an alternative to tax-loss selling as a motivation for mid- to late-December sales of losing stocks.[19] Thus, to demonstrate that taxes are the key motivation for a sale of stock that has declined in value, it is important to show that many investors are willing to repurchase the stock sold in mid- to late December. There is strong evidence that this occurs in the Finnish stock market. We will also demonstrate that the repurchase timing of household investors, which cannot be attributed to return anticipation or window dressing, is not shared by finance and insurance institutions, who have less motivation to engage in tax avoidance.

For household investors, Table 2 and Figure 2 document the propensity to repurchase by event period relative to the turn of the year and relative to the day of sale. For each sale of stock at a date in event time relative to the turn of the year, the right half of Table 2 computes the cumulated percentage of the shares in the same stock repurchased (by the same household investor) from 0-25 trading days after the sale date. The sale dates are calculated relative to January 1 so that there are 25 trading days before the turn of the year (representing event days [-25,-1]) and 25 trading days after the turn of the year (representing event days [0,24]). We cap share repurchases at 100% of the stock and employ an algorithm that assigns each sale to the

[18] For instance, in the 1971-00 period, a strategy of buying the winner quartile of Finnish stocks from the previous January-November period and shorting the loser quartile of stocks from the same period, would on average have generated a –0.2% return in December and a 2.2% return in January.

[19] Extensive analysis of window dressing in both the equity and fixed income markets is found in Lakonishok et al. (1991), Sias and Starks (1997), and Musto (1997, 1999).

nearest subsequent purchase, then the next nearest subsequent repurchase, etc., until the sale amount is exhausted. Each sale's fractional repurchase is averaged with repurchases for all sales that occur on the same date (using an equal weighting, independent of the size of the sale).

There were 64,933 sales by households between event days [-8, -1] inclusive and 199,281 sales between event days [0, 24] inclusive. On average, 8.6% of the stock sold in the 8 days before the turn of the year [-8, -1] are repurchased over the 25 trading days subsequent to the sale and about 1/3 of these repurchases take place on the same day as the sale! Thus, averaging over all household sales, about 1 in 35 shares sold in late-December are repurchased on the same day. In the absence of tax motivations, it is difficult to understand why more than a negligible proportion of sales would be repurchased so quickly by non-active traders. Moreover, the many repurchases of losing stocks that take place in December are inconsistent with year-end window dressing as a motivation for the December change in the trading behavior of households.

The precise timing of the repurchases also seems to be consistent with tax-loss selling. For the 199,281 sales that occurred after the end of the year, the repurchase rate within the 25 days after the sale was only 6.1% and only about 1 in 100 shares were repurchased on the same day. The difference between the (largely January) 6.1% repurchase rate and the (late-December) 8.6% repurchase rate is highly significant. A binomial difference of proportions test (similar to that in Table 1) strongly rejects (z-value = 18.74) the null that the repurchase rate is the same immediately before (event days [-8,-1]) and after the turn of the year (event days [0,24]). It also rejects the hypothesis (z-value = 21.42) that the two pre-turn of the year event windows have the same repurchase rate. Indeed, the 17 trading days before the last 8 trading days of the year have modestly *lower* repurchase rates than those after the turn of the year. A similar pattern shows up in the haste with which household investors repurchase the shares just sold. The same-day repurchase rates are about twice as large as those in the other two event windows. The relative

fraction of same-day repurchases in the event window [-8,-1] significantly differs from the same-day repurchase fractions both in event windows [-25, -9] (z-value = 49.09) and [0, 24] (z-value = 65.09). Clearly, the approaching turn of the year has a drastic effect on the repurchase behavior of households.

Figure 2, which portrays household repurchase activity on a daily basis around the turn of the year, strongly suggests that there is a spike in the repurchase activity in the days immediately prior to January 1: during the last four days of December, the 25-day repurchase rate is on average about 10%. During the last day, it is more than 11%. By contrast, sales that do not take place in late December generate a much smaller proportion of repurchases.

Moreover, consistent with Table 2, the rate of repurchase in Figure 2 seems to be hastened for the late-December sales than for sales during other periods. Indeed, as the end of the year approaches, most of the repurchases take place on the day of or the day after the sale. We believe that the late-December jump in both the 25-day repurchase rate and the acceleration of these repurchases towards the day of the sale can have only one motivation: tax-loss selling.

The results from institutional trading in Panels B and C tell a very different story. Panel B reports that for nonfinancial corporations, the average 25-day repurchase rates across event periods are within 0.5% of each other: 28.8% for sales in the 8 days prior to the turn of the year (the same percentage applies to event window [-25,-9]), and 28.3% for the 25 days after the turn of the year (event window [0.24]). Finance and insurance institutions also exhibit repurchase rates across event periods that are inconsistent with tax-motivated wash sales. Panel C observes that for finance and insurance institutions, the repurchase rate is 72.8% in the 8 days before the turn of the year (which is *smaller* than the 74.4% repurchase rate for event window [-25,-9]) and negligibly larger than the 72.0% repurchase rate for the 25 days after the turn of the year. None of the

institutional *z*-values indicate that the repurchase rate is significantly larger in the last 8 trading days of the year.

