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Can Tax-Loss Selling Explain the January Seasonal in Stock Returns?

K. C. CHAN*

ABSTRACT

This paper analyzes the tax-loss selling hypothesis as an explanation of the January seasonal in stock returns and argues that rational tax-loss selling implies little relation between the January seasonal and the long-term loss. Empirical results show that the January seasonal is as strongly related to the long-term loss as it is to the short-term loss. The evidence is inconsistent with a model that explains the January seasonal by optimal tax trading.

RECENT EMPIRICAL RESEARCH HAS discovered a strong January seasonal in stock returns. Rozeff and Kinney [18] report that January returns are higher than in any other month in the U.S. data. Similar findings are reported for other countries by Officer [11] and Richards [14]. Keim [10] documents a strong relation between January returns and firm size. He finds that a significant portion of the abnormal returns reported by Banz [1] and Reinganum [12] occurs in the first few trading days in January.

Following the works of Branch [3] and Dyl [8], many authors have suggested tax-loss selling as an explanation of the January seasonal. According to this hypothesis, investors wish to realize their losses before the new tax year. This creates a downward price pressure on stocks sold for tax reasons near the end of the year, as well as a price rebound in the beginning of the new tax year, as the selling pressure dissipates.

Empirical studies of the tax-loss hypothesis have taken several different approaches. First, Roll [15] and Reinganum [13] examine the U.S. stock returns data and report that January returns are higher for firms that have experienced larger losses in the previous year, which they interpret to be consistent with the tax-loss hypothesis. The second approach—that of Brown, Keim, Kleidon, and Marsh [4] and Gultekin and Gultekin [9]—examines, with mixed evidence, the stock returns data in other countries to see whether they exhibit a strong seasonal at the turn of the tax year. More recently, Schultz [20] finds no evidence of the January seasonal in stock returns before personal income taxes were levied in the United States, which he interprets as favorable to the tax-loss selling hypothesis.

Constantinides [5] presents a model of optimal tax trading. His optimal trading rule does not predict the January seasonal by itself. Transaction costs and a distinction between the short- and long-term tax rates are additional factors

* Faculty of Finance, The Ohio State University. I thank Warren Bailey, James Bodurtha, Stephen Buser, Nai-fu Chen, George Constantinides, Rene Stulz, and especially the referee for helpful comments.

suggested by Constantinides that may explain a seasonal pattern in tax-related trading.

Following Constantinides' analysis, this paper argues that the earlier finding of a relation between the January return and a previous loss does not necessarily confirm the existence of price pressure resulting from tax-loss selling. An additional prediction of rational tax-loss selling is that the January seasonal has little relation to a long-term loss. After a loss becomes long term, there is no tax benefit gained by realizing the loss before the turn of the year, at the presumably depressed price. This paper will test this additional implication of the tax-loss selling hypothesis.

The paper is organized as follows. Section I examines the tax-loss selling hypothesis and derives testable implications. The main empirical test is implemented in Section II. Section III performs sensitivity tests, and Section IV concludes the paper.

I. The Tax-Loss Selling Hypothesis

The tax-loss selling hypothesis attempts to explain a stock return anomaly by the trading behavior of rational investors under the existing tax laws. It is safe to say that the presumption of rationality makes the hypothesis an appealing one. In this section, we will lay out the hypothesis in a framework of optimal trading in order to derive testable implications consistent with rationality.

The tax-loss selling hypothesis has been critically examined by Constantinides [5], Brown, Keim, Kleidon, and Marsh [4], and Schwert [19]. In particular, Constantinides shows that the optimal trading strategy in the U.S. environment consists of deferring gains and realizing losses early, preferrably short term.[1] The strategy does not predict the January seasonal in stock returns, but Constantinides' analysis highlights several factors necessary for explaining a tax-related January effect.

In the absence of transaction costs, with or without the distinction between long- and short-term tax rates, the investor wishes to realize losses immediately, whenever they occur.[2] Therefore, the optimal strategy does not predict year-end tax-loss selling. Now assume instead that there are transaction costs, but that there is no distinction between short- and long-term tax rates. At the beginning of the year, the transaction costs may be greater than the tax rebate from realizing a small capital loss. Towards the end of the year, the reluctance to realize the loss may be overcome by a desire to get the tax benefit this year

[1] The short-term holding period was six months in 1942–1976, nine months in 1978, and one year until 1984. Short-term gains or losses are taxed as ordinary unearned income, while long-term gains and losses are taxed at 40% of the investor's marginal tax rate on ordinary income, since 60% of long-term gains or losses are excluded from taxable income. Net short-term losses and net long-term gains incurred in the same year, however, offset each other. Also, net short-term losses and 50% of net long-term losses are limited to a deduction level of $3,000 in any year. Unused capital losses may be carried forward indefinitely.

