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Volume for Winners and Losers: Taxation and Other Motives for Stock Trading

JOSEF LAKONISHOK and SEYMOUR SMIDT*

ABSTRACT

Capital gains taxes create incentives to trade. Our major finding is that turnover is higher for winners (stocks, the prices of which have increased) than for losers, which is not consistent with the tax prediction. However, the turnover in December and January is evidence of tax-motivated trading; there is a relatively high turnover for losers in December and for winners in January. We conclude that taxes influence turnover, but other motives for trading are more important. We were unable to find evidence that changing the length of the holding period required to qualify for long-term capital gains treatment affected turnover.

INVESTORS RESPONDING TO THE tax incentives in the capital gains laws should produce predictable patterns in the volume of trading in a stock, but not necessarily in its price. This study uses past price patterns as a proxy to measure the incentives to sell or avoid selling a stock and observes trading volumes to estimate the extent to which investors respond to these incentives. Past price patterns may influence trading volumes for other (non-tax related) reasons as well. These are also considered.

We find that past prices influence current incentives to trade through both tax and non-tax motives. Winners tend to have higher abnormal volumes than losers. This would be expected if non-tax-related motives were predominant. However, the influence of tax-related motives on trading volume is shown by seasonal variations in the relationship between past price changes and turnover. As predicted by tax-induced trading theories, the volume of losers is higher than normal in December, and the volume of winners is higher than normal in January. We found no evidence that trading volume was affected by changes in the length of the holding period required to qualify for long-term capital gains.

Investors' reactions to capital gains taxes are important for several reasons. First, a comprehensive understanding of investor behavior would include both price and volume. Understanding the relationship between taxes and volume is a fruitful and convenient method of contributing to this subject. The resource allocation consequences of capital gains taxes are controversial in part because

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economists do not agree about how investors respond to these taxes (Poterba [20]). Among the views expressed are that investors avoid realizing taxable capital gains (the lock-in effect) or follow aggressive tax-reducing strategies by realizing short-term losses and long-term gains. Both of these strategies involve real costs and may result in suboptimal portfolios. Second, policy makers are interested as well in the revenue-generating characteristics of capital gains taxes (e.g., New York Stock Exchange [18]). These obviously depend on investors' reactions. Third, understanding how investors react to capital gains taxes may contribute to a better understanding of how they react to other situations such as taxable dividends. Fourth, the ability to distinguish between information-motivated trading and tax-motivated trading would be helpful to investors who rely on trading patterns as an information source.

Until recently, theoretical analyses of capital gains taxes have assumed that investors followed simple strategies (Farrar and Selwyn [9]). Sophisticated tax avoidance strategies are discussed by Miller and Scholes [16], Constantinides and Scholes [5], a series of papers by Constantinides [3, 4], Stiglitz [26], Grundy [11], and Lakonishok and Vermaelen [13, 14].

Analyses suggesting that investors take capital gains tax liabilities into consideration are presented by Dyl [8], Branch [2], and Selmrod [24]. The peculiar behavior of rates of return of small firms around year-end is widely suspected to be tax-related, although it seems clear that other factors are also at work (Keim [12], Lakonishok and Smidt [15], Reinganum [21], and Roll [22]). Evidence that individual investors engage in tax selling, and that it affects stock prices, is provided by Rozeff [23].

A recent U.S. Treasury study [27] using cross-sectional methodologies introduced by Feldstein, Selmrod, and Yitzhaki [10] estimated an elasticity of about -2 for common stock capital gains' realizations with respect to income tax rates.¹ An important recent study by Poterba [20] uses cross-sectional data to categorize individual investors on the basis of the strategies they appear to follow with respect to managing capital gains tax liabilities. He estimates that about 20 percent follow sophisticated tax-reducing trading strategies which seek, for example, to offset capital gains and ordinary income with capital losses. Approximately 40 percent follow an effective unsophisticated tax-reducing strategy; they do not report capital gains. The effective tax rate on capital gains of these two groups may be zero or negative. The balance of investors face positive marginal tax rates on capital gains similar to those assumed in the traditional theoretical analyses of capital gains. In addition, a substantial and growing proportion of common stock holdings are in pension and endowment portfolios that are exempt from the capital gains tax.

The remainder of this article is organized as follows: the next section discusses various ways past prices might affect subsequent investor behavior. Section II sets out the main hypotheses to be tested. Section III describes our data and methodology. The fourth section presents some descriptive results. The fifth, sixth, and seventh sections, respectively, present the results of a one-way analysis

¹ The estimated elasticity is defined as "the percentage change in realizations per unit percentage change in the marginal tax rate" (U.S. Treasury [27]).

of variance, a four-way analysis of variance and an analysis of covariance. The final section contains a summary and some concluding remarks.

I. Investors' Responses to Past Prices

In idealized markets with homogeneous investors, market adjustments require price changes but not necessarily transactions. Tax laws serve to partition investors into distinct categories that may result in tax-induced trading not necessarily accompanied by price changes. With respect to capital gains taxes, any tax-paying entity may have tax incentives to initiate transactions.

The most important categories of investors not likely to initiate transactions in response to taxes are tax-exempt pension and retirement-related accounts, tax-exempt institutions, and individual investors who do not report realized capital gains. The status of equity-oriented mutual funds is in doubt.

The next two subsections identify reasons why past price changes might provide a motive for initiating transactions. The first subsection deals with motives applicable to tax-paying investors. The second subsection deals with motives that might be applicable to any investor.

A. Tax-Related Responses

It is convenient to consider investor responses to capital gains taxes in two categories: responses to unrealized losses and responses to unrealized gains. There is general agreement about the appropriate response to losses, but less consensus about the appropriate response to gains.

Since capital gains and losses are generally recognized for tax purposes only if they are realized, taxable investors have an incentive to realize losses. Transaction costs and wash-sale restrictions inhibit the motivation that might otherwise exist for investors to realize losses continuously. The distinction between long-term and short-term losses creates an added incentive to realize losses before they become long-term. Since taxes are in general settled annually, there is an incentive to realize losses before the end of a tax year.

The prevailing view, until recently, was that taxpayers should avoid realizing capital gains, thereby producing a lock-in effect. According to Constantinides [4], tax-paying investors may also wish to realize capital gains soon after they become long-term, on stocks that are sufficiently volatile. By realizing the gain and replacing the stock with an equivalent security, the investor is in a position to realize future losses, if they occur, as short-term.

There are a number of considerations that may limit the extent of tax-induced trading.