Although institutions are taxable, and thus would have a motive to engage in tax-motivated repurchase activity, it appears that their repurchase activity is driven by other considerations. Capital losses need to offset ordinary business income for these institutions (which is taxed at the same capital gains rates). However, corporations have a variety of earnings management tools, like the amortization of goodwill and recognition of R&D costs and foreign exchange losses that allow them to adjust earnings in a manner that may be less costly than wash sales. The other major consideration is that corporate taxes are based on reported income. As noted earlier, income for financial reporting and taxes are virtually identical. Thus, wash sales make it more difficult for companies to report high profits and pay dividends out of those profits. In addition to the lack of increased wash sales just prior to the turn of the year, the larger level of institutional wash sales also indicates that other considerations play a role in these wash sales. Most of the institutions are far more active traders than the households. Active trading motivated by other considerations, perhaps even market making in the case of finance and insurance institutions, will not exhibit the seasonal pattern generated by tax-motivated wash sales. [20]

4.3. Realized returns and wash sales

Perhaps the most conclusive evidence that household repurchase activity is tied to tax-loss selling comes from the relation between repurchase activity and the capital losses on the stock around the turn of the year. Table 3 shows that in the last 8 trading days of the year, capital losses in excess of 30% have a distinctly stronger effect on the propensity of a household investor to

[20] The results for nonfinancial corporations who trade infrequently are similar. For these institutions, with fewer than 300 trades over the sample period, the 25-day repurchase rate in the last eight trading days of the year is 13.1%, while it is 12.3% and 12.6% in the prior and subsequent event periods, respectively.

repurchase over the subsequent 25 days than milder capital losses. It also shows that these large capital losses have their greatest impact on the repurchase rate in the last 8 trading days of the year.

For stocks sold in the 8 days prior to the end of the year, those with capital losses exceeding 30% generate a 25-day household repurchase rate, averaged over the five years, of 17.2%, while those sold with more modest capital losses have a 25-day repurchase rate of 11.7%. For stocks with capital gains, the 25-day repurchase rate for stocks sold in the same event interval is 9.9%. The repurchase rate for the extreme capital loss (greater than 30%) repurchases significantly exceeds the rate for the mild capital losses and capital gains, (z-values of 3.70 and 5.58, respectively) in the last 8 trading days of the year. A similar monotonic pattern consistent with tax-loss selling is observed prior to the turn of the year over the [-25,-9] event period, although here, the spread between the repurchase rate for stocks with extreme capital losses (11.9%) and those with capital gains (8.3%), while significant, is quite modest.

In the 25 days after the turn of the year, a very different picture emerges. Over this event period, the 8.9% 25-day repurchase rates are about the same for stocks with extreme and modest capital losses. Moreover, the 10.5% repurchase rate for stocks sold with capital gains is modestly *larger* than the 8.9% household repurchase rates observed for the two capital loss ranges.

Table 3 also indicates that except for stocks with capital gains, there is more repurchase activity going on in the 8 days just prior to the turn of the year than at other times. The difference is significant when the comparison is with the first 25 trading days of the new year, as seen in Panel C.

As a robustness check, we replicated our tests using all household investors, including those who trade frequently. These results are similar although somewhat weaker than the reported results. The slight loss in power in the tests probably results from the fact that active traders, due

to their sheer trading activity, are likely to repurchase stocks without a wash sales motive more frequently than non-active traders.

The conclusions of Table 3 do not apply to institutions. For example, among nonfinancial corporations with fewer than 300 trades over the sample period, for which tax-related repurchases are far less likely to be swamped by repurchases motivated by other factors, the 25-day repurchase rate for sales with extreme capital losses over the 8 days prior to the turn of the year is 13.3%. The comparable repurchase rate for sales with capital gains over the same 8 day event period is 12.4%. The 0.9% difference in these repurchase rates pales in comparison with the 7.3% difference observed for households and is statistically insignificant. In short, wash sales associated with tax-loss trading are a phenomenon that is largely specific to households and these sales primarily occur just prior to the turn of the year.

4.4. Wash sales and firm size

Table 4 analyzes how seasonalities in repurchase rates relate to firm size. Panels A and B split the sample of firms into three categories based on their market capitalization at the beginning of each year. Panel A demonstrates that the stock sold of the smallest companies tends to be repurchased less than the stock of larger companies, except during the last 8 trading days of the year. The greater liquidity and lower effective transaction costs of large firms' shares should generate larger repurchase rates for them at most times. However, the wash sales activity of small stocks shows a much more marked increase at the end of the year than the wash sales activity for the larger stocks, overcoming the liquidity differences between these groups. For small stocks, Panel A shows that the cumulative 25-day ahead repurchase rate generated by the sales executed during the event window [-8,-1] is about 100% larger than the repurchase rates for the post turn of the year event window [0,24], whereas the repurchase ratios for the largest-sized and middle-sized

stocks are only about 50% larger just prior to the turn of the year than in the 25-day post turn of the year event window.[21]