[2] The optimal strategy also entails realizing long-term gains in high-variance stocks and repurchasing the stock in order to realize potential losses short term.

rather than the next.[3] High-variance stocks are probably more susceptible to tax-loss selling because (a) they are more likely to have losses in the first place and (b) the investor is more likely to realize losses on these stocks lest they vanish. This scenario predicts that tax-loss selling increases from the beginning towards the end of the year and suddenly ceases the first few days in January. And if firms are ranked by variance, a positive relation between January abnormal returns and the ranking is expected. As variance and firm size are negatively correlated, a negative relation between the January abnormal returns and firm size will also be observed.

But, as Constantinides argues, without a distinction between short- and long-term rates, transaction costs may dissipate the tax trading, and the optimal policy may be to refrain from tax-loss selling. When we draw a distinction between short- and long-term tax rates, however, the optimal strategy calls for realizing losses short term. Simulation by Constantinides demonstrates that transaction costs do not significantly decrease the benefit of this strategy.[4]

Even if the year-end trading, for whatever reasons, is unusually heavy, one crucial assumption needed for the tax-loss selling hypothesis to explain the high January returns is that such selling exerts downward price pressure. If the year-end trading is purely caused by tax considerations, rational tax-loss sellers could repurchase stocks sold (by others) for tax reasons at the same time. Then the trading is not expected to depress stock prices.

If we assume additionally that the market for small firms' stocks is illiquid, the price pressure will be associated with small firms, a prediction consistent with empirical findings. The difference between the depressed price and the true value is, however, a cost to the marginal seller.[5] The marginal seller must be indifferent between selling at the depressed price at the end of the year and waiting a few more days for the price to rebound. Let L (>0) be the holding period loss, which consists of the drop in the true price and d (>0), the drop in price due to price pressure and therefore the rebound in January, and let τ_1 and τ_2 be the applicable tax rates for selling before the year end and selling in January, respectively. Ignoring discounting and a potential change in the true price, the marginal investor sells the stock before the end of the year if

$$L\tau_1 \geq (L - d)\tau_2 + d. \tag{1}$$

Rearranging terms, we obtain

$$d(1 - \tau_2) \leqslant L(\tau_1 - \tau_2). \tag{2}$$

[3] Some investors can receive the tax benefit immediately by adjusting their estimated tax payments or withholding. How widespread this practice is among investors who hold small firms' stocks is unknown.

[4] Another assumption that yields year-end tax trading is that enough investors are forced to liquidate their investment portfolios at year end, possibly for consumption purposes. Stocks that have had losses, especially short term, are candidates for such selling. If strong liquidity needs at the end of the year are what cause the selling in the first place, the proceeds from the sale will not be reinvested, and, therefore, stock prices will be depressed. But, empirically, there is no significant drop in the prices of small firms' stocks in December.

[5] In Constantinides' simulation, which shows the significant gain from the optimal tax-trading strategy, stocks are immediately repurchased following realization of gains or losses, with the implicit assumption of a liquid market.

If $d = 0$, there is no price pressure and the investor follows the optimal tax-trading strategy, but the January seasonal is unexplained.

Consider now the case of $\tau_1 - \tau_2 > 0$ and $d > 0$. This occurs if the holding period changes from short to long term by waiting. For the marginal investor, the weak equality in (2) becomes a straight equality. Equation (2) then predicts that the magnitude of the price pressure (and the subsequent rebound) is a positive function of the holding period loss.

Next consider the case of $\tau_1 - \tau_2 = 0$ and $d > 0$. This case occurs if (a) the short-term holding period happens to span the turn of the year and (b) the holding period by the end of the year is already classified as long term. By equation (2), the marginal investor refrains from tax-loss trading.[6]

A reasonable implication of the tax-loss selling hypothesis, with all favorable assumptions intact, is that the January seasonal is stronger where a distinction between short- and long-term holding periods can be drawn than where there is no distinction. Previous studies only test the relation between the January returns and short-term losses. On balance, the evidence is consistent with the tax-loss selling hypothesis. The relation between January returns and long-term losses will be tested in this paper.