1. Constantinides assumes that short-term losses can be offset against ordinary income or against short-term capital gains that are taxed like ordinary income. This may not always be the case because the amount that can be offset against ordinary income is limited and investors may not have enough short-term capital gains. Therefore, short-term losses may need to be offset against long-term gains or carried forward to future years, which reduces the tax benefits.

2. Because taxes are settled on a tax-year basis, an individual who realizes a capital gain or loss early in the year will not know for certain what the tax consequences will be. Because of events occurring later in the tax year, the investor may not be able to benefit from the loss, but will have incurred real transaction costs. This possibility may reduce tax-induced trading early in the tax year.
3. The wash-sale provisions in the tax code prohibit realizing tax benefits from sales, if the same asset is repurchased within thirty days. To the extent that stockholders possess differential information or interpret information about a stock they own more favorably than other investors, the wash-sale provisions may reduce the motivation to realize losses.
4. According to Constantinides, the strategy of realizing capital gains is most advantageous in companies, the stock of which is volatile. However, high transaction costs may reduce the incentives to trade. Volatile companies have high bid-ask spreads. In addition, volatile companies, particularly if they are small, tend to have low-priced shares; and low-priced shares are traditionally charged higher brokerage commission rates per dollar (see Copeland [6]).
5. Until Constantinides, the strategy of realizing capital gains was not discussed in the academic literature, nor to our knowledge, among practitioners. By contrast, the lock-in effect was widely known. Therefore, past trading patterns may not reflect this strategy, even if it is profitable.
6. Taxpayers who do not report realized capital gains on their tax returns may not need to concern themselves about the tax consequences of such gains. It has been estimated that 30 to 50 percent of realized gains are not reported (see Poterba [20] for a discussion). Furthermore, taxpayers who do not plan to report realized gains may avoid aggressive tax trading strategies for fear that reporting mainly losses could increase the chance of an IRS audit.

B. Non-tax-related Responses

Past prices may influence trading volume for other (non-tax-related) reasons as well. Some of these are mentioned below.

To the extent that accounting practices distinguish between realized and unrealized gains and losses, corporate investors may time the realization of capital gains and losses so as to produce desirable accounting results, a practice known as window-dressing. This may lead to a relationship between past prices and trading volume particularly at year-end.

Investors who do not hold the market portfolio may respond to a large price increase in one stock by selling some of the shares of that stock to restore the diversification of their portfolios. But if there has been a large price decrease in one stock, the diversification motive does not require buying more shares of the same company. To restore diversification to the previous levels, investors might sell shares in companies that had not declined. But there is no particular reason to reinvest the funds in the stock that had declined. These considerations may lead to a relatively higher volume for securities, the prices of which have increased. This could create a positive correlation between prices and volume.

It is well known that the amount of research attention a company receives is related to its size. A company that has recently experienced a large percentage increase in price may attract more attention because it is larger, while a company that has recently experienced a large decrease in price may attract less. If the volume of trading of a company's shares is affected by the amount of attention it receives, then companies that recently had unusually large increases (decreases) in price may experience increases (decreases) in trading volume. This could create a positive correlation between prices and volume. In a similar manner, a company that has experienced a large increase in value may become more attractive to financial institutions that are known to prefer larger companies.

If investors believe that price changes are positively correlated, they may be attracted to stocks with rising prices and may avoid stocks with falling prices. This could create a positive correlation between prices and volume.

Investors with favorable information which they believe is not yet incorporated into a stock's price may buy, intending to sell when the price increases to a pre-set target level that fully reflects the information. This strategy would tend to create a positive correlation between price changes and volume. In addition, professional managers who are compensated based on performance may tend to realize gains and restructure their portfolios to ensure that the gains are not lost by subsequent market downturns.

A positive correlation between price and volume is suggested by prospect theory. "One of the most significant and unique features in Kahneman and Tversky's approach to choice under uncertainty is aversion to loss realization" (Shefrin and Statman [25, p. 788]).

Tax-induced trading, or any of the processes referred to in the previous paragraphs, might cause volume to depend on past price changes. Therefore, the importance of price-dependent trading and its causes are empirical questions. The characteristics of the dependence may permit identification of the causal factors. Tax-related responses connecting past prices and current volume suggest, in general, a negative correlation between past price changes and current volume. Most non-tax-related responses suggest a positive correlation between past prices and volume.

II. Hypotheses Tested

To the extent that capital gain taxes are a consideration in influencing volume, we would expect the following characteristics to be observed, with the exceptions and qualifications noted.

Hypothesis 1: Shares for which prices decreased (losers) should have a higher volume than shares for which prices increased (winners).

Before the end of the short-term holding period, tax considerations suggest selling losers and deferring the sale of winners. After the end of the holding period, tax considerations suggest avoiding the sale of winners. In both cases, other things being equal, selling a winner is less attractive than selling a loser.

A qualification and an exception are necessary, leading to two additional hypotheses.

The qualification reflects the influence of transaction costs. Without transaction costs, losses should be recognized as soon as they occur. To reduce transaction costs, investors might wait until the end of the holding period or the end of the calendar year to realize short-term losses. Thus:

Hypothesis 2: The volume of short-term losers should be especially large at the end of the holding period or at the end of the calendar year, or both.

The exception might be in the first months after a winner becomes long-term. For volatile stocks, it has been argued that it may be worthwhile to realize gains at this time so that future losses, if they occur, will be short-term. Call this the insurance motive. Also, investors might wish to delay selling winners until the beginning of a new tax year. Call this the present value motive. The insurance and present value motives suggest the following exception to the primary hypothesis.

Hypothesis 3: The volume of winners should be especially large in the first month after the end of the holding period (insurance motive) or at the beginning of the calendar year (present value motive), or both.

III. Data and Methodology

This study seeks to identify the relationship between abnormal volume and past prices. Each month, cross-sectional regressions are run with abnormal volume as the dependent variable and indicators of past price changes as independent variables. A number of different sets of indicator variables are used. One set of independent variables are binary variables, distinguishing stocks whose prices have increased and stocks whose prices have decreased. In essence, this is an analysis of variance. A second set takes into account not only the direction of price change, but also the magnitude. This is essentially an analysis of covariance.

The main data used in our study are monthly prices and share volumes for companies listed on the New York Stock Exchange (NYSE) and the American Stock Exchange (ASE). Our main data source is the Compustat Prices—Dividends—Earnings (PDE) tape. We use all companies from the two major exchanges for which data are available. To control the trading volume for company size, we divide the number of shares traded in a given month by the number of shares outstanding to obtain a monthly turnover measure which we also refer to as volume.