The seasonal pattern is similar if we analyze the data on a firm-by-firm basis. For the turns of the year 1995-96 to 1999-00, using the event window [-25,+24] as a base, we compute abnormal repurchase activity in event window [$-t_2$,$-t_1$] for a stock as the ratio of its 25-day cumulative repurchase rate from t_2 days prior to the turn of the year to t_1 days prior to the turn of the year divided by the stock's 25-day cumulative repurchase rate over event window [-25,+24]. The time series average of the cross-sectional average and median ratios across firms in particular size classes, reported in Panel B, illustrate a seasonal pattern that is similar to that observed in Panel A. Whether looking at average abnormal repurchase activity, or the median value of abnormal repurchase activity, it is clear for firms in all size categories that there is a spike in such activity in the last 8 trading days of the year. However, the spike in abnormal repurchase activity over this 8-day event period is largest for the smallest firms.[22]

4.5. Wash sales, repurchases, price pressure, and firm size

Past research, by Keim (1983) and Roll (1983), among others, has documented that the turn-of-the-year return effect is more pronounced for small companies than for large companies. Table 4 has shown that repurchase rates have a turn-of-the-year seasonality to them as well, particularly for small firms. In this subsection, we study the link between returns and the price pressure generated by wash sales activity and how this link relates to firm size.

[21] The observed seasonalities in the 25-day ahead repurchase rate are not indicative of optimal tax timing. As shown in Constantinides (1984), there is no reason to wait until the very end of the calendar year to realize losses, although this appears to be what happens.

[22] Note that the [-8,-1] event window, which forms the bulk of all repurchase events, particularly for small firms, implicitly appears in the denominator of the ratio. Had we used a base that excludes the [-8,-1] window, the abnormal repurchase ratios for small firms over the last eight trading days of the year would have been much more distinct.

Given investors' tendency to alter their buying and selling patterns at the very end of the year, it is possible that the repurchases, which appear to arise from wash sales motivations, generate buying pressure relative to other days. For example, on January 3, 1996, there is buying pressure from repurchases that take place on January 3, 1996. Based on the evidence presented in this paper, we believe that, for the most part, these January 3 repurchases are associated with tax-loss driven sales that took place over the prior 25 trading days. Such repurchases can be thought of as generating an abnormally large aggregate demand, as they represent purchases that are motivated by considerations that are unrelated to news about the firm. It is possible that price effects arise from this repurchase pressure.

Similarly, sales that take place on January 3 that are associated with repurchases over the next 25 days can be thought of as generating an abnormally large aggregate supply, as they represent sales that are not motivated by public information. Subtracting January 3 wash sales, (measured as the number of repurchase events in the 25 trading days on or after the January 3 sales),[23] from the January 3 repurchases associated with sales over the past 25 days, properly scaled, represents a measure of a temporal shift in buying pressure on January 3. Of course, in the absence of market frictions, the temporal shift should be properly anticipated. However, if other market participants find it difficult to accurately forecast, assess, or counteract this temporal shift in buying pressure, there may be price effects arising from the wash sales and repurchases. We would conjecture, for example, that an unusually large amount of net buying pressure in a stock, arising from these tax considerations, may cause the stock price to be higher, ceteris paribus, and vice versa.

Table 5 Panel A reports the net tax loss buying pressure averaged over days in event windows of various length prior to and after the turn of the year along with average daily returns of equally

[23] This metric for the wash sale puts the selling pressure from the sale into the same units as the buying pressure from repurchases.

weighted portfolios of firms for those event windows. Net tax loss buying pressure on day t is defined to be the quotient

{[day t repurchase events (arising from sales over the past 25 trading days)]

- [day t to day $t + 25$ repurchase events (arising from sales on day t)]}

/[sum of day t buy and sell events].

On each day, we separately aggregate the numerator and denominator for all small, middle, and large-sized firms (with equal numbers of firms in each category determining the breakpoints) before computing the ratio. We then average the ratios from days $-t_1$ to -1, where $t_1 \in \{-1,\ldots,-12\}$, and from days 0 to t_2, where $t_2 \in \{0,\ldots,8\}$.

As an example, Table 5 Panel A indicates that the average daily net tax loss buying pressure in the first trading day of the new year is 5.6% of daily trading volume for the smallest third of firms, and 2.9% of the daily trading volume for the largest third of firms. Of course, the small number of repurchases on any single day, particularly for small- and middle-sized firms, makes comparisons of single day event windows difficult to interpret. Averaged over several days, however, the pre- and post-turn of the year pattern becomes quite clear: There is relatively more buying pressure from tax loss related shifts in demand after the turn of the year for small firms than for medium-sized and large firms. Prior to the turn of the year, there is net selling pressure for all three size categories of firms, but little difference in the net selling pressure by firm size.

For firms of all sizes, the average selling pressure prior to the turn of the year seems to diminish slowly (if at all) as we lengthen the horizon before the turn of the year. By contrast, the average daily buying pressure after the turn of the year drops off daily and quite dramatically in the first 3 to 4 trading days after the turn of the year but persists a little longer for the smallest third of firms. A similar pattern exists in the returns. Prior to the turn of the year, the average daily returns over the horizons are largely indistinguishable from each other, with the maximum difference in the

average daily returns across any pair of horizons being 0.9%. By contrast, there is a clear drop off in the average daily return magnitudes after the first three to four days of the new year have passed.