II. Test for a Short-Term Effect of Tax Losses on January Returns

A. Empirical Design

The stock returns data used in this study are obtained from the December 1983 University of Chicago's Center for Research on Security Prices (CRSP) daily tape. The data on the CRSP tape begin in July 1962. At the end of each of the twenty-one years in the 1962–1982 period, we compute two measures for each stock. The first one is the market capitalization (MV), which is defined to be the number of shares outstanding multiplied by the price at the end of the year. The second is the potential tax-loss selling measure (PTS) as used by Reinganum. The assumption here is that the magnitude of the year-end tax-loss selling is correlated with the loss suffered by the stock from the high in the period of the previous year that would be classified as a *short-term* holding period. More explicitly, if the short-term holding period is set to be six months, a maximum price is selected from July 1 through the second-to-the-last trading day of the calendar year. Then Reinganum's PTS measure is obtained by dividing the price on the second-to-the-last trading day by this maximum price. The ideal measure of tax-loss selling pressure, as Reinganum recognizes, should take into account trading volumes and institutional holdings also, but such data are not available.

The high January return immediately following the date the PTS measure is computed, as documented by Reinganum and Roll, presumably contains the price rebound from short-term tax selling. To test the relation between the January

[6] If we introduce other factors, such as the potential loss of tax benefit on high-variance stocks and a desire for an immediate tax rebate, we will predict tax-loss trading, but the price pressure must be smaller than that in the case where we can draw a distinction between the tax rates for selling before and after the end of the year.

return and the long-term loss, one can test whether the *PTS* measure computed this year also predicts a high January return a year hence. Because the *PTS* measure is in part a measure of the stock return variance, it may be serially dependent; therefore short-term losses must be controlled for. For this purpose, after stocks are initially ranked by tax-selling pressure at the end of a year, their *PTS* measures are recomputed at the end of next year. As a result of the cross-classification, stocks with different combinations of losses in year 1 and year 2 will be identified.

Both the market capitalization and the first-year potential tax-loss selling pressure measures are ranked at the end of each year in the 1962–1981 period, and the second-year *PTS* measures are obtained for 1963–1982. The year following the second rank date is the test year, in which the return seasonality will be examined. Thus, the test sample consists of 20 years from 1964–1983.

Table I summarizes the distribution of the stocks in the *MV* deciles and first-year *PTS* quartiles in the entire sample period. The *PTS* measure and size are correlated. Note that 54% of the firms in the lowest market capitalization decile (*MV*1) are in the *PTS*1 quartile, and 77% are in the combined *PTS*1 and *PTS*2 groups. Since we do not know how precisely the *PTS* quartiles are correlated with tax losses, it is unclear which *PTS* quartiles contain tax-loss candidates. Due to the concentration of small firms in the *PTS*1 quartile, the cut-off is chosen to be between the *PTS*1 quartile and the rest of the *PTS* quartiles. If a different cut-off is chosen, the two-year cross-classification procedure will yield very small samples for some combinations. Sensitivity of test results to the definition of potential tax losses will be examined later.

Table I

Distribution of Firms by Tax-Loss Selling and Market Value Portfolio (in Percent)[a]

	*PTS*1	*PTS*2	*PTS*3	*PTS*4
*MV*1	5.56	2.47	1.18	.78
*MV*2	4.08	2.98	1.74	1.19
*MV*3	3.29	2.90	2.28	1.52
*MV*4	2.68	2.98	2.45	1.87
*MV*5	2.31	2.90	2.65	2.14
*MV*6	1.94	2.77	2.79	2.50
*MV*7	1.72	2.44	2.96	2.88
*MV*8	1.46	2.22	3.05	3.28
*MV*9	1.18	2.02	3.07	3.72
*MV*10	.91	1.81	2.92	4.36

[a] *MV*1 contains firms in the bottom decile of the year-end capitalization ranking. *MV*10 contains those firms in the top decile. *PTS*1 contains firms that are in the bottom quartile of the potential tax-loss ranking, and *PTS*4 contains those in the upper quartile. The tax-loss measure is computed by dividing the price on the second-to-the-last day of the year by the maximum price in the prior period considered by the IRS to be a short-term holding period. The figures in the table are the averages of the yearly distribution in the sample period of twenty-one years (1962–1982) for *MV* and *PTS* calculated in the *same* year.