To control for market-wide influences, we regress monthly company turnover on the average turnover of a “market” portfolio for that exchange.² We also experimented with several alternatives including combining the two exchanges into one market portfolio and alternative specifications of the market model.³

² The same procedure was used by Morse [17].

³ To check the robustness of our result, we also computed abnormal turnovers using two additional methods. Under the first method, we assumed that turnovers are generated according to the following process:

$$VT_{it} = VTM_t + e_{it}.$$

This process is widely used in computing abnormal security returns. With this process, any abnormal behavior during the period in which the coefficients are computed in many of the other models does

These alternatives produce essentially the same results as those presented. Our analysis is performed on the period 1968–1982. Before 1968, there are not enough observations on the number of shares traded on the PDE tape, especially for ASE securities.

The procedure for computing abnormal turnover for 1971 was as follows: we computed monthly turnover for all companies that were on the PDE tape throughout the four years, 1968–1971. We computed turnovers for two “market” portfolios, one consisting of all NYSE companies and the second of all ASE companies. The market portfolio turnover is a simple average of the turnovers of companies included in the portfolio. The data for the first three years was used to find coefficients of the turnover market model by running the following regression:

$$VT_{it} = a_i + b_i VTM_t + e_{it} \quad (1)$$

where

- VT_{it} = the turnover of security i in month t ,
- VTM_t = the relevant market turnover in month t , and
- e_{it} = the disturbance term for company i in month t .

The next step involves finding monthly abnormal turnovers in the fourth year, 1971. The abnormal turnovers are defined as,

$$AVT_{it} = VT_{it} - (a_i + b_i VTM_t). \quad (2)$$

In general, to compute the abnormal turnovers for a given year, we select all companies on the PDE tape throughout the four-year period ending in the given year. The first three years of data are used to estimate the turnover market model coefficients [Equation (1)]. These coefficients are then used to estimate abnormal volume in the fourth year.⁴

Our procedure was used to generate abnormal turnovers on a monthly basis for the period 1971–1982, one-hundred-forty-four months.

IV. Preliminary Descriptive Results

A. Market Average Turnover

Most of our analysis is concerned with abnormal turnover. In this section, we comment briefly on the time series and seasonal characteristics of the market-wide average turnover rate. Our market turnover rates are simple averages of the

not effect the computed abnormal volumes. The last turnover-generating process that we used is:

$$VT_{it} = a_i + b_i VTM_t + c_i VT_{it-1} + d_i VTM_{t-1} + e_{it}.$$

A similar process was used by Copeland [6] and by Asquith and Krasker [1]. Also for the last two models as for the first model, we used two specifications of the market portfolio: combining the two exchanges and treating each exchange separately.

⁴ The PDE tape suffers from survival bias; only companies that existed in 1982 are on the tape. Our procedure ensures that abnormal volume will be calculated for a given company, based on a market portfolio of companies which suffered the same fate. Every time we take a new four-year period, we consider only companies that existed during these four years.

company turnover rates and go back to 1966.⁵ In Table I, Panel A, we provide yearly turnover rates for the two exchanges. Until the early 1970's, small companies (ASE) had higher turnovers than large companies (NYSE). Since then, the turnover on the two exchanges are similar.

The NYSE *Fact Book* [19] has data on NYSE turnovers starting in 1900⁶ which enables us to gain a longer perspective on changes over time in turnovers. In general, in the first period, ending in the mid-thirties, turnover rates were high (usually over 5 percent per month), but with a clear downward trend. The record high was over 25 percent per month during 1901. In the second period, ending about the mid-1960's, turnover rates were low (usually between 1 and 2 percent per month) with no noticeable trend. Since then, turnover rates have ranged from 2 to 4.25 percent and appear to be increasing.

Prior to the third period, financial institutions' portfolio turnover rates were usually below the market average. In the third period, institutional portfolio turnover rates have been above the market average rate. Reduced transaction costs associated with block trading techniques (developed in the late 1960's and now accounting for about half of the market volume) and the abolition of fixed minimum commissions undoubtedly provide part of the explanation.

Monthly data on average turnovers are presented in Panel B of Table I for the two exchanges. On both exchanges, the turnover rate in January is higher than in any other month and is about two standard deviations above the yearly average. None of the other months is significantly different from the average. Part of the seasonal variation in turnovers may be due to seasonal differences in the number of trading days per month. The average number of trading days each month is presented in Table I, Panel C (the range is from 19.2 to 22.3), and is used to construct the indices of turnover per trading day in Panel D. December is just an average month. Even after adjusting for the number of trading days, January is the only month for which the turnover is significantly different from the average. The relatively high turnover in January may be due in part to the high frequency of annual results and analysts' recommendations released in January (Dimson and Marsh [7]).

B. Classification of Data

We first sought to determine if stocks with declining prices had different turnover rates than those with increasing prices. Since the effect, if any, of past price changes may vary from time to time, we first looked at each month individually.

⁵ We calculated market turnover rates beginning in 1966, but attempted to estimate abnormal turnover only for 1971 and later years.

⁶ The NYSE turnover rate is the number of shares traded divided by the number outstanding. It is equivalent to a weighted average of the company turnover rates with each company weighted by its number of shares outstanding. Annual turnovers provided by the NYSE have been divided by twelve to make the rates more comparable to our monthly data. Our measure gives equal weight to each company. The NYSE data are from the 1985 NYSE *Fact Book* [19].

Table I
Average Monthly Turnover Per Company for the NYSE and the ASE by Years and Months, 1966–1982 (Percent per Month)

Panel A: Average Monthly Turnover per Company by Years																		
Year	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	Average
NYSE	1.6	2.0	3.3	2.5	2.1	2.8	2.7	2.3	1.7	2.2	2.6	2.5	3.5	3.4	3.4	4.1	3.6	2.72
ASE	1.1	4.8	7.0	4.5	2.7	3.2	2.9	1.8	1.1	1.4	1.8	1.9	2.9	3.0	3.4	4.1	3.6	3.01
Panel B: Average Monthly Turnover per Company by Months																		
Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average					
NYSE	3.0	2.6	2.9	2.8	2.8	2.7	2.5	2.7	2.6	2.8	2.5	2.8	2.72					
ASE	3.5	2.8	3.1	3.2	3.3	3.1	2.9	2.8	2.8	3.0	2.6	3.1	3.01					
Panel C: Average Number of Trading Days per Month																		
Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average					
Trading Days	20.9	19.2	22.3	20.6	20.9	21.8	20.8	22.2	20.6	21.8	20.3	21.2	21.0					
Panel D: Indices of Average Turnover per Company per Trading Day by Months																		
Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average					
NYSE	111	104	100	105	104	96	93	94	98	99	95	102	100					
ASE	117	102	97	109	110	99	97	88	95	96	89	102	100					

Within each month, we considered the two exchanges separately. It is convenient to separate the exchanges for two reasons. First, the NYSE companies tend to be larger, resulting in higher absolute volumes and lower transaction costs.⁷ Second, trading by tax-exempt institutions is more important on the NYSE than on the ASE. Therefore, the two factors work in opposite directions, and their relative strength is an empirical issue.

