To the Graduate Council:

I am submitting herewith a dissertation written by Chu-San Edward Wang entitled "A Mystery of the January Effect: Single or Multiple Driving Forces?" I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

Ramon P. DeGennaro

Ramon P. DeGennaro, Major Professor

We have read this dissertation
and recommend its acceptance:

Amy F. Farmer

Amy F. Farmer

Deborah L. Gunthorpe

Deborah L. Gunthorpe

Ronald E. Shrieves

Ronald E. Shrieves

Accepted for the Council:

Anne Mayhew

Associate Vice Chancellor and
Dean of The Graduate School

A MYSTERY OF THE JANUARY EFFECT: SINGLE OR MULTIPLE DRIVING FORCES?

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Chu-San Edward Wang

August 1997

DEDICATION

This dissertation is dedicated to

God the Father, Jesus Christ the Son, and the Holy Spirit.

Without Him, this work can not be done.

ACKNOWLEDGEMENTS

I am grateful to my wife Liangjiin for her love, support, and patience during the past few years. Especially, I would like to thank my major professor, Dr. Ramon P. DeGennaro, for his continuous encouragement and excellent guidance. I would also like to give thanks to the other committee members: Dr. Amy F. Farmer, Dr. Deborah L. Gunthorpe, and Dr. Ronald E. Shrieves, for their helpful comments and encouragement during the course of this dissertation work.

ABSTRACT

This study examines the joint effect of potential explanatory factors of the January effect. Four major hypotheses are tested in the study, including the tax-loss selling/parking-the-proceeds, window dressing, overreaction, and liquidity hypotheses. The results of this study make the following contributions to the literature:

[1] A new, potentially more powerful proxy for potential tax-loss selling (PTS) is derived. This new proxy allows us to examine directly the tax-loss selling effect on cross-sectional stock returns and trading volumes.

[2] We simultaneously test the four major hypotheses in a regression. Previous studies fail to simultaneously control for the most potentially important factors in their analyses. Consequently, their empirical results and conclusions are often contradicting to one another, and make these studies on the January effect less conclusive. By inspecting the sign of the estimated coefficients, based on the prediction of each major hypothesis, we reexamine the effects of different possible explanatory factors and identify the underlying explanations of the January effect. Our evidence strongly supports the liquidity and the overreaction hypotheses.

[3] We add an institutional-ownership interaction term for each tested factor in the simultaneous test. Since all the four tested hypotheses resort to trading behavior of either individual or institutional investors as the explanation of the January effect, the evidence from institutional ownership plays an indispensable role in testing these

hypotheses. It also provides an opportunity to distinguish between the tax-loss selling and the window dressing hypotheses, which is unavailable in prior studies.

[4] We examine the trading behavior of management, institutions, and insiders around year-end. If the January effect is exploitable, then its continuous existence is obviously evidence against the efficient market hypothesis, which is the foundation of many modern finance theories. Since the January effect is a well-known phenomenon, these stock market participants may exploit this opportunity with their private information or lower transaction costs in stock trading. Because of the advantage in stock trading, they are the most likely candidates of exploiting the January effect. However, our results provide no evidence that these participants exploit the January effect.

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

CHAPTER I

INTRODUCTION

1.1 The January Effect

The January effect refers to the anomaly of extraordinarily high average stock returns occurring in January, with most of the excess returns concentrating in the turn-of-the-year period, a five-day period starting from the last trading day of December to the first four trading days of January.[1] Therefore, it is also referred to as the turn-of-the-year effect by some researchers. The January seasonality in common stock returns is first observed in the literature by Wachtel (1942). The issue lay dormant until Rozeff and Kinney (1976) pointed out that the January effect constitutes an important anomaly: Such abnormal returns should not be available in an efficient market. Rozeff and Kinney (1976) present the first serious evidence that January returns are higher than in any other months.

Keim (1983) shows that the January effect is especially pronounced for small firms. Gultekin and Gultekin (1983) examine stock markets in 16 major countries[2] other than the U.S. They find that the January effect is almost everywhere, since January is the only month of the year with a significantly positive return in all of the 16 countries.[3] Nor is the

---

[1] An alternative definition of the January effect is that small stocks earn significantly positive abnormal monthly returns in and only in January.

[2] These countries are Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Singapore, Spain, Sweden, Switzerland, and United Kingdom.

[3] Since most studies exploring the January effect examine the evidence from U.S. stock markets, the finding of Gultekin and Gultekin (1983) indicates that the January seasonality in stock returns is not a phenomenon unique to the U.S. stock markets. However, it does not necessarily imply that the January effect is induced by the same single driving force in every country. For example, as discussed later in Chapter II, tax-loss selling may be the underlying reason for the high January returns in the U.S. stock

January effect limited to stocks. Keim and Stambaugh (1986) document that the January effect also exists in the market of corporate bonds.

On the other hand, except for high returns, January has some more startling and mysterious features. For example, Tinic and West (1984) point out that the risk premium is paid only in January. That is, high-beta stocks earn the same ex-post monthly returns as low-beta stocks for all months in the year except January. Another important example is the tax premium. Theory predicts that tax-paying investors will require higher pre-tax returns on stocks paying dividends than on stocks paying no dividends at all, such that their after-tax returns are commensurate with each other. Keim (1985) reports that returns on stocks paying dividends do increase with the size of dividend yield, but only in January. In the other 11 months, returns are the same for stocks paying no, little or huge dividends. However, he also finds that stocks paying no dividend earn a January return of 10 percent, which is about twice as large as the January return on the top quintile dividend-paying stocks. There is no clear explanation for this finding.[4]

1.2 Motivation

These above-mentioned interesting and unsolved features of the January effect stimulate numerous studies in this field. Many hypotheses, including tax-loss selling,

---

markets (Ritter (1988)), since a calendar year is exactly the same as a tax year. Nevertheless, in addition to a January effect, an 'April effect' is also found in the U.K. where a tax-year ends on April 5 (Reinganum and Shapiro (1987)). Obviously, the January effect in the U.K. stock market cannot be explained by any tax-related trading. Further, the Japanese stock market exhibits a stronger January effect than the U.S., even though there is no capital gain tax for individual investors in Japan (Kato and Schallheim (1985)).

[4] As pointed out by Haugen and Lakonishok (1988), some of this difference is attributable to the fact that most non-dividend-paying stocks are small firms.

window dressing,[5] overreaction, and the liquidity hypotheses, have been proposed to explain the January effect. Nevertheless, the reasons for the existence of the January effect are not yet well understood, even after extensive study over the past two decades. Empirical evidence on these major hypotheses is mixed and oftentimes contradictory. Part of the contradictory results are probably due to the different methodologies used. However, a considerable extent of the inconsistency could come from the reasons shown later in this section. The main objectives of this dissertation are to investigate the January effect by simultaneously testing the four hypotheses and to explore whether the effect is exploitable by insiders and institutional investors. Another objective is to examine the power of stock price and firm size in explaining cross-sectional variation in institutional ownership of the NYSE/AMEX firms.

Recently, Fama and French (1992) find that beta has no explanatory power for the cross-sectional stock returns of the NYSE, AMEX, and NASDAQ firms during the period of 1963-1990, while firm size (market equity) and book-to-market equity ratio combine to capture the cross-sectional variation in stock returns. Fama and French's finding suggests that the CAPM (Capital Asset Pricing Model) approach is unlikely to be fruitful in explaining cross-sectional variation in stock returns. If this is true, then it may imply that the CAPM, which is applied in most of the previous studies, is not an adequate tool for examining the January effect.[6] Therefore, we examine the cross-sectional expected January

[5] This dissertation tests two versions of the window dressing hypothesis: the traditional window dressing and the risk-preference switching hypotheses. Please refer to Section 2.2 for an introduction to these two versions.

[6] Prior studies document the abnormally high January return as a stock market anomaly, since they find that the CAPM cannot explain the January seasonality. However, if the CAPM is invalid, then the January effect might disappear when a correct model is used. On the other hand, Banz (1981), Reinganum (1981),

returns by using a more powerful multifactor model such as Fama and French's. We assume that the abnormal returns around year-end, e.g., depressed year-end and high turn-of-the-year returns according to the tax-loss selling hypothesis, result from the effect of some additional explanatory factors.[7] That is, in the absence of these factors, stock returns should follow the expected return-risk relationship described by Fama and French's two-factor model.

The second problem in previous studies is that they fail to control for the most potentially important factors simultaneously in their analyses. This neglect of important variables may seriously bias their results and hence could be responsible for the observed contradicting empirical evidence.[8] Therefore, simultaneous investigation of all major hypotheses is desperately needed. In fact, we show that omitting potentially important factors could reach opposite conclusions when testing these hypotheses. Simultaneous testing is not only methodologically correct but also provides an opportunity to compare the relative strength of tested hypotheses' power in explaining the January effect.

---

and Keim (1983) report that stock returns of small firms are significantly higher than those of large firms. As pointed out by Haugen and Lakonishok (1988, p. 45), a small-firm effect "is still perfectly consistent with market efficiency because size may be serving as a proxy for risk." Since there is no other widely-accepted asset pricing model in the literature, this dissertation applies Fama and French's two-factor model, which incorporates the effect of firm size. In a sensitivity test, we also include beta in our regression. The result shows that our conclusions do not change when beta is added to explain cross-sectional stock returns.

[7] Similarly, we assume that the abnormal trading activities around year-end can be explained by these additional factors in our analysis of trading volumes.

[8] For example, Ritter and Chopra (1989), examining returns of stocks in each firm-size quintile portfolio, report that there is a positive risk-return relation in January for small firms, but not for large firms. However, since they do not include a variable proxying potential tax-loss selling (PTS) pressure, their finding could be attributed to the January price rebound of the stocks experiencing year-end tax-loss selling pressure, rather than investors' increased demand for risky stocks in January. This is because the tax-loss selling hypothesis argues that small firms are more volatile and hence more likely to incur capital losses (Roll (1983)). The specification error of omitting a relevant explanatory variable from the regression will bias the estimated coefficient of beta, unless beta is uncorrelated with PTS.

Moreover, our simultaneous test examines the evidence form both stock returns and trading volumes, while only few studies in the literature have examined trading volumes in testing the four major hypotheses. These hypotheses not only predict the return patterns in December and January, but also have implications on trading volume variations in those periods. Therefore, it will be of great benefit if the evidence from analysis of returns can be corroborated using trading volumes.

On the other hand, since some of these hypotheses have similar implications for the patterns of stock returns and trading volumes, part of the results from the simultaneous test may be confounding and can be explained by more than one hypothesis. This is especially true for the tax-loss selling and the window dressing hypotheses. The proxies used to test these two hypotheses are highly correlated. Specifically, those stocks experiencing large cumulated capital-losses during the year, which are the focus of tax-loss selling, are likely to be the loser stocks[9] which have large negative holding-period-returns over the same time period. These stocks are the focus of window dressing.

However, a simultaneous test makes distinguishing between these two hypotheses possible. Noteworthily, a fundamental difference between these two hypotheses lies in the contrasted roles played by different investors, i.e., window dressing by institutional investors versus tax-loss selling by individual investors. After assuming that loser stocks with higher (lower) institutional ownership would be more likely sold by institutional (individual) investors in the year-end window dressing (tax-loss selling) activities, if the window dressing hypothesis is valid, then we expect that losers with higher institutional ownership would have lower December returns than those with lower institutional ownership. In contrast, according to the tax-loss selling hypothesis, this return pattern should be opposite.

After regressing December returns on the potentially most important factors, suppose we find that the observed signs for the commonly predicted coefficients, such as the coefficient for short-term-winners, are exactly the same as predicted by these two hypotheses,[10] except that the result indicates a significantly negative relation between December returns and institutional ownership for losers. Then we can conclude that the empirical evidence suggests that window dressing plays a more important role in explaining the January effect than tax-loss selling. Therefore, a simultaneous test with an institutional ownership variable incorporated in the analysis provides an opportunity to distinguish the tax-loss selling hypothesis from the window dressing hypothesis. In this dissertation, our simultaneous test measures the relative strength of the four major hypotheses in explaining the January effect; it does not presume that the hypotheses are mutually exclusive.

In fact, all of the four major hypotheses are related to trading behavior of a subset of stock investors: either institutional or individual investors, but not both.[11] Hence, the evidence from institutional ownership plays a key role in simultaneously testing all these hypotheses. It allows us to investigate the validity of these hypotheses from a new and

---

[9] Here, the losers are short-term losers, rather than long-term losers. This is because the window dressing hypothesis makes predictions about long-term losers while the tax-loss selling hypothesis does not.

[10] As shown later in Table 1 on p. 48, the tax-loss selling and window dressing hypotheses both predict that short-term winners should have higher December returns than other stocks, ceteris paribus.

[11] Specifically, the tax-loss selling, overreaction, and liquidity hypotheses are related to individual investors and the window dressing hypothesis resorts to institutional investors.

important aspect. Unlike prior studies, this dissertation acknowledges the importance of institutional ownership data and tests the four major hypotheses by using this powerful tool.

The third problem in prior studies is related to the choice of proxy variable used in previous studies. Among the four major hypotheses of the January effect, the tax-loss selling hypothesis is probably the one that receives the most attention. However, as both Reinganum (1983) and Chan (1986) point out, an ideal measure of tax-loss selling pressure should take into account trading volumes and institutional holdings. More importantly, in measuring potential tax-loss selling (PTS) pressure, what really matter are capital losses, essentially the difference between the sales price and the purchase price, rather than the average stock return or the relative price ratio used in previous studies testing the tax-loss selling hypothesis.

Therefore, the observed positive relation between tax-loss selling pressure and the January effect could be due to using fallacious PTS measures. This is very likely since the empirical evidence from other studies using different approaches to test the tax-loss selling hypothesis tends to reject this hypothesis. We derive a new PTS proxy in this study. Our PTS proxy avoids the above potentially serious defects and hence is probably more powerful than any other PTS proxies used in the literature. A detailed discussion of serious potential pitfalls of the different PTS measures used in prior studies is presented in Appendix 1 and the derivation of our PTS proxy is displayed in Appendix 2.

In addition to the inconclusive evidence on explaining the cause of the January effect, more fundamental mysteries remain. One of the puzzles is why the January effect continues to exist, since it has been widely studied in the past two decades and thus well known among investors. Investors recognizing the January seasonality should take advantage of this knowledge in their trading to earn arbitrage profits, which would then eliminate high January returns and the January effect. Recently, Haugen and Jorion (1996) study stock returns of the NYSE firms from 1926 through 1993. However, they find that "the January effect is still going strong 17 years after its discovery. The magnitude of the effect has not changed significantly, and no significant trend portends its eventual disappearance."