Because of the noise from the small sample, Panel A of Table 5 does not report the buying pressure on any given day, except on the day prior to and day after the turn of the year. Moreover, viewing the numbers in Panel A of Table 5 does not easily link returns to the buying or selling pressure associated with wash sales. For example, there is greater buying pressure for small firms on the first trading day after the turn of the year, but the average small firm premium is unimpressive.

A potential explanation for the lack of such a premium is the aggregation of the five turns of the year. If the small firm turn of the year premium differs across years because the net small firm buying pressure after the turn of the year varies day to day and year to year, we would have no way of detecting this with the methodology in Panel A. We address this possibility by analyzing correlations between net buying pressure and returns around the turn of the year in Panel B. Panel B of Table 5 makes use of the daily net buying/selling pressure and daily returns of an equal-weighted portfolio of stocks within various size groupings over various event windows in computing a correlation between daily returns and the daily net buying pressure. That is, the correlations in Panel B are based on the net buying pressure and returns on the individual days, rather than on the event-time averages of cumulated pressures and returns reported in Panel A. For example, there are 85 trading days in the event window [–12, 4], as a consequence of there being 17 days in the event window and 5 separate turns of the year. The 85-element vector of small firm net tax loss buying pressure over the five years, as noisy as it is, has a highly significant correlation of .246 with the corresponding 85-element vector of daily returns. However, the large- and medium-sized firms have smaller correlations – respectively, an insignificant .086 for the

medium-sized firms and -0.024 for the large-sized firms. Similar patterns hold for other horizons, with another significant correlation for small firms occurring at the event horizon [-8,4].

Reverse causation is an unlikely explanation for the time-series relation between net tax loss buying pressure and daily stock returns of small firms around the turn of the year. Grinblatt and Keloharju (2000, 2001) have documented that Finnish households are contrarians with respect to same-day returns in both their propensity to sell vs. hold and sell vs. buy stock. Hence, knowing that the stock had gone down that day would tend to make Finnish household investors want to hold onto their stock.

5. Summary and conclusion

In the absence of data on investor decisions to sell stocks they hold, and knowledge of the attributes of those stocks, it is very difficult to assess what motivates a sale. This is especially true when it comes to the January effect, which is often linked to tax-loss selling without concrete evidence that tax-loss selling is taking place.

By documenting the daily pattern of sales around the turn of the year and its link to the capital gains or losses of investors, as well as by studying repurchases, we have convincingly documented that Finnish investors engage in tax-loss selling. In particular, they realize losses more towards the very end of the calendar year, and their repurchases of stocks at the very end of the year not only tend to occur almost immediately after the stock is sold, but also are highly linked to the size of the capital losses on those stocks.

We have also investigated whether the observed tax-loss selling is linked to the return pattern observed in December and January. One piece of evidence is that the temporal pattern of net buying pressure, arising from repurchases associated with prior sales less sales that will subsequently be repurchased, is similar to the temporal pattern of returns – small or slightly

negative at the end of the year and quite positive on the first few days of the new year. Another piece of evidence consistent with this is that small firms exhibit the most extreme change in the temporal pattern of repurchases around the turn of the year. The correlation between daily net tax loss buying pressure and daily returns is also positive, significantly so for small firms. Thus, the known historical pattern of returns around the turn of the year seems to markedly mimic the net buying pressure observed in our sample period.

The results in our paper do not conclusively prove that tax-loss selling causes the January return anomaly, particularly because of our small sample and unique country. However, if the pattern of sales and purchases in Finland around the turn of the year in our sample period is typical of other time periods and other countries, then it is highly plausible that the January return effect is partly or wholly due to tax-loss trading and subsequent repurchases.

References

Auerbach, A., Burman, L., Siegel, J., 1998. Capital gains taxation and tax avoidance: new evidence from panel data. NBER working paper.

Berglund, T., 1986. Anomalies in stock returns on a thin security market. PhD dissertation, Swedish School of Economics, Helsinki, Finland.

Booth, G., Lin, J., Martikainen, T., Tse, Y., 2002. Trading and pricing in upstairs and downstairs stock markets. Review of Financial Studies, forthcoming.

Brown, P., Keim, D., Kleidon, A., Marsh, T., 1983. Stock return seasonalities and the tax-loss selling hypothesis: analysis of the arguments and Australian evidence. Journal of Financial Economics 12, 105-127.

Chan, K., 1986. Can tax loss selling explain the January season in stock returns. Journal of Finance 41, 1115-1128.

Constantinides, G., 1984. Optimal stock trading with personal taxes. Journal of Financial Economics 13, 65-89.

D'Mello, R., Ferris, S., Hwang, C., 2000. Tax-loss, price pressure and investors' trading behavior at the turn-of-the-year. Working paper, University of New Orleans.

Dyl, E., 1977. Capital gains taxation and year-end stock market behavior. Journal of Finance 32, 165-175.

Givoly, D., Ovadia, A., 1983. Year-end tax-induced sales and stock market seasonality. Journal of Finance 38, 171-185.

Grinblatt, M, Keloharju, M., 2000. The investment behavior and performance of various investor-types: a study of Finland's unique data set. Journal of Financial Economics 55, 43-67.

Grinblatt, M, Keloharju, M., 2001 What makes investors trade? Journal of Finance. 56, 589-616.

Grinblatt, M., Moskowitz, T., 2001 What we really know about the relation between past returns and expected returns, UCLA and CRSP working paper.