Each stock on a given exchange in a given month was sorted into one of two mutually exclusive categories according to whether its price per share had increased or decreased in the previous N months. For convenience, these categories were referred to as N -month winners and N -month losers or simply winners and losers.

The values of N used were 5, 11, 23, and 35. In each case, a stock was considered to be an N -month winner in month t if $P_{t-1}/P_{t-(N+1)} > 1$, where P_t is the closing price of month t . For example, for $N = 5$, stocks were classified as winner if $P_{t-1}/P_{t-6} > 1$. The values of N used were selected in part to capture the holding period over which short-term losses (gains) could be realized. Through 1976, the holding period was six months, from 1978 the period was twelve months, and during 1977 the relevant holding period was nine months. The gain or loss from a stock bought at time $t - 6$ ($t - 12$) and sold anytime during month t would be classified as short-term if the holding period were six (twelve) months. The last two N -values, twenty-three and thirty-five months, were intended to capture the effect of long-term losses (gains) and other motives for trading.

The preliminary analysis showed that the pattern of abnormal volumes during the months of February through October was essentially the same. Therefore, the results for these months are presented as a single group. We are particularly interested in the possibility that the response to past price changes might vary around the end of the year; this dictated keeping November, December, and January separate. Therefore, the results are reported for four groups of months—three individual months and one set of nine months referred to as the mid-year group. This mid-year group has many more observations than the one-month groups, and therefore tests on this subset are more powerful.

The smallest sample subset analyzed consisted of the stocks on a given exchange for a given group of months in a given year. (There are 96 such subsets (two exchanges $\times$ four-month groups $\times$ twelve years.) For each subset, we had available the abnormal turnover of each stock. The initial results reported rely on classifying each stock each month as an N -month winner or loser using one of four values of N (5, 11, 23, or 35). With our methodology, the average abnormal turnover for all stocks in a given sample subset must be zero. Thus for each subset, if the average abnormal turnover of winners is positive, the average abnormal turnover of losers must be negative and vice versa. There may not be an equal number of winners and losers in the subset; therefore, the average abnormal turnovers of winners and losers may not have the same absolute values.

⁷ On the relationship between trading volume and transaction costs, see Lakonishok and Smidt [15].

C. A Non-Parametric Test

Table II provides simple counts of the number of years in which the average abnormal turnover of losers is greater than that of winners by exchange, group of months, and winner/loser definition. The possible range is from zero to twelve.

There is a striking seasonal difference between December and other months. Except in December, the abnormal volume of winners is always larger than the abnormal volume of losers. December is different at least on the NYSE; years in which losers have a higher turnover than winners are not uncommon. This conclusion does not depend strongly on how many past months are used to define winners and losers.

The data of Table II can be used to provide simple non-parametric tests of the null hypothesis that the abnormal turnovers of winners and losers are equal.

We could reject the null hypothesis (Hypothesis 1), that losers will have higher abnormal turnovers than winners, at the 2.5 percent level against the *one*-tailed alternative if the average abnormal turnover of losers were greater than that of winners in ten or more of the twelve years. This never happens!

To reject a *two*-tailed test of the null hypothesis at the five percent level requires numbers of ten or more or of two or less. Excluding the December column, this condition is satisfied for all but one cell. Even in December, the hypothesis is rejected using ASE data except for the thirty-five-month winner definition. Using NYSE data, the null hypothesis is rejected in December only for the five-month winner definition. Whenever the null hypothesis is rejected,

Table II
Number of Years during 1971–1982 in which the
Average Abnormal Turnover of Losers is Greater
than of Winners by Month, Winner/Loser
Definition, and Exchange

Winner/Loser Definition ^a	Jan.	Feb.–Oct.	Nov.	Dec.
NYSE				
5	0	0	0	2
11	0	0	1	6
23	1	0	0	5
35	3	2	2	8
ASE				
5	0	1	1	1
11	0	0	0	1
23	0	0	0	0
35	1	0	2	3

^a Winners (losers) are stocks whose prices have increased (decreased) over the previous N (5, 11, 23, and 35) months.

it is always because there are too many years in which the abnormal turnover of winners is greater.

In general, the volume of winners is greater than the volume of losers. At least on the NYSE, December is different.

V. One-Way Analysis of Variance

To determine whether the differences between the abnormal volumes of winners and losers were economically and statistically significant, a one-way analysis of variance was performed.

Formally, the following cross-sectional regression was run for each of the four definitions of winners and losers ($N = 5, 11, 23$, and 35) and each of the 96 sample subsets previously described ($4 \times 96 = 384$ regressions):

$$AV_i = \alpha + \beta DN_i + e_i \quad (3)$$

where AV_i is the abnormal volume for stock i , DN_i is a binary variable receiving the values: $DN_i = 1$ if $P_{t-1}/P_{t-(N-1)} > 1$ and 0, otherwise.

The t -value of the β coefficient in regression (3) measures the statistical significance of the difference between the abnormal volumes of winners and losers. Table III gives the frequency of the t -values for thirty-two groups—defined by exchange, month group, and N -value—($2 \times 4 \times 4$). Each group consists of twelve yearly cross-sectional regressions. A negative t -value indicates that losers have a higher abnormal volume than winners.

The most striking characteristic of the table is the high frequency of t -values above plus 2, indicating that the abnormal volume of winners was greater than that of losers and that the difference was statistically significant. The results for December are different on both exchanges. The t -values tend to be lower, and on the NYSE, some t -values are even below minus two, which with one exception, does not happen in other months.

Table IV reports data that is helpful in judging the economic importance of the difference between the abnormal volume of winners and losers. The classification of results is similar to Tables II and III, with the data classified by exchange, month group, and winner definition. The results reported are the average abnormal volumes of winners and losers and the average t -value of the differences between them. In each year, the abnormal volume of winners is the estimated $\alpha + \beta$ from regression (3); for losers, it is the estimated α ; the t -value is the t -value for β . These values are averaged over the twelve yearly regressions in each case. (The t -values reported are also just simple averages.)