In contrast, Maberly and Maris (1991) argue that "the introduction of derivative securities (index futures in 1982 and index options in 1983) allows for more complete arbitrage of the size-related January effect by increasing liquidity, reducing transaction costs, and facilitating large dollar transactions." Their empirical results support their argument and show a significant reduction in arbitrage opportunities created by the January effect since the introduction of index futures and index options.

But, on the other hand, Bhardwaj and Brooks (1992) report that the January effect is primarily a low-share price effect and less so a market value (firm size) effect. They argue that the January anomaly is not likely to be exploitable by typical investors, because they find that after-transaction-cost raw and excess returns are lower on low-price stocks than on high-price stocks. Lastly, Bhardwaj and Brooks conclude that "failure of informed traders to eliminate significantly large before-transaction-cost excess January returns on low-price stocks is potentially explained by higher transaction costs and a bid-ask bias."

The exploitability of the January effect is a critical issue for the efficient market hypothesis, which is the foundation of many modern finance theories including the CAPM.

If the January effect is exploitable, then its continuous existence is obviously evidence against the efficient market hypothesis. Consequently, many widely-accepted theories need to be reestablished. Therefore, given the above inconclusive findings, it is important to investigate whether stock-market participants, such as management, insiders, and institutional holders, who have either private information about their stocks or some advantage in stock trading, actually can exploit the January effect in their stock trading. If these most likely candidates for exploiting the January effect are found to have no identifiable arbitrage activities, then the arbitrage opportunities may not be exploitable for the reasons given by Bhardwaj and Brooks.

Another puzzle about the January effect is related to the role played by firm size and stock price. Both the overreaction and the liquidity hypotheses propound or imply that individual investors prefer small-firm stocks to large-firm stocks so that the January effect is more pronounced for small-firm stocks. However, as mentioned above, Bhardwaj and Brooks (1992) show that the January effect is primarily a low-price effect and their finding seems inconsistent with the explanation of these hypotheses. But it is also possible that individual investors may actually prefer low-price stocks rather than small-firm stocks. To investigate this possibility, we conduct a cross-sectional analysis by regressing institutional ownership on stock price and firms size.

1.3 Major Findings Of This Dissertation

The evidence in this study from the cross-sectional regressions on stock returns and trading volumes strongly supports the overreaction and the liquidity hypotheses. The liquidity hypothesis is both a statistically and an economically significant explanation for the January effect. Since investor overreaction occurs only on extreme winners and losers, we find that the overreaction hypothesis is statistically significant but economically insignificant. In contrast, our evidence only weakly supports the tax-loss selling hypothesis and tends to reject the traditional window dressing hypothesis, which are both found to be economically insignificant. However, support for the risk-preference switching version of the window dressing hypothesis is found to be both statistically and economically significant in explaining the January effect.

Further, we find that both stock price and firm size are powerful in explaining cross-sectional variation of institutional ownership. However, after examining institutional ownership of the stocks in the small-firm and the low-price quintile portfolios, the result shows that firm size has greater explanatory power than stock price for institutional ownership of these stocks. Therefore, the evidence does not support the explanation that individual investors actually prefer low-price stocks. Further study is needed to reconcile the seemingly contradictory explanations between the two hypotheses and Bhardwaj and Brooks (1992).

Finally, the results from studying the stock trading behavior of management, insiders, and institutional owners do not provide supporting evidence that the January effect is exploitable by actively buying or selling around the year-end. However, our evidence weakly supports the view that insiders may acknowledge the January seasonality of stock returns and passively exploit the January effect by adjusting their planned stock purchases or sales in December or January when the prices are more favorable. In general, our finding supports the view of Bhardwaj and Brooks (1992) that the January effect is not exploitable due to high transaction costs and the bid-ask spread in stock trading. That is, the evidence is consistent with the efficient market hypothesis.

1.4 Organization Of This Dissertation

The rest of this dissertation is divided into four chapters. Chapter II introduces the four major hypotheses of the January effect and reviews the relevant major findings on testing these four hypotheses. It is further divided into four sections. Section 2.1 is for the tax-loss selling hypothesis. Section 2.2 is for the window dressing hypothesis. Section 2.3 is for the overreaction hypothesis. Section 2.4 is for the liquidity hypothesis.

Chapter III explains the data and methodology and is subdivided into five major sections. Section 3.1 lists and briefly explains the data and their sources. Section 3.2 discusses the simultaneous test using return data. Section 3.3 discusses the simultaneous test using trading volume data. Section 3.4 shows the methodology used to examine the relationship of stock ownership with stock price and firm size. Section 3.5 presents the analytical approach to explore the reactions of management, insiders, and institutional holders toward the January effect.

Chapter IV presents and discusses the empirical results and is subdivided into five major sections. Section 4.1 reports the evidence from stock returns. It discusses the result of the simultaneous test on the four major hypotheses of the January effect. In contrast, section 4.2 discusses the evidence from trading volumes for the simultaneous test. Section 4.3 consolidates the findings from returns and trading volumes. Section 4.4 presents the relationship of stock ownership with stock price and firm size. Section 4.5 shows the reactions of management, insiders, and institutional holders toward the January effect.

Chapter V concludes this dissertation and is divided into three sections. Section 5.1 summarizes the empirical results of the simultaneous tests on stock returns and trading volumes. Section 5.2 summarizes the finding on the relationship of stock ownership with price and firm size. Section 5.3 summarizes the evidence from trading behavior of management, insiders, and institutional holders.

CHAPTER II

LITERATURE REVIEW

As mentioned in Chapter 1, the January effect refers to the anomaly of extraordinarily high average stock returns occurring in January, with most of the excess returns concentrating in the turn-of-the-year period, a five-day period starting from the last trading day of December to the first four trading days of January.[12] Therefore, it is also referred to as the turn-of-the-year (TOTY) effect by some researchers. There are many hypotheses proposed as possible explanations of the January effect. In this dissertation, the four major hypotheses are examined, i.e., the tax-loss selling/parking-the proceeds, window dressing, overreaction, and liquidity hypotheses. To distinguish the tested hypotheses from the empirical evidence, we indent and italicize the paragraphs or sentences stating the four hypotheses.

2.1 The Tax-Loss Selling/Parking-The-Proceeds Hypothesis

Among a variety of candidates in the literature, one of the most promising explanations of the January effect is tax-loss selling. The tax-loss selling hypothesis states that,

[12] As mentioned in footnote 1, an alternative definition of the January effect is that small stocks earn significantly positive abnormal monthly returns in and only in January.

individual investors wanting to realize capital losses in the current tax year create downward price pressure, at year end, on securities that have previously experienced negative returns. Subsequently, at the beginning of the new tax year, this selling pressure is relieved and the affected securities earn excess returns as their prices rebound.

Furthermore, because small firms' stock returns are more volatile than large firms' returns, small-firm stocks are more likely to generate usable tax losses and therefore high turn-of-the-year returns.[13] *An alternative explanation of the small firm effect is that smaller firms tend to have higher individual-investor ownership and hence higher tax-loss selling pressure at year end and stronger price rebound at turn-of-the-year.*[14,15]

---

[13] Roll (1983, p. 22) offers this possible explanation for the small-firm January effect without providing supporting evidence.

[14] In general, institutional investors have little motivation for tax-loss selling since capital losses cannot be deducted from their ordinary income. They can only be used to offset capital gains. Net capital losses of a corporation can be carried back to the three preceding years to offset net capital gains claimed in those years. If some net capital loss remains, then it is carried forward to the next five years. More importantly, there is no distinction between short-term and long-term gains (losses) for corporations, since capital gains are taxed as ordinary income. Consequently, given transaction costs for stock trading, institutional investors would have little tax-motivation to sell losers at *year-end*. In contrast, for individual investors, there may be a distinction between short-term and long-term tax rates on capital gains and net capital losses can be deducted from their regular income under the $3,000 limit per tax year. Individuals' net capital losses can be carried forward indefinitely. Please refer to Appendix 3 on p. 209 for detailed explanation about individuals' tax rates on capital gains. Further, many institutional investors, such as pension funds, have no motivation for tax-related trading due to their very low or zero tax rates. However, mutual fund managers may have the incentive to do so for their clients of individual investors. But because mutual fund assets account for only a small portion of equity markets and institutional holdings in mutual funds are also significant (please refer to Appendix 2 for details), we assume that the positive relation between tax-loss selling and *individual* ownership is not fully offset by the less significant positive relation between tax-loss selling and *institutional* ownership of mutual funds.

[15] Blume and Friend (1986) report that stocks with a market value of less than $50 million in 1985 comprised only 0.8 percent of the equity portfolios of institutions, while comprising 2.7 percent of the market value of all stocks. Based on their finding, Ritter (1988, p. 706) claims that "whenever individuals buy stock, their buying is intensive in low-priced and low-capitalization stocks." Recently, Eakins and Sewell (1993), document that there is a significantly positive relationship between institutional ownership and firm size. After controlling for firm size, they further find that January abnormal returns inversely vary with institutional ownership.

These arguments imply that losers should be more actively traded, i.e., have higher turnover rate, at year end.

Constantinides (1984) shows that transaction costs do not significantly decrease the benefit from tax-loss selling and rational tax-loss sellers should repurchase different stocks sold by other tax-loss sellers at about the same time. Therefore, Ritter (1988) argues that tax-loss selling alone can not explain the January effect. He maintains that if individual investors sell losers at year end and simultaneously reinvest the proceeds from the sale in other loser stocks sold by other individual investors, then there will be little net selling pressure on loser stocks at year end and hence no subsequent January price rebound. That is, individual investors could just swap loser stocks among themselves to realize capital losses but avoiding further price depression of loser stocks at year end. Ritter (1988) also claims that,

> *In order to explain the January effect, in addition to year-end tax-loss selling, individual investors must also park the proceeds away from the stock markets to induce year-end depressed prices. And then at turn-of-the-year, the price rebound of loser stocks plus strong demand of small stocks due to reinvesting the proceeds results in abnormally high January return, since individual investors hold proportionately more small stocks than do institutions and whenever individuals buy stock, their buying is intensive in low-priced and low-capitalization stocks.*[16]

[16] Please refer to footnote 15 for the supporting evidence.

Moreover, Constantinides (1984) also points out that, in addition to selling short-term losers, investors should defer realizing capital gains until they become long-term, given the favorable long-term tax rate. This implication of optimal tax trading gives us an additional aspect to test the tax-loss selling hypothesis: Deferring capital gains should result in lower and higher turnover rates in December and January, respectively, for winners.

Though the relationship between tax-loss selling pressure and January return is well documented in the literature, the evidence concerning its cause is mixed and inconclusive. Some studies, such as Branch (1977), Givoly and Ovadia (1983), Dyl (1977), Slemrod (1982) and Roll (1983) support tax-loss selling pressure as a possible explanation for the January effect. However, Reinganum (1983), and Brauer and Chang (1990) note that the tax-loss selling hypothesis cannot explain the entire January effect.

Specifically, Reinganum finds that small firms with little or no previous capital-loss, and therefore the least likely to be sold for tax reasons, also exhibit large average January returns, although not unusually large returns during the first few days of January. Chan (1986) further argues that the prior finding of a relationship between January return and a previous loss does not necessarily confirm the existence of price pressure resulting from tax-loss selling. In addition, if tax-loss selling is the underlying factor for the January effect, there will be little relation between long-term losses and the January return, since there is no tax benefit gained by realizing the long-term loss before the TOTY, at the depressed year-end price. Nevertheless, he discovers that the January effect exists for both long- and short-term losses.

A problem with the previous studies directly examining the tax-loss selling effect on January returns is that they all use a rough proxy for potential tax-loss selling (PTS). The form of the rough proxies employed varies from prior-year return to some relative price ratio. More important, these proxies suffer from some potential serious defects and hence may weaken the validity of their conclusions.[17] We correctly recognize the nature of a capital loss and derive a PTS proxy (shown in Appendix 2) for this study:

$$\sum_{t} \text{MAX}\,[P_t - P_{end}, 0]^* V_t^* G(YV_{end}) \qquad \text{(A1)}$$

where V_t and P_t are the trading volume and the stock price on day t, respectively; day t is each trading day during January-November of the year; P_{end} and YV_{end} are the stock price and the yearly trading volume on the last trading day of November in the year, respectively. $G(YV_{end})$ is a function of YV_{end}.[18] $\sum_{t} \text{MAX}\,[P_t - P_{end}, 0]^* V_t$ is the cumulative capital losses weighted by daily trading volumes over the IRS-defined short-term period, which is one year in our sample period.[19] $G(YV_{end})$ is used as an adjustment factor to reflect the sensitivity of selling pressure toward the weighted cumulative capital losses.

---

[17] As mentioned on p. 7, in measuring potential tax-loss selling pressure, capital losses, essentially the difference between the sales price and the purchase price, rather than the average stock return or the relative price ratio, are more relevant. Please refer to Appendix 1 on p. 195 for the PTS proxies used in the prior studies and a discussion of the potential defects.

[18] Though the exact functional form for $G(YV_{end})$ is unknown, we use $\frac{1}{YV_{end}}$ for $G(YV_{end})$ in the empirical tests of this dissertation. As mentioned later on p. 43 and footnote 146 on p. 206, the reason for using $\frac{1}{YV_{end}}$ is because there should be a negative relation between yearly trading volume and selling pressure, i.e., PTS should inversely vary with $G(YV_{end})$, and $\frac{1}{YV_{end}}$ is the simplest form to express this relationship (please also refer to p. 203 in Appendix 2 for the explanation about $G(YV_{end})$).

[19] Please refer to Appendix 3 on p. 209 for definition of a short-term period in tax codes during different time periods.

As shown in Appendix 2, this proxy is still imperfect, because it omits some relevant variables. However, it avoids the potential serious defects of the previous studies, and hence offers a more powerful tool to explore the relationship between tax-loss selling and January returns. The major results of other studies testing the tax-loss selling hypothesis are described in the following.