Heath, C., Huddardt, S., Lang, M., 1999. Psychological factors and stock option exercise. Quarterly Journal of Economics 114, 601-627.

Jegadeesh, N., Titman, S., 1993. Returns to buying winners and selling losers: implications for stock market efficiency. Journal of Finance 48, 65-92.

Kahneman, D., Tversky, A., 1979. Prospect theory: an analysis of decision under risk. Econometrica 47, 263-291.

Kasanen, E., Kinnunen, J., Niskanen, J., 1996, Dividend based earnings management: evidence from Finland, Journal of Accounting and Economics 22, 283-312.

Kato, K., Schallheim, J., 1985. Seasonal and size anomalies in the Japanese stock market. Journal of Financial and Quantitative Analysis 20, 243-260.

Keim, D., 1983. Size-related anomalies and stock return seasonality: further empirical evidence. Journal of Financial Economics 12, 12-32.

Kukkonen, M., 2000. Capital gains taxation and realization behaviour: evidence from Finnish panel data. PhD dissertation, Helsinki School of Economics, Helsinki, Finland.

Lakonishok, J., Smidt, S., 1986. Capital gains taxation and volume of trading. Journal of Finance 41, 951-976.

Lakonishok, J., Shleifer, A., Thaler, R., Vishny, R., 1991. Window dressing by pension fund managers. American Economic Review 81, 227-231.

Martikainen, T., 2000, Security market anomalies in Finland. In Keim, D. and W. Ziemba (eds.), Security Market Imperfections in World Wide Equity Markets, Cambridge University Press, 390-415.

Musto, D., 1997. Portfolio disclosures and year-end price shifts. Journal of Finance 52, 1563-1588.

Musto, D., 1999. Investment decisions depend on portfolio disclosures. Journal of Finance 54, 935-952.

Odean, T., 1998. Are investors reluctant to realize their losses? Journal of Finance 53, 1775-1798.

Poterba, J., 1987. How burdensome are capital gains taxes? Evidence from the United States. Journal of Public Economics 33, 157-172.

Poterba, J., Weisbenner, S., 2001. Capital gains rules, tax-loss trading, and turn-of-the-year returns. Journal of Finance 56, 353-368.

Reinganum, M., 1983. The anomalous stock market behavior for small firms in January: empirical tests for tax-loss selling effects. Journal of Financial Economics 12, 89-104.

Ritter, J., 1988. The buying and selling behavior of individual investors at the turn of the year. Journal of Finance 43, 701-717.

Roll, R., 1983. Vas ist das: the turn-of-the-year effect and the return premium of small firms. Journal of Portfolio Management 9, 18-28.

Shefrin, H., Statman, M., 1985. The disposition to sell winners too early and ride losers too long: theory and evidence. Journal of Finance 40, 777-790.

Sias, R. and Starks, L., 1997. Institutions and individuals at the turn-of-the-year, Journal of Finance 52, 1543-1562.

Table 1. Proportion of gains and losses realized around the turn of the year

Table 1 studies the gain/loss characteristics of stocks sold in 3 event windows associated with 50 trading days around five turns of the year 1995-96 to 1999-00. It reports the average over the five years of proportions of gains realized, losses realized, proportion differences, and *z*-values associated with whether a given year's proportion difference is greater in the 8 days prior to the turn of the year than in the 17 preceding trading days or the first 25 trading days after the turn of the year. Panel A reports these numbers for household investors. Panel B and C report analogous results for nonfinancial corporations and finance and insurance institutions, respectively. Each year has the same weight in the analysis. Gains and losses refer to holding period capital gains and losses. Realized gains and losses represent the gains and losses from sell transactions for which the purchase price is known. Each sell is matched with all stocks in the investor's portfolio that are not sold the same day and for which the purchase price is known. Paper gains and losses are generated from the holding period capital gains or losses of these hypothetical transactions. All same-day trades in the same stock by the same investor are netted. Household investors who have more than 300 buys and sells throughout the sample period are omitted from the analysis.

Panel A: Household average 1995-00

Trading day relative to turn of the year	Proportion of gains realized	Proportion of losses realized	Proportion of gains realized - Proportion of losses realized	*z* for null that [-8,-1] difference equals event window difference
[-25,-9]	0.300	0.134	0.166	-19.86
[-8,-1]	0.236	0.177	0.059	---
[0,24]	0.317	0.119	0.198	-28.38

Panel B: Nonfinancial corporation average 1995-00

Trading day relative to turn of the year	Proportion of gains realized	Proportion of losses realized	Proportion of gains realized - Proportion of losses realized	*z* for null that [-8,-1] difference equals event window difference
[-25,-9]	0.208	0.070	0.138	-5.25
[-8,-1]	0.197	0.087	0.109	---
[0,24]	0.196	0.075	0.121	-2.39

Panel C: Finance and insurance institution average 1995-00

Trading day relative to turn of the year	Proportion of gains realized	Proportion of losses realized	Proportion of gains realized - Proportion of losses realized	*z* for null that [-8,-1] difference equals event window difference
[-25,-9]	0.077	0.028	0.049	-0.61
[-8,-1]	0.093	0.049	0.045	---
[0,24]	0.085	0.042	0.043	0.25