In general, the difference in the average abnormal volume between winners and losers is statistically significant⁸ and has a substantial impact on trading volume. For example, for the period February–October, NYSE sample, and defining winners (losers) based on the prior eleven months, the abnormal volumes of the winners and losers are 0.32 percent and -0.37 percent, respectively.

⁸ In Table IV, the average t -values reported, when multiplied by $\sqrt{12} \approx 3.5$ are normally distributed with a mean of zero and a standard deviation of unity under the null hypothesis of no difference in abnormal return between winners and losers.

Table III
 Number of Years during 1971-1982 in which *t*-Values for Abnormal Turnover Differences of
 Winners and Losers are in the Indicated Ranges^a by Month, Winner/Loser Definition, and
 Exchange

Winner/Loser Definition ^b	Jan.			Feb.-Oct.			Nov.			Dec.		
	<i>t</i> < -2	-2 < <i>t</i> < 2	<i>t</i> > 2	<i>t</i> < -2	-2 < <i>t</i> < 2	<i>t</i> > 2	<i>t</i> < -2	-2 < <i>t</i> < 2	<i>t</i> > 2	<i>t</i> < -2	-2 < <i>t</i> < 2	<i>t</i> > 2
NYSE												
5	0	0	12	0	0	12	0	1	11	1	6	5
11	0	0	12	0	0	12	0	2	10	0	6	6
23	0	5	7	0	0	12	0	3	9	1	7	4
35	0	9	3	1	1	10	0	7	5	2	8	2
ASE												
5	0	1	11	0	1	11	0	3	9	0	8	4
11	0	1	11	0	1	11	0	3	9	0	6	6
23	0	4	8	0	0	12	0	2	10	0	7	5
35	0	7	5	0	1	11	0	5	7	0	11	1

^a A positive *t*-value shows that the abnormal volume of winners is higher than for losers.
^b Winners (losers) are stocks whose prices have increased (decreased) over the previous N (5, 11, 23, and 35) months.

Table IV
Average Abnormal Turnovers of Winners, Losers, and *t*-Value of Difference^a by Month, Winner/
Loser Definition, and Exchange, 1971-1982 (Percent per Month)

Winner/ Loser Definition ^b	Jan.				Feb.-Oct.				Nov.				Dec.	
	Losers	<i>t</i>	Winners	Losers	<i>t</i>	Winners	Losers	<i>t</i>	Winners	Losers	<i>t</i>	Winners	Losers	<i>t</i>
NYSE														
5	-0.39	5.5	0.51	-0.29	9.8	0.25	-0.33	4.7	0.42	-0.06	1.5	0.14		
11	-0.34	4.8	0.51	-0.37	12.0	0.32	-0.31	4.3	0.36	-0.05	1.3	0.13		
23	-0.17	3.1	0.36	-0.30	9.8	0.27	-0.36	4.0	0.39	-0.02	1.0	0.15		
35	-0.08	1.6	0.19	-0.17	6.4	0.20	-0.22	2.2	0.19	-0.04	-0.3	0.03		
ASE														
5	-0.47	4.1	0.94	-0.43	8.1	0.41	-0.48	3.1	0.68	-0.19	1.5	0.30		
11	-0.51	4.0	0.95	-0.55	10.3	0.62	-0.68	3.9	0.77	-0.39	2.4	0.35		
23	-0.41	3.3	0.71	-0.55	9.0	0.60	-0.74	3.8	0.76	-0.41	2.4	0.44		
35	-0.21	2.3	0.58	-0.38	6.3	0.42	-0.55	2.2	0.39	-0.25	1.1	0.19		

^a A positive *t*-value shows that the abnormal volume for winners is higher than for losers.
^b Winners (losers) are stocks whose prices have increased (decreased) over the previous N (5, 11, 23, and 35) months.

According to Table I, the mean monthly turnover is 2.72 percent; hence, winners have a volume that is nearly 30 percent higher than losers $\left(\frac{2.72 + 0.32}{2.72 - 0.37} - 1 = 0.29\right)$. In some cases, the differences between the volume of winners and losers

are even more pronounced. The comparable difference for ASE companies (February–October, eleven-month criterion) is nearly 50 percent. In general, the effect of past price changes on volume is greater for the ASE than for the NYSE.

The results reported in Table IV exhibit a seasonal pattern. To focus on this, Table V presents the average turnover differences (winners minus losers) for three groups of months (January, February–October, and December) and two winner definitions (five and eleven months). November is similar to a mid-year month. The data are for the entire twelve-year period from 1971–1982.

Four features of Table V deserve comment. First, in every case, the average turnover of winners is greater than that of losers. This can be interpreted as contradicting Hypothesis 1, which predicts that losers will have a higher volume than winners. Second, as predicted by Hypothesis 2, the difference between winners and losers is smaller in December than in mid-year for both winner definitions and both exchanges. Third, as predicted by Hypothesis 3, the difference between winners and losers is larger in January than in mid-year for both winner definitions and both exchanges. Fourth, the difference between winners and losers in December is much greater on the ASE than on the NYSE. One should not conclude from this that tax-motivated selling is less important on the ASE. The turnover difference between winners and losers is greater on the ASE every month, but the shift in December is essentially the same on both exchanges.

Table V
Average Turnover Difference Between Winners and
Losers For 5- and 11-Month Winner/Loser
Definitions by Month and Exchange, 1971–1982
(Percent per Month)

Winner/Loser Definition ^a	Jan.	Feb.–Oct.	Dec.
NYSE			
5	0.90	0.54	0.20
11	0.85	0.69	0.18
ASE			
5	1.41	0.84	0.49
11	1.46	1.17	0.74

^a Winners (losers) are stocks whose prices have increased (decreased) over the previous N (5, 11, 23, and 35) months.

VI. Four-Way Analysis of Variance

In the one-way analysis of variance, companies were classified as winners or losers on the basis of price changes in the previous five, eleven, twenty-three, or thirty-five months. These classifications are not independent. If a stock had a large price increase in the previous five months, it is more likely to be classified as a winner using the eleven-, twenty-three-, and thirty-five-month criteria. Therefore, the coefficients presented in the previous tables may be biased.

To explore this issue, we performed a four-way analysis of variance. Abnormal volume was regressed on four binary variables as follows:

$$AV_i = \alpha + \beta_1 D5_i + \beta_2 D11_i + \beta_3 D23_i + \beta_4 D35_i + l_i \quad (4)$$

where AV_i is the abnormal volume for stock i (in a given month), and $D5$, $D11$, $D23$, and $D35$ receive a value of one (zero) if the stock price increased (decreased or no change) over the previous period of five, eleven, twenty-three, and thirty-five months, respectively.