As mentioned earlier, Ritter (1988) proposes the parking-the-proceeds hypothesis, together with the tax-loss selling hypothesis, as the explanation of the January effect. In addition to the explanation indicated by Ritter that, throughout the year, it is common for individuals who have sold stock to wait for several days or weeks before investing the proceeds, Miller (1990) offers a possible reason that lengthens the normal lag from sale to reinvestment. He points out that the year-end follows the Christmas holidays and argues that the holidays are traditionally a busy time during which gifts are bought, parties attended, relatives visited, etc. The opportunity cost of time is unusually high and thus investment decision making is postponed. If collecting information for new stocks is more time-consuming than for selling stocks, buying decisions are more likely to be postponed than selling decisions. It creates a net imbalance during a period when time's opportunity cost is high. After the holidays, things return to normal and in early January the decisions on what to purchase are made and orders placed, which explains the January price surge. Miller argues that there will be a turn-of-the-year effect in countries celebrating Christmas.

Ritter (1988) finds that the ratio of stock purchases to sales by individual investors displays a seasonal pattern, with individuals having a below-normal buy/sell ratio in late December and an above-normal ratio in early January. This evidence is consistent with the park-the-proceeds hypothesis. Further, Eakins and Sewell (1993) find that the small firms that usually exhibit high January returns have low institutional ownership. And after controlling for firm size, it is still found that institutional ownership is significantly related to January excess returns. Their finding is consistent with the explanation that the January effect concentrates in small firms because these firms are held by tax-motivated individual investors.

Another study by Dyl and Maberly (1992) uses odd-lot transactions as the proxy for trading behavior of individual investors, and reports that a significant decrease in the ratio of odd-lot sales to odd-lot purchases occurs at the turn of the year. Therefore, the evidence supports the trading behavior of individual investors as one of the explanations for the January effect. However, they also find that the trading patterns are not due entirely to tax considerations.[20]

---

[20] Dyl and Maberly (1992), in a belief that tax-loss selling should be greater around turns of the years following bear markets, examine the odd-lot sale and purchase transactions around the ends of bull- and bear-market years. The result indicates that the ratio of odd-lot sales to odd-lot purchases for the 10-day period around the turn of the year significantly drops by 57% after bear-market years and by 37% after bull-market years. However, they find that odd-lot sales do not significantly change around the turn of the year following a bull market, though the increase in odd-lot purchases are significant. This suggests that the funds invested by individual investors in January following a bull-market year are not from the proceeds from the year-end tax-loss selling, since the amount of selling is the same before and after the turn of the year. In contrast, odd-lot sales significantly drop around the turn of the year following a bear market, which is consistent with tax-loss selling. But the increase in odd-lot purchases around the turn of the year following a bear market is not statistically significant. Dyl and Maberly conclude that the proceeds from sales to realize tax losses are reinvested rather promptly, since they find that both sales and purchases are higher than normal at the end of the year following bear markets.

Miller (1990) also cites the report of Gultekin and Gultekin (1983) that Israel's stock market lacks a January effect as the evidence supporting his hypothesis about the high opportunity cost of time during the Christmas holidays. However, French and Trapani (1994), after examining fund balances in assets in which investors typically would park their proceeds, report that high January small-firm returns (proxied by the CRSP equally-weighted return) do not tend to follow increases in parked proceeds.

As mentioned previously, the results of prior studies directly examining the relation between tax-loss selling pressure and the TOTY (January) return are mixed and inconclusive. Many studies such as Branch (1977), Givoly and Ovadia (1983), Roll (1983) and Rozeff (1986) report that the stocks that dropped most in the previous year rebounded most in early January. Dyl (1977) further finds that there is significant abnormal trading volume in December for stocks that have experienced a substantial price change during the preceding year. He suggests that abnormally low volume for stocks that have appreciated during the year presumably reflects the year-end capital gains tax lock-in effect, and that abnormally high volume for stocks that have declined in price during the year presumably reflects year-end tax-loss selling. Slemrod (1982) also presents evidence supporting the tax-loss selling hypothesis, revealing that sales of stocks resulting in capital losses are significantly higher in December than in other months, and that gain-taking is lower in December than would otherwise be expected. This is the direct evidence for active year-end tax-loss selling behavior. However, the selling activity does not necessarily depress December stock prices seriously.[21]

In contrast, there are a number of studies testing robustness of the tax-loss selling hypothesis by different approaches: Some address tax code changes, some addressing international differences. If tax-loss selling is the sole explanation for the January effect, then the abnormal January returns should disappear when tax rate is zero. The findings of these studies are described in the remainder of this section (2.1).

Schultz (1985) examines the turn-of-the-year returns of a small firm portfolio before and after the introduction of personal income taxes in 1917. The portfolio contains all stocks listed in the *Wall Street Journal*, from all exchanges, with a bid price of five dollars per share or less. The result indicates that the turn-of-the-year effect was not significant until after 1917. However, Pettengill (1986), Jones, Pearce and Wilson (1987) and Jones and Wilson (1989), using monthly Cowles Industrial Index with a longer sample period, report that the January effect exists in both the pre-tax period and the post-tax period.

Later, Jones, Lee and Apenbrink (1991) employ daily return data based on an equally-weighted version of the same Cowles index and calculate excess return by netting the return on the Dow Jones Industrial Average. The evidence suggests that excess returns at the turn-of-the-year and for January were not significant until after 1917. Besides, they show that the conflicting results of the prior studies can be due to using

[21] For example, as mentioned earlier, Constantinides (1984) points out that rational tax-loss sellers should repurchase different stocks sold by other tax-loss sellers at about the same time. Consequently, there will be little net selling pressure on losers stocks, though they may have higher turnover rates in December.

monthly, gross returns and the value-weighted Cowles index, instead of daily (the turn-of-the-year), excess returns and the equally-weighted Cowles index.

In an attempt to reconcile the inconsistent findings among the previous studies, Brailsford and Easton (1993) extend Schultz's sample period by examining daily equity returns on the Dow Jones Railroad Index over a 28-year pre-tax period compared to his 18-year pre-tax period. Since the turn-of-the-year effect is negatively associated with firm size and the Railroad Index comprised relatively larger firms than the Dow Jones Industry Average over the pre-tax period, their analysis is biased against finding a turn-of-the-year effect. Nevertheless, Brailsford and Easton find a significant turn-of-the-year effect over the extended period and suggest that tax-loss selling does not offer a complete explanation of the effect. Noteworthily, evidence from Pettengill (1986), Jones, Pearce and Wilson (1987) and Brailsford and Easton (1993) *does* suggest an increase in the magnitude of the January or the turn-of-the-year effect after 1917. Therefore, tax-loss selling could still account for one of the factors resulting in the January/turn-of-the-year effect.

Further, Miller (1990) examines stock returns at the 1986/1987 turn-of-the-year, when the tax laws provided a strong incentive to retain losers and sell winners, behavior opposite that usually encouraged. However, there was no reversal of the usual pattern of stocks that hit new lows at year-end having abnormally high returns in January of the next year. Other studies, such as Gultekin and Gultekin (1983), Brown et al. (1983), Berges et al. (1984), Tinic et al. (1987), and Kato and Schallheim (1985), examine foreign stock markets where either the tax year does not begin in January or there is no capital gain tax, i.e., zero tax rate on capital gains/losses. They report that a significant January effect exists in those foreign markets.

But the evidence from foreign stock markets is not totally against the tax-loss selling hypothesis. In addition to the January effect, a 'July effect' has been reported in Australia following a June tax-year end (Brown et al, 1983) and an 'April effect' in the U.K. where a tax-year ends on April 5 (Reinganum and Shapiro, 1987). Moreover, the observed January anomalies could be explained by integration between these markets and others where the January effect exists, such as the U.S. That is, the observed January effect in these markets could be due to, say, U.S. investors.

Lee and Chang (1988), Lee (1992) and Tong (1992) investigate the Korean stock market in which neither capital gains are taxed for individuals, nor trading by foreigners is allowed, but their results are contradictory. Lee and Tong both show that the January effect is absent, while Lee and Chang report its existence. Nevertheless, as pointed out by Miller (1990) and Tong (1992), the same phenomenon is not necessarily driven by the same factor. Since there are so many institutional differences across markets, the same January effect observed in many countries can be due to totally different institutions.

However, the evidence from the stock markets in Japan and Canada tends to weaken the explanation that the observed January anomalies in the countries where there is no tax on capital gains could result from integration between these markets and others where the January effect exists. Specifically, as pointed out by Haugen and Lakonishok (1988), the correlation between the Japanese and the U.S. stock returns is very low and stocks in Japan are unlikely to be affected by the U.S. income tax.[22] However, the January effect in Japan is even more pronounced than in the U.S., though there is no capital gain tax in Japan.

Similarly, prior to 1972, capital gains were not taxed in Canada, but both Berges et al. (1984) and Tinic et al. (1987) report that the January effect exists in the period before and after 1972. Further, Tinic et al. (1987), examining the aggregate monthly purchases and sales of Canadian stocks by U.S. investors on Canadian exchanges, find no evidence supporting the view that the January effect in Canada results from abnormal trading activities of U.S. investors around year-end. Therefore, the overall evidence in the literature tends to suggest that tax-loss selling could not be the sole explanation of the January effect.

2.2 The Window Dressing Hypothesis

Since 1979, investment managers have been required to report information about their fund holdings as of the end of each calendar quarter, including fair market value of holdings and number of shares held, to the Securities Exchange Commission (SEC).[23] The purpose of this requirement is to "provide information that will be useful for policy decisions because of the large influence of institutional investors on the securities markets" (*Wall Street Journal*, January 5, 1979, p. 4). This disclosure also enables

---

[22] Haugen and Lakonishok (1988) show that, in six previous studies in the literature, the correlation coefficient between the Japanese and the U.S. stock returns is quite low and ranges from 0.11 to 0.32. The average correlation coefficient for these studies is 0.18.

[23] According to the 1975 amendment of the Securities Exchange Act of 1934, in August 1978 the SEC issued release 14582 (Rule 13-F) requiring all investment managers with discretion over more than $100 million in equity assets to file Form 13-F annually to provide information about the securities held. Effective on February 5, 1979, the reporting frequency was increased to quarterly. That is, since then, investment managers have been required to report their holdings as of March 31, June 30, September 30,

investors to examine the specific security choices of an institutional manager on a periodic basis, a capability that may encourage managers to undertake trading activities just prior to the end of the reporting period strictly for the purpose of making his or her performance appear better. Furthermore, Bildersee and Kahn (1987) suggest that one motivation for window dressing lies in the use of a fund's holdings as a sales document. Fund managers might believe that a "better-looking" portfolio will increase investment in the fund and, consequently increase their compensation if it is a function of total fund assets.

On the other hand, although investment managers are typically evaluated once a quarter, the main evaluation takes place at the year-end. Lakonishok, Shleifer, Thaler, and Vishny (1991) argue that "...the main focus of fund evaluations is *past* performance relative to some benchmark, such as the S&P 500. Stock returns, however, are noisy and may not suffice to identify the manager investment philosophy or to see whether he just got unlucky on a few stocks. As a result, sponsors may look at the actual portfolio holdings as well."[24] The financial press suggests that the presence of the reporting requirements and periodic evaluations of managerial performance by the constituents of the fund and other market analysts induce managers to window dress their portfolios.

---

and December 31 to the SEC. However, equity holdings below 10,000 shares and less than $200,000 in principal amount and market value are exempted.

[24] Consistent with this argument, *Duns Business Month* reports that board members of mutual and pension funds typically do not have time to review the purchase and sale records of institutional managers which are reported to them, although they are generally not available to the public. Rather, board members concentrate on end-of-quarter holdings and are concerned if the manager continues to hold securities showing a loss for the quarter (*Dun Business Month*, July 1983, p. 19).

Jannson (1983) identifies five types of window dressing strategies allegedly used by investment managers (shown in Appendix 4). Among them, "dumping the losers" and "buying the winners" are typically mentioned in the financial press. Most studies testing the window dressing hypothesis only examine these two trading behaviors of institutional managers. Hence, this dissertation focuses on these two window dressing activities. Specifically, as argued by Miller (1990),

> *institutions trying to eliminate embarrassing losers from their year-end list of holdings could produce heavy selling of stocks that have experienced losses. Following this year-end window dressing activity, institutional investors then, in the aggregate, become net buyers of these securities at turn-of-the-year.*[25]

This explanation is referred to as the window dressing hypothesis. The window dressing activity of dumping losers at year-end would resemble tax-loss selling behavior, which makes independently testing the window dressing and the tax-loss selling hypotheses extremely difficult. The window dressing hypothesis implies that winners and losers are more actively traded before year-end for window dressing. And since institutional investors buy back those losers at the following turn-of-the-year, losers will be also more actively traded in January than in other months.[26]

Haugen (p. 500, 1986) and Haugen and Lakonishok (pp. 66-101, 1988) offer a variant of the window dressing hypothesis and suggest that,

---

[25] In order to explain the high January returns on the stocks suffering losses in the prior period, the window dressing hypothesis proposes that institutional investors, in the aggregate, buy back these loser stocks in the following January.

[26] The window dressing hypothesis does not explicitly state the timing for reselling the winners purchased in year-end window dressing activity. It may occur in the following January or later.

institutional managers may lock profits earned throughout the year by switching from high-risk stocks to low-risk stocks at year-end, and then become net buyers of high-risk stocks at the turn of the year.[27,28]

In this study, we test both versions of the window dressing hypothesis. To distinguish between these two versions of the window dressing hypothesis, we refer to "dumping the losers" and "buying the winners" as the traditional window dressing hypothesis. Haugen and Lakonishok's explanation is referred to either as the risk-preference switching version of the window dressing hypothesis or as the risk-preference switching hypothesis. Ritter and Chopra (1989) further combine the risk-preference switching hypothesis with the tax-loss selling/parking-the-proceeds hypothesis as the explanations of the turn-of-the-year effect. They refer to this as the portfolio-rebalancing hypothesis which states that the high returns on high-risk stocks in January are caused by systematic shifts in the portfolio holdings of investors at the turn-of-the-year. That is, institutional investors, following year-end window dressing, become net buyers of high-risk stocks at the turn-of-the-year, plus individual investors reinvest the proceeds from December tax-motivated sales in January.

---

[27] Haugen and Lakonishok do not point out the exact timing for the year-end risk-preference switching, but most likely it occurs in early December. If it takes place earlier in the year, then October and November are highly possible. And if this scenario is true, then we should find lower October and November returns for high-risk stocks than low-risk stocks. This return pattern should not exist in December. Risk switching is less likely to take place too early in the year. This is because an early switching would lower the overall yearly performance of institutional managers. It is also less likely to obtain good performance in a shorter time period such that institutional managers are motivated to lock-in their performance well before the year-end. Further, institutional managers are required to file their equity holdings to the SEC at the end of each calendar quarter. Therefore, institutional managers might want to lower the possibility of their lock-in behavior being noticed and thus switch from high-risk to low-risk stocks after September 30.