Because the return seasonality is concentrated in small firms, and also because the portfolios of large capitalization stocks contain too few stocks with cumulative losses, the cross-classified *PTS* portfolios are only constructed for size deciles *MV*1 through *MV*4. For reference, the equally weighted portfolio with no losses in both year 1 and year 2 is labeled *NN* (for normal/normal); the portfolio with cumulative losses is labeled *LL* (for loss/loss); the portfolio with losses in year 1 but normal in year 2 is labeled *LN*; and the portfolio that has no losses in year 1 but has losses in year 2 is labeled *NL*. These four portfolios are the basic portfolios used in the test.

Table II reports the joint distribution of stocks with year 1 and year 2 losses, by their capitalization at the end of year 1. The table also contains expected frequencies under the assumption that the *PTS* measure is serially independent, and they are computed as products of the marginals of the joint distribution. The *PTS* measures are serially correlated, and a chi-square test rejects serial independence with a significance level less than 1%. Based on the joint distribution, the probability of a second-year loss conditional on a first-year loss is .565, and the probability of a second-year loss conditional on no losses in the first year is .357. It is not clear whether the true tax-loss selling potential is also serially correlated, but, if it is, it might be conceivable that the long-term loss portfolio *LN* contains short-term losses that are undetected by our imperfect proxy *PTS*.[7] Sensitivity tests that involve deletion of suspicious observations will be performed in the next section.

The tests will be run on Sharpe-Lintner excess returns of the basic portfolios. The effect of past performance on subsequent returns is assumed to be additive but different for January from the rest of the year. An interaction term is also allowed between the losses incurred in the two consecutive years prior to the test year. Thus, for *each size decile*, we write the model as

$$\begin{aligned} \varepsilon_{J,it} &= \alpha_J + \gamma_{1J} L_{1it} + \gamma_{2J} L_{2it} + \gamma_{3J} L_{1it} L_{2it} + \eta_{J,it}, \\ \varepsilon_{R,it} &= \alpha_R + \gamma_{1R} L_{1it} + \gamma_{2R} L_{2it} + \gamma_{3R} L_{1it} L_{2it} + \eta_{R,it}, \end{aligned} \tag{3}$$

where

$\varepsilon_{\cdot,it}$ = the Sharpe-Lintner excess returns of portfolio i, where i = *NN*, *NL*, *LN*, and *LL*;
L_1 = 1 if the portfolio has a long-term loss and 0 otherwise;
L_2 = 1 if the portfolio has a short-term loss and 0 otherwise;
$\eta_{\cdot,it}$ = the residual term, and $\text{cov}(\eta_{\cdot,it}, \eta_{\cdot,jt}) \neq 0$, for $i \neq j$;
the subscript J denotes January, and the subscript R denotes the rest of the year.

The parameters γ_{1J} and γ_{1R} represent the mean effects of a long-term loss on returns in January and the rest of the year, respectively; γ_{2J} and γ_{2R} represent the mean effects of a short-term loss. The mean effects of the interaction between short-term and long-term losses for January and the rest of the year are measured by γ_{3J} and γ_{3R}. Each parameter is estimated by forming a portfolio that has a value of 1 in the desired effect and 0 elsewhere and by computing the mean

[7] I am grateful to the referee for pointing out the problem that such serial correlation might cause in interpreting the results reported in an earlier draft of this paper.

Table II

Joint Frequency Distribution of Stocks with and without Losses in Two Consecutive Years[a]

	*MV*1	*MV*2	*MV*3	*MV*4
LL (loss/loss)	31.4	18.9	13.2	10.2
	(26.3)	(14.9)	(10.1)	(7.2)
LN (loss/normal)	24.2	21.9	19.8	16.6
	(29.4)	(21.8)	(22.8)	(19.6)
NL (normal/loss)	15.8	17.6	17.5	16.7
	(20.9)	(21.6)	(20.6)	(19.7)
NN (normal/normal)	28.5	41.6	49.5	56.5
	(23.4)	(37.5)	(46.5)	(53.4)
Total	100.0	100.0	100.0	100.0

[a] Stocks in the *PTS*1 quartile are assumed to have losses; those in *PTS*2 through *PTS*4 are assumed to have no losses. *MV*1 through *MV*4 are the smallest four of the capitalization deciles. In the parentheses are expected frequencies under the assumption that the loss status is serially independent, and they are calculated as products of the marginals.

return and *t*-statistic of that portfolio. For example, α_J is the mean January return of the portfolio *NN*, and γ_{1J} is the mean January return of a portfolio that is long on *LN* and short on *NN* with equal weights.