The results for the entire twelve-year period are shown in Table VI. The constant term shows the abnormal volume if the stock price declined over the

Table VI
Four-Way Analysis of Variance: Regression
Coefficients and t -Values Showing the Effect on
Abnormal Turnover of Winner/Loser Status in the
Previous 5, 11, 23, and 35 Months by Month and
Exchange, 1971–1981 (Percent per Month)

Observation Period		Direction of Price Trend in the Previous:			
		5 months	11 months	23 months	35 months
NYSE					
Jan.	–0.39 (–10.12) ^a	0.61 (11.62)	0.34 (5.88)	0.06 (0.98)	–0.20 (–3.43)
Feb.–Oct.	–0.50 (–33.92)	0.28 (15.59)	0.41 (20.76)	0.24 (11.18)	–0.04 (–2.03)
Nov.	–0.52 (–11.24)	0.39 (6.85)	0.25 (4.04)	0.46 (6.79)	–0.12 (–1.98)
Dec.	–0.09 (–2.32)	0.16 (3.10)	0.08 (1.38)	0.17 (2.70)	–0.21 (–3.70)
ASE					
Jan.	–0.54 (–7.30)	0.86 (7.55)	0.65 (5.32)	0.13 (0.99)	–0.26 (–2.16)
Feb.–Oct.	–0.81 (–22.80)	0.44 (9.96)	0.56 (11.67)	0.43 (8.10)	0.03 (0.69)
Nov.	–1.07 (–11.63)	0.41 (3.68)	0.79 (6.54)	0.82 (6.05)	–0.06 (–0.49)
Dec.	–0.55 (–7.05)	0.12 (1.22)	0.45 (4.37)	0.59 (5.05)	–0.20 (–1.84)

^a t -values are in parentheses.

previous four periods. The coefficients of each of the independent variables show the impact of a price increase for the corresponding period. For example, based on NYSE stocks for the months of February–October, if the prices decreased over the four periods (five, eleven, twenty three, and thirty five months), the abnormal volume is -0.50 ; if the price increased over the past five months and decreased over the remaining three periods, the abnormal volume is -0.22 ($-0.50 + 0.28$); and if the price increased over the four periods, the abnormal volume is 0.39 ($-0.50 + 0.28 + 0.41 + 0.24 - 0.04$).

In general, the results in Table VI confirm the previous results: an increase (decrease) in stock prices triggers a higher (lower) trading volume. The coefficients for the first three periods (five, eleven, and twenty three months) are always positive and consistent with higher volume for winners. The coefficients on the thirty-five-month variable are usually negative, but their *t*-values are in general much lower and the size of the coefficients is small. For example, for the February–October period on the NYSE, the coefficient on the price change over thirty five months is -0.04 percent. Relative to the average trading volume, which is 2.72 percent per month, the impact of the thirty-five-month coefficient is negligible. For the mid-year period (February–October), the coefficient for the eleven-month price change tends to be the most important (0.41 and 0.56 for NYSE and ASE, respectively), and the coefficients for five and twenty three months are of similar magnitude (0.28 and 0.24 for NYSE and 0.44 and 0.43 for ASE, for five and twenty three months, respectively).

The results in Table VI show that the past price pattern has a substantial impact on trading volume. For the February–October period, a NYSE stock that decreased in price over the four past periods will have a trading volume of 2.22 percent, and a stock, the price of which increased over these periods will have a trading volume of 3.11, or winners have a trading volume that is higher by 41 percent than losers. The comparable number for ASE is 66 percent (2.20 percent for losers versus 3.66 percent for winners). As we observed before, the reluctance to realize losses and the willingness to realize gains is greater on ASE than on NYSE.

Turning to December (NYSE), the difference between trading volume of winners and losers is substantially reduced relative to a typical month. For example, a stock that decreased in price over the past four periods will have a decrease in trading volume of 0.09 percent, and a stock that experienced an increase in price over the same periods will have an increase in trading volume of 0.11 ($-0.09 + 0.16 + 0.08 + 0.17 - 0.21$). Also, the coefficients for the five and eleven months are smaller in December.

We will now estimate the magnitude of the tax-induced trading in December. The gap on the NYSE between consistent winners (increase by all four definitions) and losers was 0.89 percent in the mid-year periods (3.11 versus 2.22). This gap decreases in December to 0.20 percent. Such a swing of 0.69 percent is roughly 33 percent of a typical trading volume in a month. For the ASE, the gap between winners and losers decreased from 1.46 in February–October to 0.96 in December; the swing is roughly 32 percent of a typical trading volume. If the increase (decrease) in prices does not occur in all the past periods, the impact of tax-induced trading is smaller.

In January, there is a stronger tendency to realize recent gains (five and eleven months). The sum of the coefficients over five and eleven months in January is 0.94 for NYSE companies versus 0.69 for a typical month. For the ASE, the sum of the two coefficients in January is 1.51 versus 1.00 for a typical month. Hence, investors who recently accumulated capital gains have a tendency to postpone gains until the next year.

Although we report results only for a four-way analysis of variance, we tried other specifications as well. We examined models for which we had variables to capture price change in thirty-five past periods. In such regressions, multicollinearity makes it difficult to interpret the individual coefficients. However, looking at aggregated coefficients, the results were essentially the same as in Table VI. The four variables that we use in Table VI capture a substantial part of the variability of past price changes.

The four-way analysis of variance was expanded to include interaction terms. However, the interaction terms turned out not to be significant in general; therefore, these results are not presented.

A. Effects of Changes in the Holding Period

The holding period required to qualify for long-term capital gains was not the same for all of the years covered by our data. During calendar years 1971–1975, the required holding period was six months and during calendar years 1978–1982, it was twelve months. We consider the two years omitted, 1976–1977, as a transition period. Hypothesis 2 suggests that investors tend to wait (because of transaction cost considerations) until the last month of the holding period to realize losses. If so, the response of abnormal volume to the five-month losers should have been larger in the first subperiod than in the second. Similarly, the response of abnormal volume to the eleven-month losers should have been larger

Table VII
Analysis of Covariance: Regression Coefficients
Showing the Effect on Abnormal Turnover of
Winner/Loser Status in the Previous 5, 11, 23, and
35 Months by Month, NYSE, 1971–1982
(Percent per Month)

Coefficient	Jan.	Feb.–Oct.	Dec.
α	0.03	−0.02	−0.16
β_1	−0.14	−0.16	0.12
β_2	−0.07	−0.09	−0.19
β_3	0.14	−0.04	−0.02
β_4	−0.22	−0.19	−0.17
$\gamma_1 + \delta_1$	0.0373	0.0217	0.0076
$\gamma_2 + \delta_2$	0.0161	0.0121	0.0126
$\gamma_3 + \delta_3$	−0.0053	0.0031	0.0002
$\gamma_4 + \delta_4$	−0.0023	−0.0035	−0.0020
$-\gamma_1$	−0.0089	0.0101	0.0187
$-\gamma_2$	0.0008	−0.0032	0.0081
$-\gamma_3$	−0.0030	−0.0052	−0.0091
$-\gamma_4$	−0.0041	−0.0102	−0.0027

in the second subperiod than in the first. These relationships should be most apparent in December when investors are more sensitive to tax considerations.