Table 2. Propensity to repurchase a stock by event time relative to the turn of the year and relative to the day of sale

Table 2 describes the extent to which household investors repurchase a stock within 25 trading days from the sale. Panel A analyzes households. Panel B analyzes nonfinancial corporations, and Panel C analyzes finance and insurance institutions. The table studies 3 event windows within a 50 trading-day interval around five turns of the year 1995-96 to 1999-00 inclusive. Each year has the same weight in the analysis. Within each year, each sell transaction has the same weight, irrespective of the size of the sale. All intraday purchases and sales of a given stock by a given investor are netted separately. If a sale takes place on the same day as the purchase, the purchase is assumed to occur after the sell. Household investors who have more than 300 buys and sells throughout the sample period are omitted from the analysis. The cumulative proportion repurchased is capped to 100% of the size of the sale.

Panel A: Propensity to repurchase by event time relative to turn of the year and relative to day of sale
Households

	Average 1995-00				
Trading day relative to turn of the year	Cumulative proportion of stock repurchased within 25 days from sale	z for null that [-8,-1] proportion equals window proportion	Fraction of cumulative proportion repurchased on event day after sale		
			0	1	[2,25]
[-25,-9]	0.055	21.42	0.186	0.102	0.713
[-8,-1]	0.086	---	0.324	0.117	0.559
[0,24]	0.061	18.74	0.163	0.083	0.754

Panel B: Propensity to repurchase by event time relative to turn of the year and relative to day of sale
Nonfinancial corporations

	Average 1995-00				
Trading day relative to turn of the year	Cumulative proportion of stock repurchased within 25 days from sale	z for null that [-8,-1] proportion equals window proportion	Fraction of cumulative proportion repurchased on event day after sale		
			0	1	[2,25]
[-25,-9]	0.288	0.00	0.268	0.098	0.634
[-8,-1]	0.288	---	0.320	0.089	0.591
[0,24]	0.283	0.95	0.240	0.102	0.659

Panel C: Propensity to repurchase by event time relative to turn of the year and relative to day of sale
Finance and insurance institutions

	Average 1995-00				
Trading day relative to turn of the year	Cumulative proportion of stock repurchased within 25 days from sale	z for null that [-8,-1] proportion equals window proportion	Fraction of cumulative proportion repurchased on event day after sale		
			0	1	[2,25]
[-25,-9]	0.744	-2.37	0.239	0.094	0.667
[-8,-1]	0.728	---	0.258	0.088	0.653
[0,24]	0.720	1.21	0.223	0.098	0.679

Table 3. Propensity to repurchase a stock by event time relative to the turn of the year and size of holding period return

Table 3 describes the extent to which household investors repurchase a stock within 25 trading days from the sale as a function of the size of the holding period capital gain or loss. Panel A presents the 25-day repurchase rate broken down by the capital gain or loss magnitude and event window. Panel B performs tests for whether there are differences in repurchase rates across capital gain or loss magnitudes broken down by event window. Panel C examines whether there are differences in repurchase rates across event windows, broken down by the capital gain or loss magnitude. The table studies 3 event windows within a 50 trading-day interval around five turns of the year 1995-96 to 1999-00 inclusive. Each year has the same weight in the analysis. Within each year, each sell transaction has the same weight, irrespective of the size of the sale. In the analysis of repurchases, all intraday purchases and sales of a given stock by a given investor are netted separately. If a sale takes place on the same day as the purchase, the purchase is assumed to occur after the sell. Investors who have more than 300 buys and sells over the sample period are omitted from the analysis. The cumulative proportion repurchased is capped to 100% of the size of the sale. Realized gains and losses represent the gains and losses from sell transactions for which the purchase price is known. In the computation of realized holding period return, all same-day trades in the same stock by the same investor are netted.

Panel A: Average propensity to repurchase by size of holding period return and event window, 1995-00

	Proportion repurchased within 25 days from sale		
	Trading days relative to the turn of the year		
Holding period return	[-25,-9]	[-8,-1]	[0,24]
]-1,-0.30[	0.119	0.172	0.089
[-0.30,0[	0.106	0.117	0.089
[0,82]	0.083	0.099	0.105
]-1,82[	0.093	0.121	0.102
All observations	0.055	0.086	0.061

Panel B: Test of difference in propensity to repurchase by size of holding period return

	z-value for difference in repurchase proportions		
	Trading days relative to the turn of the year		
Holding period return	[-25,-9]	[-8,-1]	[0,24]
]-1,-0.30[vs.[-0.30,0[	0.59	3.70	0.01
]-1,-0.30[vs.[0,82]	1.95	5.58	-1.09
[-0.30,0[vs.[0,82]	4.16	2.29	-3.44

Panel C: Test of difference in propensity to repurchase by event window

	z-value for difference in repurchase proportions	
	Trading days relative to the turn of the year	
Holding period return	[-8,-1] vs. [-25,-9]	[-8,-1] vs. [0,24]
]-1,-0.30[	1.99	4.02
[-0.30,0[	1.22	3.87
[0,82]	3.10	-1.29
]-1,82[	6.80	5.09
All observations	21.42	18.74

Table 4. Propensity to repurchase a stock by event time relative to the turn of the year and the size of the company.