Assuming we do not have measurement errors, the hypothesis that rational tax-loss selling causes the January seasonal has three testable implications:

(H1) the January effect of short-term losses $\gamma_{2J} > 0$;
(H2) the January effect of long-term losses $\gamma_{1J} = 0$;
(H3) the January effect of the interaction $\gamma_{3J} = 0$.

The relations can be stated in terms of total returns. (H1) implies that portfolio *NL* has a higher January mean return than portfolio *LN*. (H2) implies that *NN* and *LN* have the same January mean return. (H2) and (H3) together imply that *LL* and *NL* have the same January mean return. Since there might be factors other than tax-loss selling that cause the January seasonal, the hypothesis does not imply that $\alpha_J = 0$.

Previous studies only test (H1). But the results of Reinganum [13] suggest that we cannot rule out a January effect of long-term losses. That paper finds a strong January seasonal not only for stocks with short-term losses, but also for those without, and concludes that tax-loss selling can explain a significant amount, but not all, of the January seasonal. If the January seasonal of Reinganum's "no loss" sample is not caused by long-term losses, his conclusion is valid. Otherwise, i.e. if (H2) is violated, the evidence will suggest that, although the January return is related to capital losses, it is not caused by optimal tax-loss selling.

Suppose a loss increases the January return for reasons other than tax-loss selling; then we are interested in finding whether tax-loss selling has any additional effect. We will call this effect the net short-term effect, and it will be measured as $\gamma_{2J} - \gamma_{1J}$, or the difference in the mean January return between the *NL* and *LN* portfolios.

B. Empirical Results

Monthly excess returns of all portfolios are estimated according to the Sharpe-Lintner CAPM and with the value-weighted CRSP index. The betas are estimated in the three years *after* portfolios are formed. But since the CRSP daily tape ends in December 1983, not all twenty samples have three full years of data for computing the betas. Monthly returns are used in order to minimize the bias in computing returns caused by bid-ask spreads (see Blume and Stambaugh [2] and Roll [16].)

Table III shows the mean excess returns of the basic portfolios. The January excess return appears to be positively correlated with the tax loss in *either* year. The portfolio with cumulative losses (*LL*) has the highest January excess return, and the one with no losses in both years (*NN*) has the lowest. If a long-term loss has no effect on the January return, portfolio *LL* should behave like portfolio *NL*, and the latter should have higher return than portfolio *LN*. Note, however, that the mean January return of portfolio *LL* is substantially higher than that of portfolio *NL*. Also, portfolio *LN* has a January return about as strong as *NL*. The pattern clearly shows that the January effect is related to long-term losses.

Statistical significance could be inferred from estimates of equation (3) shown in Table IV. Short-term losses have a significant effect on mean January returns, as expected. The mean effect of long-term losses is also statistically significant for all four *MV* portfolios. Take the *MV*1, for instance. The mean January effect of a short-term loss is 5.61%, and the mean January effect of a long-term loss is 3.83% with a t-value also of 3.83. The net short-term effect is 1.78%, as measured

Table III

Monthly Excess Returns (in Percent) of the Short-Term and Long-Term Tax-Loss Portfolios in the Year before and the Year after Portfolio Formation (t-Statistics in Parentheses)

	*MV*1		*MV*2		*MV*3		*MV*4	
	Jan	Feb–Dec	Jan	Feb–Dec	Jan	Feb–Dec	Jan	Feb–Dec
The year prior to portfolio formation								
LL (loss/loss)	16.58	−1.23	10.57	−1.86	8.78	−2.11	6.63	−2.21
	(6.8)	(−2.4)	(4.5)	(−4.2)	(4.3)	(−5.0)	(3.4)	(−5.3)
LN (loss/normal)	14.50	1.83	10.64	1.29	8.19	.66	6.78	.75
	(6.3)	(4.2)	(5.9)	(3.8)	(5.5)	(2.2)	(3.5)	(2.7)
NL (normal/loss)	10.47	−1.21	7.69	−1.22	6.62	−1.58	4.88	−1.38
	(6.7)	(−2.7)	(5.2)	(−2.9)	(5.5)	(−4.7)	(4.5)	(−4.0)
NN (normal/normal)	9.74	1.56	7.06	.89	5.79	1.18	5.18	.87
	(6.5)	(5.2)	(6.2)	(3.4)	(5.7)	(5.5)	(5.6)	(4.4)
The year after portfolio formation								
LL (loss/loss)	17.99	.37	12.28	.11	11.80	−.38	8.77	.00
	(7.9)	(.8)	(5.8)	(.2)	(5.6)	(−1.0)	(3.8)	(.0)
LN (loss/normal)	10.42	.57	7.89	.46	6.67	.48	7.66	.45
	(7.1)	(1.5)	(5.8)	(1.4)	(5.8)	(1.6)	(6.1)	(1.7)
NL (normal/loss)	12.20	.29	9.34	.06	8.03	−.24	7.68	−.39
	(7.9)	(.8)	(6.0)	(.2)	(4.9)	(−.9)	(6.0)	(−1.4)
NN (normal/normal)	6.59	.64	6.14	.48	5.20	.55	4.65	.34
	(7.0)	(2.3)	(6.3)	(1.9)	(6.3)	(2.8)	(5.0)	(1.9)