We tested for these relationships by using four-way analyses of variance, similar to those described previously. The analyses were performed separately for the first five years and the last five years. There appeared to be no consistent shift in coefficients in the directions predicted. To conserve space, these results are not presented.

VII. Analysis of Covariance

The results until now did not consider the impact of the magnitude of the price change on trading volume. Consistent with the previous results, we expect that not only the sign of the price change matters, but also, its magnitude.

In Tables VII and VIII, we present the results of an analysis of covariance for NYSE and ASE firms, respectively. The results are based on the following model:

$$\begin{aligned}
 AV_i = & \alpha + \beta_1 D5_i + \beta_2 D11_i + \beta_3 D23_i + \beta_4 D35_i \\
 & + \gamma_1 R5_i + \gamma_2 R11_i + \gamma_3 R23_i + \gamma_4 R35_i \\
 & + \delta_1 D5_i R5_i + \delta_2 D11_i R11_i + \delta_3 D23_i R23_i \\
 & + \delta_4 D35_i R35_i + e_i
 \end{aligned} \tag{5}$$

where $D5$, $D11$, $D23$, and $D35$ are binary variables defined as in the analysis of variance, and $R5$, $R11$, $R23$, and $R35$ are $(P_{t-1}/P_{t-6}) - 1$, $(P_{t-1}/P_{t-12}) - 1$, $(P_{t-1}/P_{t-24}) - 1$, and $(P_{t-1}/P_{t-36}) - 1$, respectively. Because this regression involves twelve independent variables, we pooled the cross-section and time-series observations. The slopes for the losers are represented by γ_1 to γ_4 , whereas the slopes for the winners are $(\gamma_1 + \delta_1)$ to $(\gamma_4 + \delta_4)$.

Table VIII
 Analysis of Covariance: Regression Coefficients
 Showing the Effect on Abnormal Turnover of
 Winner/Loser Status in the Previous 5, 11, 23, and
 35 Months by Month, ASE, 1971-1982
 (Percent per Month)

Coefficient	Jan.	Feb.-Oct.	Dec.
α	-0.31	-0.40	-0.72
β_1	0.17	-0.19	-0.07
β_2	0.12	0.00	0.03
β_3	0.13	0.07	0.29
β_4	-0.20	-0.06	-0.04
$\gamma_1 + \delta_1$	0.0195	0.0159	0.0066
$\gamma_2 + \delta_2$	0.0151	0.0089	0.0104
$\gamma_3 + \delta_3$	-0.0017	0.0027	0.0005
$\gamma_4 + \delta_4$	0.0025	-0.0006	0.0000
$-\gamma_1$	-0.0062	-0.0034	0.0129
$-\gamma_2$	0.0012	-0.0008	0.0023
$-\gamma_3$	-0.0012	-0.0038	-0.0095
$-\gamma_4$	-0.0004	-0.0008	0.0067

To facilitate the interpretation of the results, the slope coefficients for losers are multiplied by -1 (because the rates of return for losers are negative). After the multiplication, a positive (negative) slope coefficient for winners or losers indicates an increase (decrease) in trading volume.

The analysis of covariance is more difficult to interpret than the analysis of variance. Table IX summarizes the results of Tables VII and VIII by concentrating on the differences in slope coefficients for winners and losers. For the normal period, February–October, on the NYSE, the slope coefficient for winners is always greater than for losers, and the differences are statistically significant at the 1 percent level. The results for the ASE are very similar except for the thirty-five-month difference (not statistically significant).

The interpretation of the results from the slope coefficients is that a given increase in stock prices will increase the volume by more than would a comparable decrease. Thus, the difference in trading volume between winners and losers is related to the magnitude of change in stock prices in a way that reinforces the results from the analysis of variance.

The results for January are similar to the results for February–October. Only one of the four differences for each exchange is negative. But, the negative differences are not statistically significant. The coefficient on the five-month holding period in January is substantially higher than the comparable coefficient for February–October. This is consistent with our previous results which indicated that there is an incentive to postpone recent gains to the next tax year.

The differences between results for December and for the other months are consistent with tax incentives to trade. In other months, trading is greater for winners, especially for the five- and eleven-month definitions. The situation in December is different. Of the four coefficients (NYSE and ASE), two are positive and two are negative. The only coefficient significant at the 5 percent level is for the NYSE five-month holding period, and this coefficient is negative.

To get a better understanding of the results, let us assume that price changes are the same per unit of time. Table X presents the results of Tables VII and

Table IX
Analysis of Covariance: Differences in the Adjusted Slope
Coefficients of Winners Minus Losers by Month and Exchange,
1971–1982

Difference in Slope Coefficients	NYSE			ASE		
	Jan.	Feb.–Oct.	Dec.	Jan.	Feb.–Oct.	Dec.
$\gamma_1 + \delta_1 - (-\gamma_1)$	0.0462 (11.83) ^a	0.0116 (8.66)	−0.0111 (−3.18)	0.0257 (4.41)	0.0193 (7.35)	−0.0063 (−1.25)
$\gamma_2 + \delta_2 - (-\gamma_2)$	0.0153 (4.95)	0.0153 (14.01)	0.0045 (1.60)	0.0139 (2.76)	0.0097 (4.53)	0.0081 (1.82)
$\gamma_3 + \delta_3 - (-\gamma_3)$	−0.0023 (−0.87)	0.0083 (8.97)	0.0093 (3.64)	−0.0005 (−0.11)	0.0065 (3.54)	0.0100 (2.51)
$\gamma_4 + \delta_4 - (-\gamma_4)$	0.0018 (0.89)	0.0067 (9.02)	0.0007 (0.34)	0.0029 (0.85)	−0.0002 (−0.14)	−0.0067 (−2.02)

^a *t*-values are in parentheses.