[28] Given the hypothesis that institutional managers want to lock in their performance by switching to low-risk stocks before year-end, one might ask whether institutional managers who are having bad quarters will try to gamble their way back into the plus column. If the answer is positive, then it may have some effects

The results of testing these hypotheses are mixed. Few studies directly test the presence of window dressing and its impact on stock returns. Visscher (1986) investigates the relation between returns in the first two months of each quarter and those in the last month. If window dressing of buying prior winners and dumping prior losers exists, then we expect a positive relationship between the returns during the first two and the last one months in each quarter. However, her results offer no support for the window dressing hypothesis.

Ketcham (1988) further examines excess returns on the stocks reaching their yearly or quarterly highs or lows prior to the end of the quarter, which are the most likely candidates for window dressing. If window dressing exists, then the losers (winners) should earn negative (positive) excess returns during the end-of-quarter period[29] when they are sold (purchased) by institutional managers, and the returns should reverse in the following beginning-of-quarter period when the stock prices move back to their fundamental levels or when the managers rebalance their portfolios. Ketcham finds that the evidence does not support the hypothesis.

In contrast, Bildersee and Kahn (1987) examine volume data of block trades and report a pattern of abnormally high trading during days -15 to -6 relative to year-end followed by abnormally low trading during the last five trading days in each calendar quarter (days -5 to -1). Particularly, they also find that *winners* and *losers* have significantly lower block trading near the end of each quarter (days -5 to -1). Because

---

on year-end stock trading and could change the expected results. To explore the possible effect, we conduct an analysis displayed in Appendix 5 on p. 213.

[29] The end-of-quarter period is from the thirteen-to-last trading day (t-13) to the last trading day (t) for each quarter; the beginning-of-quarter period is from t to t+30.

during their sample period, it generally took up to five business days to deliver payment or shares to a stock trader upon placing buy or sell orders, Bildersee and Kahn conclude that their finding is consistent with the window dressing hypothesis.[30]

On the other hand, Athanassakos (1992), investigating buying and selling behavior of individual and institutional investors in the Canadian stock market over the 1978-1989 period, gives indirect evidence for window dressing and argues that institutional investor trading activity causes stock prices to be bid up in January. The study also suggests that the pattern of institutional trading in January and throughout the year is related to the nature of the compensation system in the industry. Similarly, Porter, Powell, and Weaver (1996) examine institutional ownership on the NYSE stocks during 1980-1986 and report a significant increase in institutional ownership of small firms in the first calendar quarter.

In testing the risk-preference switching version of the hypothesis, Ritter and Chopra (1989), employing the CRSP value-weighted index over the 1935-1986 period, find that the market's risk-return relation does not have a January seasonal. In particular, even in those Januarys for which the market return is negative, small-firm returns are positive, and they are more positive the higher is beta. Ritter and Chopra's finding is consistent with the risk-preference switching and the portfolio rebalancing explanations of the January effect. However, Eakins and Sewell (1994), examining all stocks listed on

[30] Bildersee and Kahn (1987, p. 244) point out that, "the specialists indicated that most registered investment firms choose to account for their end-of-period holdings based on the settlement date of their trades. Consequently, a fund selling or buying a security in the last five days of the quarter might not report the effects of that trade in its end-of-period reports since a trade, unless it is a cash trade, clears in five business (trading) days." Effective on June 1, 1995, the SEC now requires the delivery period to reduce to three business days.

the NYSE, AMEX, or NASDAQ during 1985-1988, find that neither regression analysis nor means tests across quarters provide any evidence that a systematic shift to lower risk, larger firms occurs at year-end.

2.3 The Overreaction Hypothesis

De Bondt and Thaler (1985) report that losers and winners over the previous five years (formation period) show substantial return reversals over the subsequent five years (testing period). They investigate "a simple stock market investment strategy motivated by work in cognitive psychology on intuitive prediction. The strategy is based on the notion that many investors are poor Bayesian decision makers. Experimental and survey evidence indicates that in probability revision problems people show a tendency to overreact." Hence, they suggest that their finding is the result of investor overreaction. That is,

> *investors overweight recent information and underweight remote data. And because of investor overreaction to earnings, stock prices may also temporarily depart from their underlying fundamental values.*[31] *Under the scenario of "prices initially biased by either excessive optimism or pessimism, prior losers would be more attractive investments than prior winners."*

---

[31] This interpretation of investor overreaction stresses misperception of future cash flows for extreme winners and losers. However, the authors, in their footnote 13 on p. 575 (1987), point out that overreaction behavior could be manifest in other ways as well. For example, investors might be overly sensitive to perceived risks, producing normatively excessive risk premia. Alternatively, some investors' decisions might be influenced by temporary fads.

In a follow-up paper (1987) covering the NYSE stocks during 1926-1982, they further find that, first, there is a pronounced seasonality in the "price correction." That is, almost all of the excess returns in the testing period occurs in January, especially for the losers. And the price correction is much larger in the January of the first three years than that of the latter two years during the testing period.[32] Second, the correction is asymmetric. After the formation period, losers win about three times the amount that winners lose. The authors did not give explanation on the seasonality and asymmetry in the price correction. Finally, the excess returns in January are related to both short-term and long-term past performance.[33]

Their findings suggest that the overreaction is corrected during a relatively long time period. That is, the overreaction has not been completed in the early testing period, but will be fully corrected as the time passes.[34] De Bondt and Thaler did not explicitly point out the relationship between the price correction and the possible seasonality in trading volume. But since losers are more attractive investments as of January in the early testing period, demand for losers in January during the period should be stronger than in other months. If this is the case, then losers would be more actively traded in January. In contrast, winners would have lower stock turnover rates in January.

---

[32] De Bondt and Thaler (1987) report that the average excess January returns of the long-term losers (winners) in the first three and the latter two years are 6.1% and 3.3% (-1.3% and -0.1%), respectively.
[33] As pointed out by the authors, the short-term return reversal may reflect tax-loss selling pressure for losers, and is consistent with deferring capital gains until the beginning of the year due to tax purpose for winners. Alternatively, however, the reversal is also consistent with window dressing. Specifically, institutional investors may dump losers (buying winners) before year-end and thus temporarily depress (bid up) the stock returns. In the subsequent January, the stock price moves back to its equilibrium fundamental level and the return reversal is observed.
[34] As shown in Section 3.2.1 later, we examine only the first January return after the five-year formation period for testing the overreaction hypothesis in this dissertation.

The findings of De Bondt and Thaler (1985 & 1987) are confirmed by Chopra, Lakonishok, and Ritter (1992). The empirical evidence of Chopra et al. shows that an economically important overreaction effect exists even after adjusting for firm size and beta, and the effect is substantially stronger for smaller firms than for larger firms. Since individuals are the primary holders of the smaller-firm stocks, while institutions are the main owners of the larger-firm stocks, Chopra et al. argue that,

individual investors overreact, while institutional investors do not.

Moreover, their evidence suggests that the overreaction effect is distinct from the tax-loss selling effect and is not just a manifestation of the size effect.

On the other hand, Conard and Kaul (1993) and Ball, Kothari, and Shanken (1995) find that many prior losers have low stock prices and large bid-ask spreads. Further, Conard and Kaul (1993) report that most of the long-term overreaction documented in De Bondt and Thaler (1985) can be explained by bid-ask spreads when monthly cumulative average returns are used, rather than prior returns. However, Loughran and Ritter (1996) find little difference in the test-period returns regardless of whether cumulative average returns or buy-and-hold returns are used. In addition, price has little explanatory power in cross-sectional returns.

Loughran and Ritter argue that the difference in findings between theirs and Conard and Kaul's is primarily due to different statistical methodology used. They demonstrate that Conard and Kaul's conclusion is driven by survivor bias and long-term time-series mean reversion in the aggregate stock market, rather than cross-sectional patterns on individual stocks. Similarly, they show that the results of Ball, Kothari, and

Shanken (1995) suffer from the confounding of time-series and cross-sectional effects as well. Once the correction is made, the results of the two studies are consistent with each other.

2.4 The Liquidity Hypothesis

As pointed out by Ritter (1988), in addition to the proceeds from December tax-motivated sales, some individuals also receive year-end bonuses. This additional source of cash augments the ability of individuals, in the aggregate, to become net buyers of securities in January, which in turn creates upward price pressure in January for stocks. Further, Ritter argues that this price pressure will be greater for small stocks,[35] since individual investors hold proportionately more small-firm stocks than large-firm stocks.[36] Consistent with Ritter's argument, Ogden (1990) reports that the standardization of payments at the end of the month (e.g., wages, salaries, bonuses, interests, and dividends) induces a rise in stock prices at the turn of each calendar month. Ogden refers to these cash payments as liquid profits and assumes that most of expected monthly cash income for the representative individual investor is received at the turn of the month, while expected cash expenditures are distributed uniformly throughout the month.

Based on principles of working capital management, Ogden (1990, p. 1261) also assumes that

> *"the representative investor maintains a 'layering' of liquidity in his or her investment portfolio. That is, the investor allocates fixed proportions (i.e., within a narrowly defined range) of investable wealth to cash, highly liquid securities such as Treasury securities, and less liquid*

[35] The evidence from Mikkelson and Partch (1985) and Asquith and Mullins (1986) supports the view that buying and selling pressure affects stock prices, especially the stock prices of small firms.
[36] Please refer to footnote 15 on p. 14 for supporting evidence.

investments such as stocks. In order to reduce transaction costs, the investor will add to his or her portfolio of stocks only if accumulated cash is sufficient to warrant further investment in relatively illiquid stocks. Since the representative investor's liquid profit position generally will be greatest at the turn of each calendar month, demand for stocks will generally be greatest at the turn of the month."

Moreover, because monetary policy affects the growth of liquidity or monetary aggregates in the economy, monetary policy is likely to affect expected liquid profits, which in turn will affect turn-of-month stock returns. That is, an easy (stringent) monetary policy is expected to induce larger (smaller) liquid profits and thus larger (smaller) turn-of-month stock returns.[37]

Finally, Ogden finds that the liquidity hypothesis also may provide a partial explanation for the January effect. He suggests that liquid profits generally are greater in December than in other months because of the well known and substantial increase in business activity near the calendar year-end, especially at the retail level.[38] Consequently, there is a more noticeable increase in returns during January. In addition, he claims that the evidence that high January returns are concentrated in the first few trading days of the month is consistent with the liquidity hypothesis.

[37] Ogden (1990) notices that monetary policy is likely to affect real economic activity, and thus investors' liquid profits, with a lag (Laurent (1988)). However, in the footnote 7 on p. 1262, he argues that "if a given monetary policy is allowed to persist long enough, then a given measure indicating stringent (easy) monetary policy should, over time, be associated with low (high) turn-of-month stock returns according to the above arguments. Furthermore, when the Fed switches from stringent (easy) to easy (stringent) monetary policy, investors may immediately decide that they need to hold a relatively smaller (larger) proportion of liquid assets in their portfolios because of the expectation of greater (smaller) liquid profits and, in the immediately following turn-of-month period, may (may not) increase their demand for stocks despite the fact that liquid profits have not (have) increased. If this is the case, then monetary policy may be observed to affect stock returns with little or no lag. (A positive association between contemporaneous changes in the money supply and stock returns is well documented (Sorenson (1982)). Thus in this context it is reasonable to suppose that both monetary variables and stock returns would be 'leading indicators' of real GNP."

[38] In his footnote 9 (p.1262), Ogden points out that the Christmas season typically accounts for 35 to 55 percent of a retail store annual sales and profits.

Based on the point of Ritter (1988) that individual investors hold proportionately more small-firm stocks while institutional investors hold proportionately more stocks of large firms, Ogden also claims that

> *liquidity could explain the greater January effect on small firms. This is because individual investors realize proportionately more liquid profits at year-end and they tend to invest most of the liquid profits in small-firm stocks.*

Ogden suggests that two possible sources of large year-end liquid profits for individual investors are year-end profits realized by privately owned businesses, and year-end salary bonuses.

Ogden (1990) does not indicate the source of cash, for year-end salary bonuses, used by firms. If they sell securities to raise the cash, then we should observe some effect in that market. For example, if they sell stocks (bonds) in November or early December, then we may observe depressed stock (bond) returns during that period and a subsequent stock (bond) price rebound.[39]

However, since firms paying year-end bonuses are usually the ones receiving huge net income in the year, according to the theory of working capital management, the accumulated surplus funds are more likely invested in inventory, accounts receivable, cash and less risky, short-term money market funds such as T-bills and commercial paper, for the planned short-term expenditures including year-end bonuses and dividends, and new real investments for expansion. Therefore, if this is the case, then we may observe depressed returns in the above-mentioned money markets during the period.

Nevertheless, if institutional managers lock in their profits by switching from risky stocks to less risky assets such as T-bills in the same period, then the observed return seasonality would be minimal.

This hypothesis is supported by Kato and Schallheim (1985) and Tong (1992). The former study finds January and July seasonalities in the stock market of Japan, where employee bonuses are paid at the end of December and June. The Tong study examines the Taiwanese stock market over the 1977-1988 period, when the Taiwan government suspended capital gain taxes. During the same period, Taiwan enjoyed fast economic growth and companies paid out large bonuses at the Lunar year-end instead of at the (Western) calendar year-end. Interestingly, Tong discovers that the January effect was absent but the Lunar January effect existed in the sample period. Clearly, this Lunar January effect has nothing to do with the tax-related considerations. The evidence in the Taiwanese market supports the liquidity hypothesis as a partial explanation of the January effect. By using the GARCH-M model suggested by Engle, Lilien and Robins (1987), Tong further excludes a time-varying risk premium as a possible explanation of the Lunar January effect in Taiwan.

---

[39] The January return seasonality exists in both stock and bond markets. Keim and Stambaugh (1986) report that low-grade bonds produce larger returns than the high-grade only in January.

CHAPTER III

DATA AND METHODOLOGY

3.1 Data Sources

The data used in this dissertation are limited to firms with stocks traded on the NYSE or AMEX. The NASDAQ stocks are excluded in order to compare our results with those of prior studies testing the hypotheses proposed to explain the January effect. The details about specific data items used in each analysis are displayed in Appendix 6. They are listed and briefly explained as follows:

[1] <u>July 1962-December 1995 CRSP daily and monthly stock files</u>

The files are obtained from the Center for Research in Security Prices (CRSP), Graduate School of Business, University of Chicago.