Table IV

Estimation of Effects of Short- and Long-Term Losses on Returns in January and the Rest of the Year[a]

$$\varepsilon_{J,it} = \alpha_J + \gamma_{1J}L_{1it} + \gamma_{2J}L_{2it} + \gamma_{3J}L_{1it}L_{2it} + \eta_{J,it}$$
$$\varepsilon_{R,it} = \alpha_R + \gamma_{1R}L_{1it} + \gamma_{2R}L_{2it} + \gamma_{3R}L_{1it}L_{2it} + \eta_{R,it}$$

	α_J	α_R	γ_{1J}	γ_{1R}	γ_{2J}	γ_{2R}	γ_{3J}	γ_{3R}	$\gamma_{2J}-\gamma_{1J}$
*MV*1	6.59	.64	3.83	−.07	5.61	−.35	1.96	.15	1.78
	(7.06)	(2.29)	(3.83)	(−.29)	(4.95)	(−1.27)	(1.86)	(.41)	(1.68)
*MV*2	6.14	.48	1.75	−.02	3.19	−.42	1.20	.06	1.44
	(6.33)	(1.91)	(2.81)	(−.10)	(3.70)	(−1.74)	(1.13)	(.21)	(1.32)
*MV*3	5.20	.55	1.46	−.07	2.82	−.78	2.30	−.07	1.36
	(6.29)	(2.75)	(2.25)	(−.35)	(2.45)	(−4.34)	(1.53)	(−.22)	(1.32)
*MV*4	4.65	.34	3.01	.10	3.03	−.73	−1.92	.28	.02
	(4.98)	(1.88)	(4.69)	(.64)	(4.22)	(−4.23)	(−1.52)	(.92)	(.02)

[a] The dummy variable L_1 (L_2) takes a value of one if the portfolio has long- (short-) term losses, as defined by the *PTS* measure, and zero otherwise. Sharpe-Lintner excess returns for portfolio i are denoted by ε_i. Subscripts J and R denote January and rest of the year, respectively. Estimates of mean effects are expressed in percent; t-statistics are in parentheses.

by $\hat{\gamma}_{2J} - \hat{\gamma}_{1J}$, and has a t-value of 1.6. As the capitalization value increases, the January effect of either a long-term or short-term loss gets smaller, but there is never any significant difference between the January effects of the two types of losses.

To sum up, (H2) is violated. A long-term loss produces a January seasonal in stock returns in approximately the same way as a short-term loss.[8] The magnitude of the net short-term effect, which measures the effect of tax-loss selling, is not statistically significant and appears to be economically unimportant anyway.

III. Sensitivity Tests

The procedure used to sort out short-term from long-term losses is not an exact method. It is possible that the measurement error of the *PTS* variable is so large that the supposedly long-term loss portfolio *LN* contains significant short-term losses also, causing the coefficient γ_{1J} to contain the effect of short-term losses. In this section, we will study alternative measures of potential tax losses to investigate whether there is evidence of short-term losses in the *LN* portfolio.

The *PTS* measure used in this paper is defined as the maximum drop in price from *any time* during the short-term holding period to the end of the year. It would be a closer measure of the tax-selling pressure if the price drop were weighted by trading volumes, but such data are not available. If trading is assumed

[8] In a paper testing market over-reaction, De Bondt and Thaler [7] independently observe that losing stocks (in terms of excess returns in a past period ranging from one to five years) will have a high January return in years after the loss. Because short-term and long-term losses are not isolated in their paper, their results do not rule out the possibility that the high January return is caused by selling pressure from realizing short-term losses. In the months just before January of the second year, for instance, large negative differences are observed when the winner's returns are subtracted from the losers' (Figure 2, p. 802).