VIII under this assumption, which enables us to reduce the dimensionality of the analysis. Expressing the annual rate of return as R_{12} , Equation (5) simplifies to

$$AV_i = A + BR_{12i}. \quad (6)$$

The intercept (A) and the slope (B) are presented separately for winners and for losers. For losers $A = \alpha$, and for winners

$$A = \alpha + \beta_1 + \beta_2 + \beta_3 + \beta_4.$$

For losers,

$$B = (5/12)\gamma_1 + (11/12)\gamma_2 + (23/12)\gamma_3 + (35/12)\gamma_4,$$

while for winners

$$B = (5/12)(\gamma_1 + \delta_1) + (11/12)(\gamma_2 + \delta_2) + (23/12)(\gamma_3 + \delta_3) + (35/12)(\gamma_4 + \delta_4).$$

Table X reveals that the slope for winners is higher than for losers and that the difference in slopes is the smallest in December. For example, the difference in slopes for ASE is 0.0044 in December versus 0.0300 in February–October and 0.0310 for January.

To reduce further the dimensionality of the problem, we present Table XI. In this table, the difference in abnormal volume between winners and losers is compared. As in Table X, we assume a constant rate of return per unit of time. We present differences in abnormal volume under three assumptions: (1) 10 percent annual increase in prices versus 10 percent annual decrease in price; (2) as (1) but for 20 percent; and (3) as (1) but for 30 percent.

Of the eighteen numbers presented in Table XI, seventeen are positive. It indicates once more that past prices have an impact on trading volume and that price increases (decreases) have a positive (negative) impact on trading volume. Assuming a monthly turnover of 2.72 percent for NYSE and 3.01 percent for ASE, past prices have a substantial impact on trading volume. In many of the cases presented in Table XI, the impact of an increase versus decrease is above 20 percent in terms of trading volume. December, with one exception, is the month for which the difference in trading volume between winners and losers is the smallest.

Table X
Analysis of Covariance: Estimates of the Effect on Abnormal
Turnover of a Constant Positive or Negative Rate of Return Per
Unit Time by Exchange and Month, 1971–1982 (Percent per
Month)

Assumed Rate of Return Category and Exchange	Jan.		Feb.–Oct.		Dec.	
	A*	B*	A	B	A	B
Winners (NYSE)	−0.26	0.0134	−0.50	0.0159	−0.42	0.0093
Losers (NYSE)	0.03	−0.0207	−0.02	−0.0384	−0.16	−0.0101
Winners (ASE)	−0.09	0.0260	−0.58	0.0182	−0.51	0.0132
Loser (ASE)	−0.31	−0.0050	−0.40	−0.118	−0.72	0.0088

* A and B are the intercepts and slopes, respectively.

Table XI

Analysis of Covariance: Differences in the Abnormal
Turnover Resulting From a Constant Annual Rate of
Price Increase Versus Decrease by Month and
Exchange, 1971-1982 (Percent per Month)

Exchange and Assumed Rate of Return Difference	Jan.	Feb.-Oct.	Dec.
NYSE			
10% increase vs. 10% decrease	0.04	0.06	-0.07
20% increase vs. 20% decrease	0.37	0.61	0.13
30% increase vs. 30% decrease	0.70	1.15	0.32
ASE			
10% increase vs. 10% decrease	0.53	0.12	0.25
20% increase vs. 20% decrease	0.84	0.42	0.30
30% increase vs. 30% decrease	1.15	0.72	0.34

To summarize, the results from the analysis of covariance reinforce the results from the analysis of variance. Past prices do have an impact on turnover; turnover for winners is higher than for losers. The incentive to realize losses in December is stronger than in a typical month.

VIII. Summary and Conclusions

In this study, we attempted to measure the extent of tax-induced trading. The research is based on the idea that the response of investors to capital gains taxes may create a relationship between trading volume in a given month and price changes in previous months. There are also non-tax reasons why investors might respond to past price changes by being more or less willing to trade. In general, our empirical design enables us to distinguish the non-tax responses from the tax responses.

In the simplest terms, capital gains taxes create incentives to realize losses, and in some circumstances to defer realizing gains or create lesser incentives to realize gains than losses. This should create negative cross-sectional correlations between past price changes and current volume. The strength of these incentives depends, among other things, on the size of the unrealized gains and losses, and on whether they would be long- or short-term if realized. By contrast, most non-tax related incentives would induce investors to realize gains and to avoid realizing losses, thus creating a positive cross-sectional correlation between past price changes and current volume.

We developed measures of monthly abnormal turnover for the companies in our sample to eliminate the effects of market-wide changes in turnover. Each month, companies were classified as winners or losers, depending on whether their prices increased or decreased over the previous five, eleven, twenty-three, and thirty-five months. The relationship between abnormal turnover and the direction of past price changes was measured in several ways. A non-parametric test was used to determine if there were differences in the abnormal turnover of winners and losers. In addition, a number of parametric tests were employed. We used one-way analysis of variance to determine the effect of the price change in the previous N months taken by itself, four-way analysis of variance to determine the combined effect of price increases or decreases over the previous five, eleven, twenty-three, and thirty-five months, and analysis of covariance to determine the relationship between abnormal volume and the direction and magnitude of the past price changes. The results were remarkably robust with respect to method of analysis.

The results indicate that past prices influence current incentives to trade through both tax and non-tax motives. The major finding is that winners tend to have higher abnormal volume than losers. This is the relationship that would be expected if non-tax-related motives were predominant. The tendency of winners to have higher abnormal volume than losers clearly holds for both exchanges and for every month of the year. The relationship is stronger on the ASE than on the NYSE. The difference between the average monthly turnover of winners and losers at mid-year is on the order of 30 percent of the average monthly turnover on the NYSE and 50 percent on the ASE.

However, tax-related motives also influence trading volume. This is evidenced by seasonal variation in the strength of the relationship between past price changes and turnover. As predicted by tax considerations, the abnormal volume of losers is higher than normal in December, and the abnormal volume of winners is higher than normal in January. We could not find any evidence that trading volume was affected by changes in the length of the holding period required to qualify for long-term capital gains.

In summary, we find clear evidence that tax incentives influence trading volume, although they are not the predominant influence. There are a number of non-tax-related motives that could account for the generally positive relationship between past price changes and volume: rebalancing of incompletely diversified portfolios, trading strategies based on past prices, and psychological theories. An important objective of subsequent studies should be to identify the motives that account for the trading patterns that we have observed.

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