[2] <u>1987-1994 COMPUSTAT annual industrial files</u>

The files are supplied by Standard & Poor's Compustat Services, Inc.

[3] <u>1988-1995 institutional quarterly stock holdings on 13-F form filed to the SEC</u>

The data are obtained from the CD/SEC files of Disclosure, Inc., which is provided by CDA Investment Technologies, Inc. The Securities Exchange Commission (SEC) requires all institutions with equity assets of $100 million or more to file a report of their equity holdings as of the end of each calendar quarter within 45 days. These institutions include banks, insurance companies, investment companies, investment advisors and large internally managed endowments, foundations and pension funds.

[4] 1992-1995 insider stock holdings on Form 4 filed to the SEC

The data are obtained from the same source as the above-mentioned CD/SEC files. Inside owners consists of officers, directors, beneficial owners and principal stockholders owning ten percent or more of the company stock.[40] Officers, directors and beneficial owners are only included if they hold at least 1,000 shares. Document type Form 3 is the initial statement of stock acquisition filed within ten days of the transaction date. If there is a change in ownership (purchase or sale), the owner must file Form 4 within ten days from the month end in which the transaction occurred.

[5] 1988-1995 daily federal funds rates

The data are obtained from the Federal Reserve Bank of St. Louis.

[6] 1988-1995 quoted interest rates of Treasury bills maturing within one month

The 1988-1990 data are obtained from the *Wall Street Journal*[41] and the 1991-1995 data are from the Federal Reserve Bank of Atlanta.[42]

[40] Noteworthily, since the insider ownership data include stock holdings from individual investors such as managers, and institutional investors, part of the insider holdings are reflected in the 13-F institutional ownership data.

[41] The quotation data of Treasury bills on the *Wall Street Journal* are provided by the Federal Reserve Bank of New York.

[42] After comparing the 1991-1995 data obtained from the Federal Reserve Bank of Atlanta with the T-bill rates listed on the *Wall Street Journal* during the corresponding period, we find that they are exactly the same.

3.2 Simultaneous Test Of The Four Hypotheses Using Return Data

3.2.1 Cross-Sectional Analysis For Rate Of Returns

To examine the factors which could explain the January effect, we assume[43]

$$R_{period,i,t} = E(R_{period,i,t}|\phi_{June,t}) + \sum_{f=1}^{n} \beta_f X_f + \varepsilon_{period,i,t} \qquad (1)$$

where t = 1988, 1989, ..., 1995 and n = 1, 2, ..., N; equation (1) is run for five cross-sectional regressions, each with a different dependent variable, i.e., *period* is

[1] the early-December period in year t (the early-December period is defined as the remaining December trading days which are prior to the year-end period),

[2] the year-end (YE) period in year t (the YE period is defined as the 10-trading-day period prior to the last trading day in the year),

[3] December in year t,

[4] the turn-of-the-year (TOTY) period in the following year (i.e., year t+1; the TOTY period is defined as the five-trading-day period beginning from the last trading day in year t),[44] or

[5] January in the following year (i.e., year t+1);[45]

$R_{period,i,t}$ is the holding-period return in *period* of year t for firm i; X_f is one of the N tested factors which may explain $R_{period,i,t}$; β_f is the estimated coefficient of X_f; $E(R_{period,i,t}|\phi_{June,t})$ is the expected value of $R_{period,i,t}$ if all $X_f = 0$, under the information set available in June of

[43] For notational simplicity, we suppress *period, i,* and t from the subscript part of factor X_f. Similarly, the subscript i is omitted from β_f.
[44] The observation for the year of 1995 is not available for the regression, since it requires the TOTY observation in the following year, 1996, which is outside of the data period of this study.
[45] Similar to the reason in footnote 44, the regression is not available for the year of 1995.

year t;[46] $\varepsilon_{period,i,t}$ is the error term. That is, we assume that the abnormal returns around year-end, e.g., depressed year-end and high turn-of-the-year returns according to the tax-loss selling hypothesis, result from the joint effect of the N explanatory factors, X_fs. That is, in the absence of these factors, stock returns should follow the expected return-risk relationship described by $E(R_{period,i,t}|\phi_{June,t})$.

Fama and French (1992) report that CAPM (Capital Asset Pricing Model) beta has no explanatory power for the cross-sectional stock returns, and suggest the following two-factor model of stock returns:[47]

$$E(R_{period,i,t}|\phi_{June,t}) = a_1*\ln(\mathrm{ME})_{i,t} + a_2*\ln(\mathrm{BE/ME})_{i,t} \tag{2}$$

where $\ln(\cdot)$ is the natural logarithmic operator; the ME in $\ln(\mathrm{ME})_{i,t}$ is the market equity as the product of price times common-stock shares outstanding at the end of June in year t; the BE in $\ln(\mathrm{BE/ME})_{i,t}$ is the book equity defined as the fiscal-year-end book value of

---

[46] As shown below in equation (2), the independent variables employ the data as of the end of June in year t or earlier.

[47] Fama and French (1992) find that firm size (market equity) and book-to-market equity ratio combine to capture the cross-sectional variation in stock returns. As described in their definitions shown below this equation, ln(ME) and ln(BE/ME) are obtained from the public information available *prior* to the *period* in year t. For notational simplicity, however, we put t in subscript for both right-hand-side variables in equation (2). We also are aware that this asset pricing equation has not been widely accepted among researchers yet. According to the capital asset pricing model (CAPM), $E(R_{i,t}) = R_{f,t} + \beta_i*[\,E(R_{m,t}) - R_{f,t}]$, and many researchers still use $R_{i,t} - R_{f,t} - \beta_i*(R_{m,t} - R_{f,t})$ to calculate abnormal returns. However, the validity of the CAPM has been seriously questioned in the literature. As pointed out by Copeland and Weston on p. 216 of *Financial Theory and Corporate Policy* (third edition, 1988), "empirical evidence has led researchers to conclude that the pure theoretical form of the CAPM does not agree well with reality." Specifically, if the CAPM is correct and we regress security return on beta, then the slope (market price for per unit of beta risk) should equal $R_{m,t} - R_{f,t}$. However, numerous studies, such as Black, Jensen, and Scholes (1972), Fama and MacBeth (1973), Tinic and West (1984), Lakonishok and Shapiro (1986), find flatter slopes than predicted by the CAPM. Fama and French (1992) even report that beta risk is not priced by the market. On the other hand, many others use the market model, $R_{i,t} = \alpha_i + \beta_i*R_{m,t} + \varepsilon_{i,t}$, to obtain abnormal returns. That is, abnormal return $= \varepsilon_{i,t} = R_{i,t} - \alpha_i - \beta_i*R_{m,t}$ However, the market model is only an *ex-post* statistical equation. There is no financial theory to support its validity. That is, it does not exist in *ex-ante* form, $E(R_{i,t}) = \alpha_i + \beta_i*E(R_{m,t})$. Nevertheless, in order to compare with the results of other studies, we acknowledge that we may need to replace equation (2) by the CAPM or the market model to examine

common equity plus balance-sheet deferred taxes in year t-1; the ME in $\ln(\text{BE/ME})_{i,t}$ is the product of stock price times number of common shares outstanding at the end of December in year t-1.

After substituting (2) into (1) and specifying each X_f factor, we get[48,49]

$$\begin{aligned} R_{period,i,t} = \; & a_0 + a_1{*}\ln(\text{ME})_{i,t} + a_2{*}\ln(\text{BE/ME})_{i,t} \\ & + [\, b_1 + b_2{*}\text{INST}_{i,t} \,]{*}\ln(\text{PTS})_{i,t} \\ & + [\, c_1 + c_2{*}\text{INST}_{i,t} \,]{*}D_{STW,i,t} \\ & + [\, d_1 + d_2{*}\text{INST}_{i,t} \,]{*}D_{STL,i,t} \\ & + [\, e_1 + e_2{*}\text{INST}_{i,t} \,]{*}\sigma_{i,t} \\ & + [\, f_1 + f_2{*}\text{INST}_{i,t} \,]{*}D_{LTW,i,t} \\ & + [\, g_1 + g_2{*}\text{INST}_{i,t} \,]{*}D_{LTL,i,t} \\ & + [\, h_1 + h_2{*}\text{INST}_{i,t} \,]{*}\text{FFS}_{period,t} \\ & + \varepsilon_{period,i,t} \end{aligned} \tag{3}$$

In equation (3), $\text{INST}_{i,t}$ is the percentage of firm i's common shares held by institutional investors, measured as of the end of September in year t. $\text{INST}_{i,t}$ is used as a proxy for the actual institutional ownership of stock i. As mentioned in Section 3.1, it only includes the equity ownership data from the institutions with equity assets more than $100 million. In this dissertation, it is also used as a complementary proxy for *individual* ownership, since the sum of *institutional* ownership and *individual* ownership equals one. As mentioned earlier, all four tested hypotheses are related to trading behavior of a subset of stock investors: either institutional or individual investors, but not both. Hence, $\text{INST}_{i,t}$

---

whether our results are sensitive to the expected return equation utilized, for the purpose of completeness of our study.

[48] The intercept term, a_0, comes from our assumption about the PTS proxy. Please refer to footnote 145 on p. 205 for details.

[49] The own standard deviation, σ, is used as a proxy for perceived risk of the institutional managers. According to the discussion in footnote 47, if we employ the CAPM or the market model, rather than equation (2) of the Fama and French model, and if the corresponding abnormal return is used as the dependent variable, then ln(ME) and ln(BE/ME) should be dropped from the regression equations of this study, such as equation (3). In addition, own standard deviation, σ, should be replaced by the non-systematic risk (diversifiable risk) since standard deviation can be decomposed into two parts: the non-

plays a key role in simultaneously testing all these hypotheses. $\mathrm{INST}_{i,t}$ helps us to compare the relative strength of the tested hypotheses. Particularly, $\mathrm{INST}_{i,t}$ interaction terms offer an opportunity to distinguish between the tax-loss selling and the window dressing hypotheses.

Specifically, as pointed out in Section 1.2, the window dressing hypothesis predicts that short-term losers with higher institutional ownership should have lower December returns.[50] In contrast, the tax-loss selling hypothesis predicts an opposite relationship. That is, they have opposite predictions on d_2. Therefore, if we find that the observed signs for the commonly predicted coefficients, such as c_1 and d_1, are exactly the same as predicted by these two hypotheses,[51] except that the estimated d_2 is significantly negative, then we can conclude that the empirical evidence suggests that window dressing plays a more important role in explaining the January effect than tax-loss selling.

$\mathrm{PTS}_{i,t}$ is the proxy for potential tax-loss selling pressure for stock i, measured over the period starting from the beginning of year t to the last trading day of November in year t. The logarithmic form for PTS, $\ln(\mathrm{PTS})_{i,t}$, is used to smooth the regression.[52] PTS is derived in Appendix 2 on p. 198 and shown as follows.

$$\mathrm{PTS} = \sum_t \mathrm{MAX}\,[P_t - P_{end}, 0]^* V_t^* G(YV_{end}) \tag{A1}$$

---

systematic risk, which equals $\sigma - \beta_i\sigma_m$, and the systematic risk, which equals $\beta_i\sigma_m$ and has already been reflected in abnormal returns.

[50] As mentioned later in Section 3.2.2, throughout this dissertation, we assume that loser stocks with higher (lower) institutional ownership are more likely to be sold at year-end for the purpose of window dressing (tax-loss selling) than those with lower (higher) institutional ownership.

[51] As shown later in Table 1 on p. 48, the tax-loss selling and window dressing hypotheses both predict that short-term winners should have higher December returns than other stocks, ceteris paribus.

[52] Here, ln(PTS) is defined as the logarithm of (PTS + 1). This adjustment allows the variable to increase continuously and monotonically from zero PTS, since ln(1) = 0.

where V_t and P_t are the trading volume and the stock price on day t, respectively; day t is each trading day during January-November of the year; P_{end} and YV_{end} are the stock price and the yearly trading volume on the last trading day of November in the year, respectively. $G(YV_{end})$ is a function of YV_{end}.

As mentioned in footnote 146 (p. 206) in Appendix 2, the exact functional form for $G(YV_{end})$ is unknown, but we use $\frac{1}{YV_{end}}$ for $G(YV_{end})$ in the empirical tests of this dissertation. The reasons for using $\frac{1}{YV_{end}}$ are because, first, there should be a negative relation between yearly trading volume and selling pressure (please refer to Appendix 2 for detailed explanations). Second, this measure is convenient.

$\sigma_{i,t}$ is the own standard deviation measured on the last trading day of November in year t by using prior-five-year monthly returns of stock i. If the five-year data are not available, then a shorter estimation period is used. However, stocks with less than 36 available monthly returns are excluded from this study. $\sigma_{i,t}$ is used as the perceived risk of institutional managers to test the risk-preference switching version of the window dressing hypothesis. $D_{LTW,i,t}$, $D_{LTL,i,t}$, $D_{STW,i,t}$, and $D_{STL,i,t}$ are dummy variables for the long-term winners, long-term losers, short-term winners, and short-term losers, respectively.

$D_{LTW,i,t} = 1$ if stock i is in the highest 10% ranking of the cumulative excess return[53] during the five-year period ending at the end of November in year t (otherwise, $D_{LTW,i,t} = 0$). Similarly, $D_{LTL,i,t} = 1$ if stock i is in the lowest 10% ranking of the cumulative excess

[53] The cumulative excess return is obtained by summing the monthly market-adjusted excess returns, $R_i - R_m$. In this study, R_m is proxied by the CRSP *value-weighted* NYSE/AMEX index returns, in contrast to

return during the five-year period (otherwise, $D_{LTL,i,t} = 0$). $D_{STW,i,t} = 1$ if stock i is in the top 10% ranking of rate of return during January-November in year t (otherwise, $D_{STW,i,t} = 0$). $D_{STL,i,t} = 1$ if stock i is in the lowest 10% ranking of rate of return during January-November in year t (otherwise, $D_{STL,i,t} = 0$).