The January returns in the second year following the ranking date are also concentrated in the first several trading days, a known feature of the January seasonal as documented by Keim [10].

to be uniform through time, the number of traded shares with short-term losses at the end of the year is proportional to the length of time when the stock price is on the downward trend. Thus, the potential tax losses may perhaps be better measured by the total returns over the holding period, as in Roll [15]. *Ex ante* we do not know which of the two measures is a better proxy of tax losses, but computing total returns may serve as a useful check for incidence of short-term losses in the *LN* portfolios.

Another measure of potential tax loss is the return variance of the stock, used before in Constantinides [5]. If it has not been controlled for in our test, so that the *LN* portfolio has higher return variances, it may perhaps explain the January effect of the long-term loss.

To some extent, the return variance of the stock is picked up by the *PTS* measure, which is analogous to the range of the price distributions. The likelihood that a stock has a high variance can be inferred from the frequency of losses as defined by the *PTS* measure. The *LL* portfolios are expected to contain stocks with high variances and the *NN* portfolios stocks with low variances. A cursory look at the variances computed for individual stocks in the various *PTS* portfolios confirms this expectation. If the return variance is only cross-sectionally correlated with the frequency of a loss but not its ordering in the two-year interval, variances of stocks in the two portfolios of interest, *LN* and *NL*, are expected to have the same distribution. Then we cannot explain the long-term loss effect by failure to control for return variances. But if, for whatever reasons, the ordering of the loss is important, such that *LN* stocks have higher variances than *NL* stocks, there might be short-term losses in the *LN* portfolios.

To test the possibility that *LN* stocks have higher variances than *NL* stocks, we tabulate in Table V the distribution of return variances of the stocks in the *MV*1 capitalization decile and in the *LN* and *NL* portfolios. The variances are computed over the six months before the test year, which coincides with the short-term holding period for most of the years in the sample period. The Kolmogorov-Smirnov test is performed to test the null hypothesis that variances from the two portfolios are drawn from the same distribution. The alternative hypothesis of interest is that the *LN* portfolio contains stocks with higher variances. The p-value of the one-sided test is reported, and the null hypothesis is not rejected at the significance level of 19%.

If both the *NL* and *LN* stocks do not seem to have different variances, the remaining question is whether our partitioning procedure sorts out the losers from the winners correctly. To show whether the *NL* and *LN* portfolios actually contain stocks with desired characteristics if a loss is defined in terms of returns over the last six months of the year, we report in Table VI the distribution of the six-month returns in the *LN* and *NL* portfolios. Not surprisingly, losers dominate the *NL* portfolios, and "normal" stocks dominate the *LN* portfolios. However, a little over 25% of the stocks in the *LN* portfolios have negative returns, and about 25% of the *NL* stocks show gains in the short-term holding period.

Could the January seasonal of the *LN* portfolio be caused by, say, 25% of the stocks that might have short-term losses as defined by the six-month returns? To rule out this possibility, these stocks are deleted from the test. And, to keep

Table V

Distribution of Daily Return Variance in Portfolios of Long-Term and Short-Term Losses in the Bottom Capitalization Decile[a]

	LN (Loss/Normal)	*NL* (Normal/Loss)
100%	0.01462	0.01628
95%	0.00535	0.00528
90%	0.00872	0.00401
75%	0.00236	0.00248
50%	0.00148	0.00150
25%	0.00087	0.00098
10%	0.00053	0.00063
5%	0.00035	0.00041
0%	0.00011	0.00012

One-sided p-value of the Kolmogorov-Smirnov Test: 0.195.

[a] Daily return variance is computed in the six months prior to the portfolio formation. The Kolmogorov-Smirnov test is a test of the null hypothesis that the return variances of stocks in the two portfolios are from the same distribution.

the average capitalization value of the portfolio relatively constant, stocks that are in the top quartile of the return distribution are also excluded from the *LN* portfolio. The truncated *LN* portfolio is denoted as *LN**. Table VI reports the average return of the *LN** portfolio in the test year, as well as repeating the returns of the *LN* and *NL* portfolios for comparison. The truncated portfolio return has a higher variance, owing partly to the smaller number of stocks, and thus has a lower t-statistic than that of the original portfolio. The truncation does not seem to weaken the January seasonal of the long-term loss portfolio, however. Compare the mean January return of 10.17% of the *LN** portfolio with the January return of 10.42% of the original *LN* portfolio. The difference now between *NL* and *LN** is 2.04%, with a t-value of only 1.21.