Table 4 describes the extent to which household investors repurchase a stock within 25 trading days from the sale as a function of firm size. Panels A and B split the sample of firms into three categories based on their market capitalization at the beginning of each year. Panel A aggregates repurchase events, and reports repurchase rates, whereas Panel B provides cross-sectional means and medians for ratios of repurchase rates on a firm by firm basis. The table analyzes 3 event windows within a 50 trading-day interval around five turns of the year: 1995-96 to 1999-00 inclusive. Each year has the same weight in the analysis. Within each year, each sell transaction has the same weight, irrespective of the size of the sale. All intraday purchases and sales of a given stock by a given investor are netted separately. If a sale takes place on the same day as the purchase, the purchase is assumed to occur after the sell. Investors who have more than 300 buys and sells throughout the sample period are omitted from the analysis. The cumulative proportion repurchased is capped to 100% of the size of the sale. All stocks listed on the HEX main list are split into three groups with an equal number of companies in each. Using these main list market value breakpoints, the remaining stocks are then assigned to each size category.

Panel A: Average aggregate cumulative proportion of stock repurchased within 25 days from sale by company size, 1995-00

Trading days relative to the turn of the year	Cumulative proportion repurchased		
	Company size		
	Smallest	Middle	Largest
[-25,-9]	0.046	0.034	0.065
[-8,-1]	0.104	0.062	0.098
[0,24]	0.054	0.040	0.069

Panel B: Yearly average of average and median firm level ratios between cumulative proportions, 1995-00

Trading days relative to the turn of the year used for computing the ratio	Ratio of cumulative proportions		
	Company size		
	Smallest	Middle	Largest
Average ratios:			
[-25,-9] / [-25,24]	0.840	1.014	0.924
[-8,-1] / [-25,24]	2.149	1.626	1.583
[0,24] / [-25,24]	0.631	0.739	0.860
Median ratios:			
[-25,-9] / [-25,24]	0.227	0.742	0.919
[-8,-1] / [-25,24]	1.561	1.326	1.507
[0,24] / [-25,24]	0.491	0.707	0.818

Table 5. Tax-loss selling net buying pressure and returns around the turn of the year by event time and firm size

Table 5 analyzes the extent to which net buying pressure generated by tax-motivated sales and repurchases of household investors varies by firm size and event time relative to the five turns of the year 1995-96 through 1999-00 inclusive. Each year has the same weight in the analysis. The sample splits firms into three categories based on their market capitalization at the beginning of each year, as described in the legend to Table 3, and then aggregates buy and sell events for all firms in the size grouping. The day *t* net tax loss repurchase pressure is the number of repurchase events of stock sold in the 25 days prior to day *t* less the number of repurchase events generated by day *t* sales over the next 25 days divided by the sum of buy and sell events on day *t*. Each sell transaction has the same weight, irrespective of the size of the sale. All intraday purchases and sales of a given stock by a given investor are netted separately. If a sale takes place on the same day as the purchase, the purchase is assumed to occur after the sell. Investors who have more than 300 buys and sells throughout the sample period are omitted from the analysis. Panel A reports the net buying pressure averaged over days in various event windows along with the average daily returns over those same event windows for 3 size groupings of firms. Panel B reports correlations and test statistics between the daily net buying pressure time series and the daily return series over 3 event windows and 3 size groupings.

Panel A: Average of net tax loss buying pressure and portfolio return around the turn of the years 1995-00 by event time and size of the company

Average from day -1 to day:	Net tax loss buying pressure, Company size			Equally weighted portfolio return, Company size		
	Smallest	Middle	Largest	Smallest	Middle	Largest
-12	-0.010	-0.006	-0.009	0.002	0.002	0.003
-11	-0.010	-0.007	-0.009	0.002	0.003	0.003
-10	-0.011	-0.008	-0.010	0.002	0.004	0.005
-9	-0.012	-0.007	-0.010	0.002	0.005	0.005
-8	-0.012	-0.009	-0.011	0.003	0.005	0.006
-7	-0.013	-0.010	-0.010	0.003	0.006	0.006
-6	-0.013	-0.010	-0.011	0.004	0.007	0.008
-5	-0.012	-0.012	-0.012	0.005	0.008	0.008
-4	-0.015	-0.014	-0.014	0.006	0.008	0.008
-3	-0.013	-0.017	-0.015	0.007	0.008	0.006
-2	-0.015	-0.020	-0.020	0.007	0.007	0.004
-1	-0.014	-0.022	-0.024	0.010	0.011	0.006
Average from day 0 to day:						
0	0.056	0.021	0.029	0.020	0.024	0.026
1	0.030	0.013	0.020	0.015	0.017	0.014
2	0.022	0.010	0.013	0.011	0.011	0.006
3	0.017	0.007	0.008	0.011	0.009	0.006
4	0.015	0.007	0.007	0.011	0.007	0.005
5	0.012	0.006	0.009	0.009	0.006	0.003
6	0.011	0.006	0.010	0.008	0.004	0.002
7	0.010	0.007	0.010	0.008	0.005	0.003
8	0.010	0.006	0.006	0.008	0.005	0.003

Panel B: Daily correlation between net tax loss buying pressure and portfolio return around the turn of the years 1995-00 by event time and size of the company