$\text{FFS}_{period,t}$ is the Federal funds spread measured as the difference of the median Federal funds rate and the median rate on Treasury bills maturing within one month, both based on rates quoted in the *Wall Street Journal* for the five business days prior to the last trading day of either November or December in year t (December, if the *period* is January or the turn-of-the-year period; November, otherwise). Federal funds spread is the variable used in Ogden (1990) as a proxy for stringency of monetary policy of the Fed to test the liquidity hypothesis.[54]

Since some independent variables in equation (3) such as $\ln(\text{PTS})_{i,t}$, $D_{STL,i,t}$, and $D_{LTL,i,t}$ are highly correlated, we also conduct a diagnostic test for multicollinearity. Specifically, we measure the variance inflation factor (*VIF*) for each independent variable in equation (3). Multicollinearity is judged as serious if the largest *VIF* is greater than the conventional benchmark, 10. Please refer to Appendix 10 for an introduction to the multicollinearity test.

---

equally-weighted average of monthly returns on all stocks listed on the NYSE, a market proxy used in De Bondt and Thaler (1985 & 1987).

[54] Equation (3) is somewhat different from the corresponding equation used in the original proposal of this study. We add the institutional ownership interaction terms for $\ln(\text{PTS})_{i,t}$, $D_{STW,i,t}$, $D_{STL,i,t}$, $\sigma_{i,t}$, and $\text{FFS}_{period,t}$, meanwhile dropping the interaction terms between the up-market/down-market dummy variable and $D_{STW,i,t}$ ($D_{STL,i,t}$ and $\text{FFS}_{period,t}$). Furthermore, we abandon the generalized least square model, which allows a random error structure of heteroskedasticity, cross-sectional correlation and first-order autoregression, after preliminary results from the originally proposed regression are obtained. The results and the reasons for not applying the generalized least square model are shown in Appendix 7.

3.2.2 The Expected Results For Return Regressions

According to the empirical results of Fama and French, we expect that $a_1 < 0$ and $a_2 > 0$ in equation (3). The authors offer two explanations for the signs and statistical significance of a_1 and a_2. The first one is rational asset-pricing which regards ln(ME) and ln(BE/ME) as proxies for economic risks. For example, low book-to-market equity firms are persistently strong performers (i.e., low-risk firms and hence lower ex-ante returns), while the economic performance of high book-to-market equity firms is persistently weak (i.e., high-risk firms and hence higher ex-ante returns). The other explanation is irrational asset-pricing which suggests that explanatory power of the book-to-market equity ratio might result from market overreaction to the relative prospects of firms. Similarly, small firms may be riskier than large firms, since small firms tend to be less well-established and monitored by fewer analysts. They may have higher cost of capital and not achieve scale economies. Alternatively, as mentioned by Roll (1983, p. 22), "small firms may have larger sales and earnings volatilities because they have few product lines and are less diversified."

In Fama and French (1992), when only ln(ME) and ln(BE/ME) are included in the regression as independent variables, the magnitudes of estimated coefficients are -0.11 and 0.35, respectively. Therefore, we expect that the values of a_1 and a_2 in equation (3) would be close to the above values. Nevertheless, if the liquidity hypothesis is correct, then the coefficient of ln(ME) in the regression of January returns should be lower than -0.11, since stock prices of smaller firms would be bid up in January when individual investors invest their large year-end liquid profits. The intercept term, a_0, is indeterminate. However, if $R_{period,i,t}$ can be fully explained by the right-hand-side variables, then a_0 should be positive.[55]

Throughout this study, our predictions on estimated coefficients of the institutional-ownership interaction terms are based on the following assumption, unless specified elsewhere. That is, when any one of the four hypotheses predicts that a stock with a certain characteristic (such as winner or loser) will be sold by institutional (individual) investors, we assume that the higher (lower) the institutional-ownership of the stock is, the more depressed its return and the higher trading volume ratio will be, since more shares of the stock are likely to be sold by its institutional (individual) shareholders.

The detailed deductive process of obtaining coefficient predictions for each hypothesis is shown in Appendix 8. Since the excess returns of prior winners and losers occur predominantly in January, the overreaction hypothesis asserts that the price correction takes place in January only. Therefore, this hypothesis has no prediction on December returns. Further, as mentioned in Section 2.3, De Bondt and Thaler (1987) find that the excess returns in January are related to both short-term and long-term past performance. They claims that the short-term return reversal may reflect tax-loss selling for short-term losers and deferring capital gains for short-term winners at year-end. Moreover, the short-term losers (winners) in this study are based on the raw holding-period returns, rather than the cumulated excess returns. Therefore, we do not test the

[55] Please refer to footnote 145 (p. 205) in Appendix 2 for explanation.

overreaction hypothesis by examining the evidence from short-term losers (winners).[56] Brief explanations on the coefficient predictions for all four hypotheses are given in the following section and summarized in Table 1. We display those predictions which require additional assumptions in parentheses.

3.2.2.1 The Tax-Loss Selling/Parking-The-Proceeds Hypothesis

If the derived PTS proxy is a powerful measure of actual tax-loss selling, then the larger the PTS value of a stock is, the more shares of the stock will be sold by individual investors in December for tax purposes. Consequently, the selling pressure further depresses December returns. In the following January, individual investors reinvest the proceeds from the December tax-loss sales and hence the stock price rebounds.[57]

In addition, the higher its percentage of institutional ownership, the weaker the December tax-loss selling by its individual shareholders and the following January trading activities will be. That is, the high-PTS stocks with higher institutional ownership should have higher December returns than those with lower institutional ownership. If we further assume that there is no additional stock demand to bid up the prices of the high-PTS stocks in January (TOTY) so that the depressed December prices move back to their fundamental levels in January, then the high-PTS stocks with higher institutional ownership should have lower January (TOTY) returns than those with lower institutional ownership. Similarly, the above predictions are well applied to short-term

[56] As shown later in Sections 4.1 and 4.2, our empirical results only weakly support the tax-loss selling hypothesis. We might need another explanation for the short-term return reversal.
[57] The January price rebound may result from both the pure adjustment from the depressed December price and the reinvested proceeds.

Table 1. Expected Coefficient Signs for the Four Hypotheses in Return Regressions[a]

Coefficient		Dec.[b]	Jan.[c]	Explanations
Panel A: Tax-Loss Selling/Parking-the-Proceeds Hypothesis				
ln(PTS)	b_1	–	+	The higher tax-loss selling pressure, the lower December return and the higher January return due to price rebound.
INST*ln(PTS)	b_2	+	(–)	Given PTS constant, the higher institutional ownership, the less December tax-loss selling and the smaller January price rebound if the price moves back to its fundamental level.
D_{STW}	c_1	+,±	–,±	Stockholders of short-term winners tend to incur capital gains; tax-motivated individual investors defer realizing capital gains until becoming long-term or at least until the next tax-year.
INST*D_{STW}	c_2	–,±	+,±	The higher institutional ownership of short-term winners, the fewer individual investors deferring realization of capital gains.
D_{STL}	d_1	–,±	+,±	Stockholders of short-term losers tend to incur large capital losses; heavier December tax-loss selling and stronger price rebound in January.
INST*D_{STL}	d_2	+,±	(–,±)	The higher institutional ownership of short-term losers, the fewer individual investors motivated for December tax-loss selling and hence the weaker price rebound in January if the price moves back to its fundamental level.
Panel B: Window Dressing Hypothesis				
D_{STW}	c_1	+	–,±	Institutional managers buy winners in December and resell in January or later.
INST*D_{STW}	c_2	(+)	(–,±)	If institutional managers have the preferred habitat to invest in high-institutional-ownership stocks.
D_{STL}	d_1	–	+	Institutional managers dump losers in December and buy back in January.
INST*D_{STL}	d_2	–	(+,±)	The higher institutional ownership of losers, the more likely window dressed by institutional managers, the lower December returns, and the stronger January price rebound if the price moves back to its fundamental level.
σ	e_1	–	+	Institutional managers switch from high-risk to low-risk stocks in December and reverse the switch in January.
INST*σ	e_2	–	(+,±)	The higher institutional ownership of high-risk stocks, the more likely window dressed by institutional managers, the lower December returns, and the stronger January price rebound if the price moves back to its fundamental level.

Table 1 (Continued)

Coefficient		Dec.[b]	Jan.[c]	Explanations
D_{LTW}	f_1	+	–,±	Institutional managers buy winners in December and resell in January or later.
INST*D_{LTW}	f_2	(+)	(–,±)	If institutional managers have the preferred habitat to invest in high-institutional-ownership stocks.
D_{LTL}	g_1	–	+	Institutional managers dump losers in December and buy back in January.
INST*D_{LTL}	g_2	–	(+,±)	The higher institutional ownership of losers, the more likely window dressed by institutional managers, the lower December returns, and the stronger January price rebound if the price moves back to its fundamental level.
Panel C: Overreaction Hypothesis				
D_{LTW}	f_1		–	Prior winners are unattractive investments and the consequent price correction takes place in January.
INST*D_{LTW}	f_2		+	Individual investors overreact, while institutional investors do not; winners with higher institutional ownership are less likely overvalued and hence smaller downward price correction.
D_{LTL}	g_1		+	Prior losers are attractive investments and the consequent price correction takes place in January.
INST*D_{LTL}	g_2		–	Individual investors overreact, while institutional investors do not; losers with higher institutional ownership are less likely undervalued and hence smaller upward price correction.
Panel D: Liquidity Hypothesis				
ln(ME)	a_1	–	–	Individual investors prefer small-firm stocks to large-firm stocks when they invest the liquid profits.
FFS	h_1	–	–	The more stringent the monetary policy, the lower the aggregate liquid profits and the stock returns.
INST*FFS	h_2	+,±	+,±	Institutional ownership is highly correlated with firm size; the stock returns of larger (higher-institutional-ownership) firms are less adversely affected by a stringent monetary policy.

[a] "+" stands for positive; "–" stands for negative; "±" stands for zero; "–,±" stands for non-positive; "+,±" stands for non-negative. The expected signs that require additional assumptions are shown in parentheses.
[b] This column includes monthly return in December, and holding period returns in the early-December and the year-end periods for all four hypotheses, except the liquidity hypothesis which excludes the year-end period.
[c] This column includes monthly return in January and holding period return in the TOTY period.

loser stocks, which are in the bottom 10% ranking of prior January-November return, since their stockholders are very likely to incur heavy capital losses.

Besides, if tax-motivated transactions can explain the January effect, the optimal tax-trading strategy also implies that individual investors should defer realization of capital gains. That is, in December short-term winners should have lower stock turnover rates and their prices could be bid up due to the thinner trading and fewer seller-initiated transactions. In the following January, individual investors begin to sell these stocks, which results in depressed returns in January. As mentioned earlier, higher institutional stock ownership will weaken the tax-induced transactions in December and January. Therefore, the short-term winners with higher institutional ownership will have lower returns in December and higher returns in January than those with lower institutional ownership.

Given the finding that the January effect is more pronounced for small firms, the hypothesis propounds that small firms' stock returns are more volatile than large firms' returns and hence are more likely to incur capital losses. Realization of these capital losses induces year-end tax-loss selling and December depressed price. Subsequently, the price rebounds in January and the high January return is observed. Since tax-loss selling proxied by ln(PTS) is controlled in the regression, if our PTS proxy is an adequate measure and tax-loss selling is the sole explanation of the January effect, then we will expect that the coefficient of firm size (market equity) should be constant across regressions of stock returns for December, January, or any other months. That is, once PTS is controlled, small-firm stocks should not have abnormally high returns in

January.[58] The expected signs of all coefficients used to test the tax-loss selling/parking-the-proceeds hypothesis are summarized in Panel A of Table 1.

3.2.2.2 The Window Dressing Hypothesis

According to the hypothesis, institutional investors dump losers and buy winners (or switch from high-risk stocks to low-risk stocks) before year-end, and buy back losers and sell the purchased winners (or switch from low-risk stocks back to high-risk stocks) at turn-of-the-year. Therefore, winners (both short and long terms) and low-risk stocks will have higher December and lower January returns. In contrast, losers (both short and long terms) and high-risk stocks should have lower December and higher January returns.

As mentioned earlier, we assume that the higher the institutional ownership of loser or high-risk stocks is, the more likely they will be sold due to year-end window dressing activities. Therefore, when institutional investors dump losers (both short and long terms) or high-risk stocks in December, losers and high-risk stocks with higher institutional ownership should have more depressed returns in December than those with lower institutional ownership. In addition, if we assume that institutional managers have the preferred habitat to purchase higher-institutional-ownership stocks, then we will expect that winners (both short and long terms) with higher institutional ownership should have higher December and no greater January returns than those with lower institutional ownership.

[58] Similarly, after controlling for PTS, we should not observe abnormally low returns in December for small-firm stocks, either. In fact, prior studies such as Jegadeesh and Titman (1993) do not find any evidence that small-firm stocks have lower December returns than large firms.

If we further assume that there is no additional stock demand to bid up the prices of losers and high-risk stocks in January (TOTY) so that the depressed December prices move back to their fundamental levels in January, then losers and high-risk stocks with higher institutional ownership should have higher January (TOTY) returns than those with lower institutional ownership. The signs of all coefficients predicted by the window dressing hypothesis are summarized in Panel B of Table 1. We display those predictions which require additional assumptions in parentheses (Panel B of Table 1). Please refer to Sections A8.1.2 and A8.2.2 for detailed discussions.

3.2.2.3 The Overreaction Hypothesis

The overreaction hypothesis implies that a price correction occurs in January only. Prior long-term losers become more attractive investments than prior winners in this period.[59] Therefore, prior long-term losers should have higher returns in January. On the other hand, prior long-term winners should have lower returns in January. The hypothesis also suggests that individual investors overreact, while institutional investors do not. Hence, prices of stocks with higher institutional ownership are less likely to depart from their underlying fundamental values so that less price correction occurs in

[59] As mentioned on p. 46, De Bondt and Thaler (1987) find that the return reversal occurs on both long-term and short-term winners (losers), which are defined according to their high (low) cumulative excess returns. They claims that the short-term return reversal could result from tax-motivated transactions. Further, since the return reversal on short-term winners (losers) is weaker than on long-term winners (losers), and in this dissertation, short-term winners (losers) are measured in holding-period returns, rather than cumulative excess returns, we do not test the overreaction hypothesis by inspecting coefficient signs on short-term winners (losers). In contrast to long-term winners and losers for the overreaction hypothesis, short-term winners and losers are primarily used for testing the window dressing hypothesis. Since institutional managers may trade winners and losers at year-end for the purpose of window dressing and holding-period returns are more directly observable than cumulative excess returns, we define short-term winners and losers according to their holding-period returns to test the window dressing hypothesis.