Since some stocks in the *NL* portfolio do not show short-term losses in terms of the six-month return measure, have we underestimated the effect of the short-term loss? When we drop the stocks with six-month returns in the top quartile, the mean January return of the truncated portfolio, denoted by *NL***, is 12.97%, a .77% increase over the original portfolio. The difference in January returns between *NL*** and *LN** averages 2.81% with a t-value of 1.68. For completeness, Table VI also reports the mean return of the *NL** portfolio, which excludes stocks in both the top and bottom quartiles of the six-month return distribution, thereby keeping the capitalization value approximately constant. Compare the *NL** portfolio with the *LN** portfolio. The former contains only losers with a medium short-term loss of 19%, and the latter contains roughly all winners with a medium gain of 12%. It is troubling for the tax-loss selling hypothesis that the mean January returns of *NL** and *LN** are indistinguishable from each other.

Table VI

Sensitivity Tests by Dropping Stocks with Extreme Six-Month Returns Prior to Portfolio Formation (Bottom Capitalization Decile)

A. Distribution of six-month returns		
	LN (Loss/Normal)	*NL* (Normal/loss)
100%	14.84	2.59
99%	2.39	1.19
95%	1.07	0.50
90%	0.73	0.24
75%	0.36	−0.03
50%	0.12	−0.19
25%	−0.07	−0.31
10%	−0.20	−0.44
5%	−0.29	−0.50
1%	−0.42	−0.60
0%	−0.50	−0.67
Mean	0.243	−0.124
Standard deviation	0.721	0.333
B. January returns following portfolio formation (in percent)[a]		
I. Original *PTS* portfolios		
LN	10.42 (7.08)	
NL	12.20 (7.97)	
II. Truncated portfolios[b]		
*LN** (25–75%)	10.17 (5.51)	
*NL*** (0–75%)	12.97 (7.75)	
*NL** (25–75%)	9.93 (5.94)	
III. Return differences (net effect of short-term losses)		
NL − *LN*	1.78 (1.68)	
NL − *LN**	2.04 (1.21)	
*NL*** − *LN**	2.81 (1.68)	
*NL** − *LN**	−0.23 (−.14)	

[a] t-Statistics in parentheses.

[b] Truncated portfolios contain stocks in the indicated percentiles of six-month returns prior to portfolio formation.

To summarize, the effect of a long-term loss is not diminished by our experiments of throwing out data points. The net effect of the short-term loss remains statistically insignificant even after we throw away all the winners as defined by the six-month return measure, a procedure that should increase the January seasonal because it decreases the average portfolio capitalization value. The insignificance of the t-statistics is in part due to the small number of stocks in the truncated portfolios. It is also a reminder of the fact that, in our search for maximum net short-term effect, we end up with so few observations that they may have little to say about the seasonality of the population of small firms.

IV. Conclusion

Our results confirm that the January seasonal is associated with losses in stock prices. But the association does not necessarily support the existence of year-end price pressure due to tax-loss selling. Optimal tax-loss selling does not predict that price pressure will be associated with long-term losses. However, we find that the relation between the January seasonal and capital loss is more persistent than earlier studies suggest, independent of whether the loss is short or long term.

The January effect found for both long- and short-term losses does not confirm or reject the existence of tax-motivated trading at the end of the year.[9] Nor does it suggest that investors depart from optimal tax trading.

The question of interest in this paper is whether there is pressure on stock prices at the end of the year. If tax-loss selling indeed produces the January seasonal, the evidence suggests that a distinction between short- and long-term holding periods is not a significant factor, which is contradictory to rational tax-selling behavior. In particular, if one interprets price pressure as a cost borne by the marginal investor who sells before the turn of the year, the investor who failed to realize the loss short term would not find it optimal to realize it long term at the depressed price.

In conclusion, our results are inconsistent with a model that explains the January seasonal by optimal tax-loss selling. Alternative models of tax-induced trading or other explanations are left for future research.

[9] A recent paper by Rozeff [17] finds evidence of share shifts at the turn of the year. Nonmembers of the New York Stock Exchange shift out of shares in December and into shares in January. Exchange members do the opposite. Rozeff concludes that the evidence supports the tax-loss selling hypothesis.

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