Event day relative to turn of the year	Correlation coefficient, Company size			*t*-value, Company size		
	Smallest	Middle	Largest	Smallest	Middle	Largest
[-12, 8]	0.122	0.062	-0.090	1.24	0.63	-0.92
[-12, 4]	0.246	0.086	-0.024	2.31	0.79	-0.22
[-8,8]	0.124	0.097	-0.046	1.14	0.89	-0.42
[-8,4]	0.278	0.156	0.067	2.29	1.25	0.53
[-4,4]	0.212	0.185	0.166	1.43	1.24	1.10

Fig. 1. *Proportion of positions with gains realized / Proportion of positions with losses realized.* This ratio is plotted for household investors on 50 trading days around the turns of the year 1995-96 to 1999-00 inclusive, with each year weighted equally. Realized gains and losses represent the gains and losses from sell transactions for which the purchase price is known. Each sell is matched with all stocks in the investor's portfolio that are not sold the same day and for which the purchase price is known. Paper gains and losses used in these proportions are generated from the holding period capital gains or losses of these hypothetical transactions. All same-day trades in the same stock by the same investor are netted. Investors who have more than 300 buys and sells throughout the sample period are omitted from the analysis.

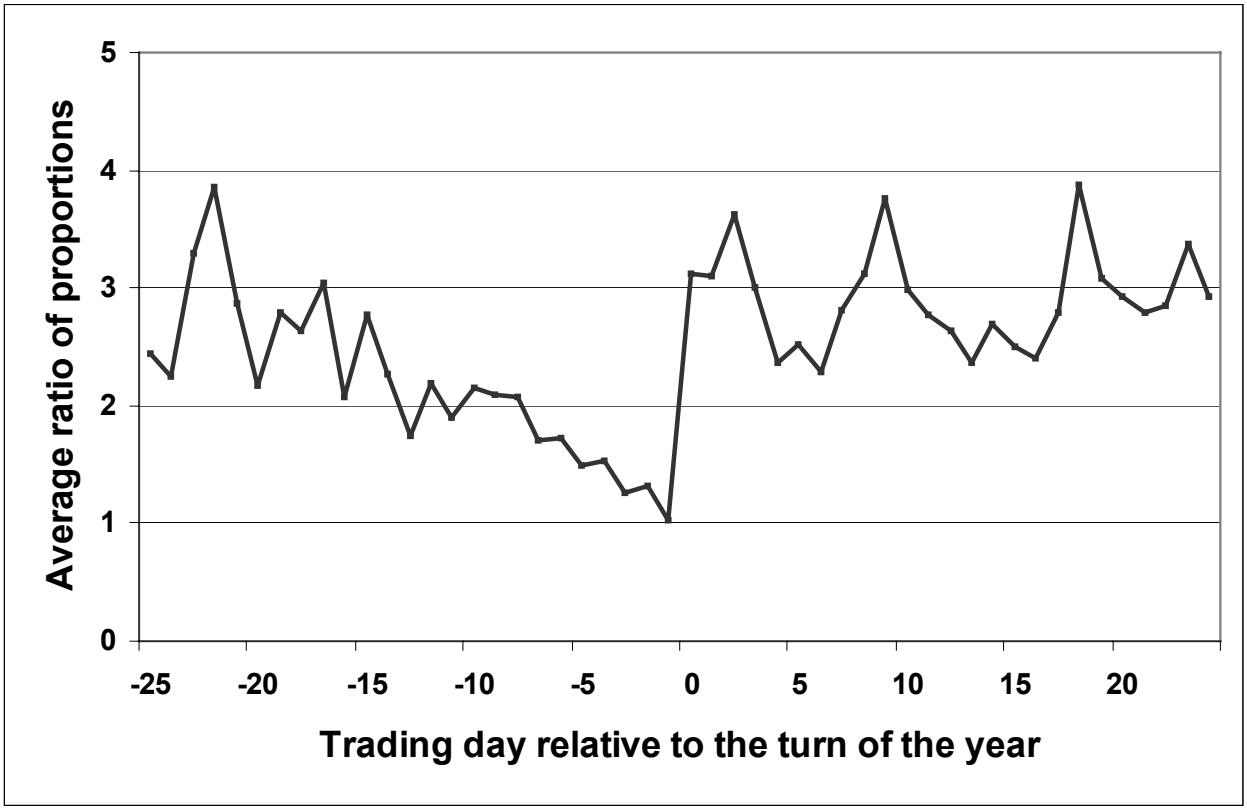

Fig. 2. *Cumulative average proportion of stock repurchased by households within 25 trading days from the stock's sale around the turns of the year 1995-96 to 1999-00 inclusive.*
Figure 2 describes the extent to which household investors repurchase a stock within 25 trading days from the sale. The figure depicts a 50 trading-day interval around the turn of the year with each year weighted equally. Within each year, each sell transaction has the same weight, irrespective of the size of the sale. All intraday purchases and sales of a given stock by a given investor are netted separately. If a sale takes place on the same day as the purchase, the purchase is assumed to occur after the sale. Investors who have more than 300 buys and sells throughout the sample period are omitted from the analysis. The cumulative proportion repurchased is capped to 100% of the size of the sale.