January. Specifically, we expect that the long-term losers (winners) with higher institutional ownership should have lower (higher) excess returns in January than the long-term losers (winners) with lower institutional ownership. The signs of all coefficients predicted by the overreaction hypothesis are summarized in Panel C of Table 1.

3.2.2.4 The Liquidity Hypothesis

The liquidity hypothesis states that the Fed's monetary policy affects expected liquidity profits of individual investors, which in turn will affect turn-of-the-month stock returns. And because individual investors receive most of their liquid profits near the calendar year-end, January (turn-of-the-year) returns are particularly higher than returns in other months (other turn-of-the-months). Therefore, we expect that the larger is the Federal funds spread (the proxy for stringency of the Fed's monetary policy), the lower returns will be for the early-December period, December, the turn-of-the-year period, and January. That is, the expected coefficient sign of FFS should be negative for the December and January regressions.

Furthermore, the hypothesis argues that individual investors prefer investing in small-firm stocks to investing in large-firm stocks, and therefore small-firm stocks have larger January returns. This implies that the coefficient of market equity should be negative in the regression of returns, even in the presence of other explanatory variables. And the coefficient should be more negative in the regression for January than for December.

Based on the liquidity hypothesis, we also expect that the turn-of-the-month returns of larger firms should be less adversely affected by the Fed's stringent monetary policy than those of smaller firms. That is, given that FFS is constant, larger firms should have higher stock returns in December and January. Since firms size is highly correlated with institutional ownership, we expect that the coefficient sign of INST*FFS should be non-negative for the December and the January regressions. The expected signs of all coefficients for the liquidity hypothesis are summarized in Panel D of Table 1.

3.2.2.5 Comparison of Expected Coefficient Signs For The Four Hypotheses

As mentioned earlier, the coefficient sign predictions in Sections 3.2.2.1-3.2.2.4 are summarized in Table 1. Before we inspect these expected results, we would like to point out that these four competing hypotheses may not be mutually exclusive to one another. To simplify our discussion, we omit the predictions requiring additional assumptions, i.e., those displayed in parentheses in Table 1.

From Panel B in Table 1, we see that all of the coefficients, except e_1 and e_2, predicted by the window dressing hypothesis are also used to test the tax-loss selling/parking-the-proceeds hypothesis (c_1, c_2, d_1, and d_2) or the overreaction hypothesis (f_1, f_2, g_1, and g_2). Most of the expected results on the common independent variables are consistent across these hypotheses. Therefore, if the observed regression result shows that the actual sign of some variable is the same as expected, then we can not tell which hypothesis is correct, since it can be either one of them or both. However, some predictions across the hypotheses are opposite, providing an opportunity to test the validity of each individual hypothesis independently and to investigate their relative explanatory power in explaining the January effect. Specifically, the window dressing hypothesis predicts that $d_2 < 0$ for December return. In contrast, the tax-loss selling/parking-the-proceeds hypothesis predicts that $d_2 \geq 0$.

Therefore, if the observed signs for the commonly predicted coefficients are found to be exactly the same as predicted by these two hypotheses, except that $d_2 < 0$ for December return, then we can conclude that the empirical evidence suggests that window dressing plays a more important role in explaining the January effect than tax-loss selling. Next, we inspect the observed coefficient signs exclusively predicted by the tax-loss selling/parking-the-proceeds hypothesis, i.e., b_1 and b_2. If we find that the actual signs of b_1 and b_2 are opposite to the predictions of the tax-loss selling/parking-the-proceeds hypothesis, then we can further conclude that tax-loss selling can not adequately explain the January effect.

In contrast, different from the three other hypotheses, the liquidity hypothesis has no predicted coefficients common to other hypotheses. Therefore, it can be examined independently. If our evidence shows that $a_1 < 0$, $h_1 < 0$, and $h_2 \geq 0$ for December and January returns, then we will suggest that the liquidity hypothesis be an underlying explanation of the January effect.

3.3 Simultaneous Test Of The Four Hypotheses Using Trading Volume Data

3.3.1 Cross-Sectional Analysis For Trading Volume Ratios

The four hypotheses not only predict the return patterns in December and January, but also have implications on trading volume variations in those periods. In the literature, few studies have examined trading volumes in testing the hypotheses. Additionally, these studies only focus on either small-firm stocks (Lakonishok and Smidt (1984)) or winners/losers[60] and thus fail to take into account most of the potentially important factors. Therefore, it will be of great benefit if the evidence from the analysis of returns can be corroborated using trading volumes.

Though ln(ME) and ln(BE/ME) can explain cross-sectional variation across stock returns of firms in the model of Fama and French, it is not clear whether they have the same power in explaining the trading volume ratio. However, to avoid excluding this possibility, we leave these two variables in the regression analysis. Hence, we hypothesize:[61]

$$E(V_{period,i,t}/YV_{i,t}|\phi_{June,t}) = a_0 + a_1 * \ln(\mathrm{ME})_{i,t} + a_2 * \ln(\mathrm{BE/ME})_{i,t} \tag{4}$$

$$V_{period,i,t}/YV_{i,t} = E(V_{period,i,t}/YV_{i,t}|\phi_{June,t}) + \sum_{f=1}^{n} \beta_f X_f + \varepsilon_{period,i,t} \tag{5}$$

where $V_{period,i,t}$ = total trading volumes in *period* of year t for firm i; $YV_{i,t}$ = yearly trading volumes for stock i from the beginning of December in year t-1 to the end of November in year t; the definitions of other variables are the same as in the previous equations.

[60] They include Dyl (1977), Lakonishok and Smidt (1986), and Ferris, Haugen, and Makhija (1988). Further, instead of using total trading volumes, Shefrin and Statman (1985) and Bildersee and Kahn (1987) employ number of transactions and block-trading-volumes, respectively.

Equation (4) implies a constant expected trading volume ratio across firms which have the same size and book/market equity ratio. For equation (5), we assume that the abnormal trading activities around year-end, e.g., December tax-loss selling and January tax-loss-proceeds reinvestment according to the tax-loss selling/parking-the-proceeds hypothesis, result from the joint effect of the N explanatory factors, X_fs. That is, in the absence of these factors, we should not observe the abnormal trading activities around year-end.

Similar to the cross-sectional regression for rate of return (equations (1)-(3)), after substituting (4) into (5) and specifying all independent variables, we obtain the following equation:[62]

$$
\begin{aligned}
V_{period,i,t}/YV_{i,t} = {} & a_0 + a_1{*}\ln(\mathrm{ME})_{i,t} + a_2{*}\ln(\mathrm{BE/ME})_{i,t} \\
& + [\, b_1 + b_2{*}\mathrm{INST}_{i,t}\,]{*}\ln(\mathrm{PTS})_{i,t} \\
& + [\, c_1 + c_2{*}\mathrm{INST}_{i,t}\,]{*}D_{STW,i,t} \\
& + [\, d_1 + d_2{*}\mathrm{INST}_{i,t}\,]{*}D_{STL,i,t} \\
& + [\, e_1 + e_2{*}\mathrm{INST}_{i,t}\,]{*}\sigma_{i,t} \\
& + [\, f_1 + f_2{*}\mathrm{INST}_{i,t}\,]{*}D_{LTW,i,t} \\
& + [\, g_1 + g_2{*}\mathrm{INST}_{i,t}\,]{*}D_{LTL,i,t} \\
& + [\, h_1 + h_2{*}\mathrm{INST}_{i,t}\,]{*}\mathrm{FFS}_{period,t} \\
& + \varepsilon_{period,i,t} \qquad (6)
\end{aligned}
$$

According to Lakonishok and Smidt (1984), small firms are relatively more actively traded around the turn-of-the-year.[63] That is, small firms may have higher average $V_{period,i,t}/YV_{i,t}$ in December or January. Therefore, we expect $a_1 < 0$.

---

[61] Similar to equation (1), we suppress *period, i,* and *t* from the subscript part of β_f and factor X_f for notational simplicity.

[62] The estimated coefficients in equation (6), such as a_0, a_1, etc., are not the same coefficients in equation (3) or other following equations. However, for notational simplicity, we use them in all regression equations in this study.

[63] However, in general, small firms are less liquid (traded less frequently, and with wider bid-ask spreads) than large firms.

3.3.2 The Expected Results For Trading Volume Regressions

As for the regressions of stock returns, our predictions of estimated coefficients for the institutional-ownership interaction terms in the trading volume regressions are based on the following assumption, unless specified elsewhere. That is, when any one of the four hypotheses predicts that a stock with a certain characteristic (such as winner or loser) will be sold by institutional (individual) investors, we assume that the higher (lower) the institutional-ownership of the stock is, the more depressed its return and the higher the trading volume ratio will be, since more shares of the stock are likely to be sold by its institutional (individual) shareholders.

The detailed deductive process of obtaining coefficient predictions for each hypothesis is shown in Appendix 8. However, brief explanations are given in Sections 3.3.2.1-3.3.2.4 and summarized in Table 2.[64] As mentioned earlier, since small firms are relatively more actively traded around the turn-of-the-year, we expect a negative coefficient sign of ln(ME) in the December and the January regressions.

3.3.2.1 The Tax-Loss Selling/Parking-The-Proceeds Hypothesis

If the derived PTS proxy is a powerful measure of actual tax-loss selling, then the larger the PTS value of a stock is, the more shares of the stock will be sold by individual

[64] Since the excess returns of prior winners and losers occur predominantly in January, the overreaction hypothesis asserts that the price correction takes place in January only. Therefore, there is no prediction on December returns or trading volumes.

Table 2. Expected Coefficient Signs for the Four Hypotheses in Trading Volume Regressions[a]

Coefficient		Dec.[b]	Jan.[c]	Explanations
Panel A: Tax-Loss Selling/Parking-the-Proceeds Hypothesis				
ln(PTS)	b_1	+	+	The higher tax-loss selling pressure, the more active December tax-loss trading and the reinvestment of the proceeds in the following January.
INST*ln(PTS)	b_2	–	(–)	Given PTS constant, the higher institutional ownership, the less December tax-loss trading; the less the January reinvestments in higher-institutional-ownership stocks if demand for lower-institutional-ownership stocks is stronger.[d]
D_{STW}	c_1	–,±	+,±	Stockholders of short-term winners tend to incur capital gains; tax-motivated individual investors defer realizing capital gains until becoming long-term or at least until the next tax-year.
INST*D_{STW}	c_2	+,±	–,±	The higher institutional ownership of short-term winners, the fewer individual investors deferring realization of capital gains.
D_{STL}	d_1	+,±	+,±	Stockholders of short-term losers tend to incur large capital losses; heavier December tax-loss selling and subsequent January reinvestment.
INST*D_{STL}	d_2	–,±	(–,±)	The higher institutional ownership of short-term losers, the fewer individual investors motivated for December tax-loss selling; the less the January investments in higher-institutional-ownership stocks if demand for lower-institutional-ownership stocks is stronger.[d]
Panel B: Window Dressing Hypothesis				
D_{STW}	c_1	+	+,±	Institutional managers buy winners in December and resell in January or later.
INST*D_{STW}	c_2	(+)	(+,±)	If institutional managers have the preferred habitat to invest in high-institutional-ownership stocks.
D_{STL}	d_1	+	+	Institutional managers dump losers in December and buy back in January.
INST*D_{STL}	d_2	+	(+,±)	The higher institutional ownership of losers, the more likely window dressed by institutional managers, the more active December sales; the more January purchases if the managers prefer high-institutional-ownership stocks.
σ	e_1	(+,±)	(+,±)	If institutional managers switch from high-risk stocks to other low-risk financial instruments such as T-bills, rather than only low-risk stocks, in December and reverse the switch in January, then risky stocks will be more actively traded than less risky stocks.
INST*σ	e_2	+,±	(+,±)	The higher institutional ownership of high-risk stocks, the more likely window dressed by the managers, the more active December sales; the more January purchases if institutional managers prefer high-institutional-ownership stocks.

Table 2 (Continued)

Coefficient		Dec.[b]	Jan.[c]	Explanations
D_{LTW}	f_1	+	+,±	Institutional managers buy winners in December and resell in January or later.
INST*D_{LTW}	f_2	(+)	(+,±)	If institutional managers have the preferred habitat to invest in high-institutional-ownership stocks.
D_{LTL}	g_1	+	+	Institutional managers dump losers in December and buy back in January.
INST*D_{LTL}	g_2	+	(+,±)	The higher institutional ownership of losers, the more likely window dressed by institutional managers and the more active December sales; the more January purchases if institutional managers prefer high-institutional-ownership stocks.
Panel C: Overreaction Hypothesis				
D_{LTW}	f_1		–	Prior winners are unattractive investments and hence have lower stock demand in January.
INST*D_{LTW}	f_2		+	Individual investors overreact, while institutional investors do not; winners with higher institutional ownership are less likely overvalued and hence are less unattractive in January.
D_{LTL}	g_1		+	Prior losers are attractive investments and hence have stronger stock demand in January.
INST*D_{LTL}	g_2		–	Individual investors overreact, while institutional investors do not; losers with higher institutional ownership are less likely undervalued and hence are less attractive in January.
Panel D: Liquidity Hypothesis				
ln(ME)	a_1	–	–	Individual investors prefer small-firm stocks to large-firm stocks when they invest the liquid profits.
FFS	h_1	–	–	The more stringent the monetary policy, the lower the aggregate liquid profits and the less stocks purchased.
INST*FFS	h_2	+,±	+,±	Institutional ownership is highly correlated with firm size; the stock demand for larger (higher-institutional-ownership) firms are less adversely affected by a stringent monetary policy.

[a] "+" stands for positive; "–" stands for negative; "±" stands for zero; "–,±" stands for non-positive; "+,±" stands for non-negative. The expected signs that require additional assumptions are shown in parentheses.
[b] This column includes trading volume ratios in December, the early-December and the year-end periods for all four hypotheses, except the liquidity hypothesis which excludes the year-end period.
[c] This column includes trading volume ratios in January and the TOTY period.
[d] The January demand for the stocks with depressed prices could be abnormally high due to heavy investments by individual investors with large year-end liquid profits or by institutional managers rebalancing their portfolios, in addition to the reinvestment of the proceeds from tax-loss sales.

investors in December for tax purposes. Consequently, December trading volume will increase and December return will be further depressed. In the following January, individual investors reinvest the proceeds from the December tax-loss sales and hence its trading volume increases and stock price rebounds.[65] In addition, the higher the percentage of institutional ownership, the weaker the December tax-loss selling by individual shareholders. That is, high-PTS stocks with higher institutional ownership should have lower December trading volumes than those with lower institutional ownership.

If we further assume that there is no extra abnormal January stock demand by individual investors with large year-end liquid profits or by institutional managers rebalancing their portfolios, except by the individual investors who reinvest the proceeds from tax-loss sales, then high-PTS stocks with higher institutional ownership should have lower January trading volumes as well. Similarly, the above predictions are well applied to short-term loser stocks, which are in the bottom 10% ranking of prior January-November return, since their stockholders are very likely to incur heavy capital losses.

Besides, if tax-motivated transactions can explain the January effect, the optimal tax-trading strategy also implies that individual investors should defer realization of capital gains. That is, in December short-term winners should have lower stock turnover rates and their prices could be bid up due to the thinner trading and fewer seller-initiated transactions. In the following January, individual investors begin to sell these stocks, which results in increased trading volumes and depressed returns in January.

[65] However, if the January price rebound is a pure adjustment back to its fundamental value, then the January trading volumes may not increase.

As mentioned earlier, higher institutional stock ownership will weaken the tax-induced transactions in December and January. Therefore, the short-term winners with higher institutional ownership will have higher trading volumes (lower returns) in December and lower trading volumes (higher returns) in January than those with lower institutional ownership. The expected signs of all coefficients used to test the tax-loss selling/parking-the-proceeds hypothesis are summarized in Panel A of Table 2.

3.3.2.2 The Window Dressing Hypothesis

According to this hypothesis, institutional investors dump losers and buy winners (or switch from high-risk stocks to low-risk stocks) before year-end, and buy back losers and sell the purchased winners (or switch from low-risk stocks back to high-risk stocks) at turn-of-the-year. Therefore, these stocks should all have higher trading volumes in December and January due to the window dressing activities. As mentioned earlier, we assume that the higher the institutional ownership of loser or high-risk stocks, the more likely they will be sold for the year-end window dressing activities. Therefore, when institutional investors dump losers (both short and long terms) in December, the losers with higher institutional ownership should have higher trading volumes in December than those with lower institutional ownership.

In January (TOTY) institutional managers purchase the stocks sold by themselves in December, and if we further assume that institutional investors prefer high-institutional-ownership stocks, then losers and riskier stocks with higher institutional ownership should have higher January (TOTY) trading volumes than those with lower institutional ownership. Similarly, if we assume that the managers switch from high-risk stocks to other low-risk financial instruments such as T-bills, rather than only low-risk stocks, in December and reverse the switch in January, then risky stocks will be more actively traded than less risky stocks.

In addition, if we assume that institutional managers have the preferred habitat to purchase higher-institutional-ownership stocks, then we will expect that winners (both short and long terms) with higher institutional ownership should have higher December and no lower January trading volumes than those with lower institutional ownership. We display these predictions in parentheses (Panel B of Table 2), since they require additional assumptions. Please refer to Sections A8.3.2 and A8.4.2 for detailed discussions. The signs of all coefficients predicted by the window dressing hypothesis are summarized in Panel B of Table 2.

3.3.2.3 The Overreaction Hypothesis

The overreaction hypothesis implies that a price correction occurs only in January. Prior losers become more attractive investments than prior winners in this period.[66] Therefore, prior losers should have higher trading volumes in January. On the other hand, prior winners should have lower trading volumes in January. The hypothesis also suggests that individual investors overreact, while institutional investors do not. Hence,

---

[66] As mentioned in footnote 59 on p. 52, return reversal occurs on both long-term and short-term winners (losers), which are defined according to their high (low) cumulative excess returns in the studies examining the overreaction hypothesis such as De Bondt and Thaler (1987). However, since the reversal on short-term winners (losers) is weaker than on long-term winners (losers), and in this dissertation, short-term winners (losers) are measured in holding-period returns, rather than cumulative excess returns, we do not test the overreaction hypothesis by inspecting coefficient signs on short-term winners (losers).

prices of stocks with higher institutional ownership are less likely to depart from their underlying fundamental values so that less price correction occurs in January. Specifically, we expect that the losers (winners) with higher institutional ownership should have lower (higher) trading volumes in January than the losers (winners) with lower institutional ownership. The signs of all coefficients predicted by the overreaction hypothesis are summarized in Panel C of Table 2.

3.3.2.4 The Liquidity Hypothesis

The liquidity hypothesis states that the Fed's monetary policy affects expected liquidity profits of individual investors, which in turn will affect turn-of-the-month stock returns. And because individual investors receive most of their liquid profits near the calendar year-end, January (TOTY) returns are particularly higher than returns in other months (other turn-of-the-months). Therefore, we expect that the larger is the Federal funds spread, the proxy for stringency of the Fed's monetary policy, the lower trading volumes will be for the early-December period, December, the turn-of-the-year period, and January.

Furthermore, the hypothesis argues that individual investors prefer investing in small-firm stocks to investing in large-firm stocks, and therefore small-firm stocks have larger January returns. This implies that the coefficient of market equity should be negative in the regression of trading volumes, even in the presence of other explanatory variables. And the coefficient should be more negative in the regression for the turn-of-the-year period (January) than for the early-December period (December). The expected signs of all coefficients for the liquidity hypothesis are summarized in Panel D of Table 2.

3.3.2.5 Comparison of Expected Coefficient Signs For The Four Hypotheses

The comparison for trading volume is very similar to that for returns; please refer to Section 3.2.2.5. In this section, we only discuss the predictions different from returns. As mentioned earlier, some predictions across the hypotheses are opposite, providing an opportunity to test the validity of each individual hypothesis independently and to investigate their relative strength in explaining the January effect. Specifically, the window dressing hypothesis predicts that $c_1 > 0$ and $d_2 > 0$ for December trading volume, while the tax-loss selling/parking-the-proceeds hypothesis predicts $c_1 \leq 0$ and $d_2 \leq 0$. Similarly, the opposite coefficient predictions of f_1 on January trading volume for the window dressing hypothesis ($f_1 \geq 0$) and the overreaction hypothesis ($f_1 < 0$) allow us to further distinguish between these two hypotheses.

3.4 Relation Of Stock Ownership With Stock Price And Firm Size

As mentioned earlier, the January effect is especially pronounced for small firms and since individual investors hold proportionately more smaller-firms stocks than larger-firm stocks, both the overreaction and the liquidity hypotheses imply or claim that the January small-firm effect can be explained by the trading behavior of individual investors. However, Bhardwaj and Brooks (1992) report that the January effect is primarily a low-share price effect and less so a firm size effect. This recent finding raises a new question. That is, could individual investors actually prefer low-share price stocks, rather than small-firm stocks? To answer this question, the following three regressions and the corresponding correlation analysis are conducted for *institutional* ownership, stock price, and firm size (market equity) at the end of calendar quarter during 1988-1995. The reason for using *institutional* ownership, rather than *individual* ownership, is because *individual* ownership data are not available. As mentioned in Section 3.2.1, *institutional* ownership is used as a complementary proxy for *individual* ownership, since the sum of *institutional* ownership and *individual* ownership equals one.

Therefore, first, we regress institutional ownership on stock price to see whether stock price has any explanatory power on stock ownership. Then similarly, we regress institutional ownership on market equity. Lastly, institutional ownership is regressed on both stock price and market equity in one equation. That is, we have

$$\mathrm{INST}_{i,t} = \alpha + \beta^{*}\ln(\mathrm{Price})_{i,t} + \gamma^{*}\ln(\mathrm{ME})_{i,t} + \nu_{i,t} \qquad (7)$$

where $\mathrm{INST}_{i,t}$ is institutional ownership of stock *i* in percentage of total common shares outstanding at the end of the *t*th quarter during 1988-1995. $\mathrm{Price}_{i,t}$ and $\mathrm{ME}_{i,t}$ are stock price and market equity (obtained from the product of stock price times total common shares outstanding), respectively, as of the end of the *t*th quarter during 1988-1995. $\nu_{i,t}$ is the error term.

If individual investors actually prefer low-price stocks, rather than small-firm stocks, then we expect that the observed estimated β should be significantly positive and the observed estimated γ insignificantly different from zero. Alternatively, since institutional ownership is used in the regression, we can also interpret the finding as the evidence supporting the hypothesis that institutional investors prefer high-price stocks.

3.5 Reactions Of Stockholders And Agency Problems

3.5.1 Management

In this dissertation, "management" is referred to as managers of the firms whose stock repurchase and issuance activities are being analyzed, rather than the portfolio or institutional managers mentioned elsewhere. The empirical results for Sections 3.2-3.3 show that risk-preference switching, investor overreaction, and liquid profits may be underlying explanations for the January effect (please refer to Sections 4.1-4.2). To illustrate, suppose risk-preference switching is the underlying explanation of the January effect, i.e., institutional managers lock in their profits by switching from risky stocks to the less risky at year-end and then switch back to risky stock in the following January. For management of the high-risk firm, it will be in the best interests of its stockholders to repurchase shares at the year end and to issue new shares at the turn-of-the-year. This is especially true for the firms for which share repurchase (issuance) can be deferred to December (January), or needs to be done in the very near future anyway.

Therefore, after collecting the data for firms that repurchased or issued new shares during the period of October-March[67] in the year and equally dividing them into two groups according to their standard deviation, σ, we expect that the group with higher standard deviation should have higher probability of stock repurchase in December or stock issuance in January than in other months. That is, the result of a χ^2-test should show that the percentage of stock repurchase in December or stock issuance in January for the higher-standard-deviation group is significantly higher than that for the lower-standard-deviation group. Similarly, for each group, the percentage of stock repurchase in December or stock issuance in January should be significantly higher than that in other months during the period of October-March.

Furthermore, if the overreaction and liquidity hypotheses are correct, we will also expect that the percentage of stock repurchase in December or stock issuance in January for losers and smaller firms and when the Fed's monetary policy is easy will be significantly higher than that for winners and larger firms and when the Fed's monetary policy is stringent, respectively. If individual investors have a preferred habitat of investing in low-institutional-ownership firms, which may have common characteristics preferred by most individual investors, or they tend to increase their stock investments on the firms already owned, rather than on new firms,[68] then we expect that the percentage of stock repurchase in December or stock issuance in January would be higher for low-institutional-ownership firms.

[67] We assume that at least part of share repurchases (issuances), which could have been done during October-March, were actually conducted in December (January).

[68] That is, since in general, individual investors are more familiar with the firms in which they have already invested and owned, when individual investors have additional cash planned to invest in stocks, they may just purchase stocks from the firms that they currently own to avoid incurring extra costs of collecting information about the stocks with which they are unfamiliar and do not own.

3.5.2 Inside Holders

The same argument works for insiders, since they know that the depressed December price of the risky stocks is likely to be temporary[69] and will hence rebound in the following January. Further, if they recognize and decide to take advantage of the knowledge that some stocks such as small-firm stocks or long-term losers tend to earn abnormally high January returns, then they would increase their holdings in December and resell in January or later at a higher price for arbitrage profits.[70] On the other hand, as pointed out by Seyhun (1988, p.130),

> "to observe the effects of the January effect in aggregate insider trading, it is not necessary that insiders actively purchase their own firms' stocks in December and sell their own firms' stocks in January. If insiders believe that the empirically documented price run-up in January in small firms represents a profit opportunity, then, in addition to any other transactions they might engage in, such as buying options or futures contracts on small firms in general, insiders would also be expected to adjust their planned transactions in their own firms."

That is, insiders in small firms would accelerate the planned purchase and trade in December, or delay the planned sale until January to exploit the January effect.[71] Consequently, insider ownership would be higher in December and lower in January than in any other month. In contrast to Seyhun (1988), who investigates the number (and dollar value) of purchases and sales for insider trading during 1975-1981 on stocks of different firm sizes only, this dissertation examines the joint effect of multiple factors on

---

[69] Since the December stock price is depressed due only to reasons such as the window dressing behavior of institutional investors, rather than changes in any market or firm-specific economic factors, the fundamental value of the stock should not be changed. Once the selling pressure on risky stocks is released by year-end, the stock price would rebound back to its intrinsic value. Therefore, the depressed price should be only a temporary departure from the fundamental value.

[70] As pointed out in footnote 10 of Seyhun (1988), section 16(b) of the Securities and Exchange Act of 1934 requires that any profit obtained from a sale and a purchase transaction within six months of each other be returned to the corporation. Therefore, as an alternative, insiders of small firms or long-term losers could purchase additional shares at the end of July and then resell the shares at the end of January or later for arbitrage profits.

change in insider ownership during August 1992-December 1995, which are identified as possible explanatory factors of the January effect in Sections 4.1 and 4.2.

If the evidence shows that insiders change their ownership in December or January according to the above-mentioned arbitrage opportunities, then the exploitability of the January effect is supported. After insider holdings data (both the number of shares held by insiders and the insider ownership in percentage of total outstanding shares) of NYSE/AMEX firms at the end of November, December, and January are collected, the monthly change in number of shares held by insiders for December and January is calculated, respectively.[72] The following regression is then performed:

$$\begin{aligned} \ln^*(\Delta \mathrm{INSD}_{i,t}/\mathrm{INSD}_{i,t,-1}) = \; & a_0 + a_1{}^*\sigma_{i,t} + a_2{}^*D_{LTW,i,t} + a_3{}^*D_{LTL,i,t} + a_4{}^*\mathrm{FFS}_t \\ & + a_5{}^*D_{low\text{-}ME,i,t} + a_6{}^*D_{low\text{-}PRC,i,t} + a_7{}^*D_{low\text{-}INST,i,t} \\ & + \varepsilon_{i,t}; \end{aligned} \tag{8}$$

$\ln^*(\cdot)$ is the transformed logarithmic function as defined in the following:

$$\begin{aligned} &\ln^*(x) \equiv \ln(1+x) \text{ when } x \geq 0, \text{ and} \\ &\ln^*(x) \equiv -\ln(1-x) \text{ when } x < 0, \text{ where } x = \Delta \mathrm{INSD}_{i,t}/\mathrm{INSD}_{i,t,-1} \end{aligned} \tag{8a}$$

$\Delta \mathrm{INSD}_{i,t}$ is the change in insider ownership (in percentage) in December (January) of year t for firm i. That is, $\Delta \mathrm{INSD}_{i,t} = \mathrm{INSD}_{i,t} - \mathrm{INSD}_{i,t,-1}$. $\mathrm{INSD}_{i,t}$ and $\mathrm{INSD}_{i,t,-1}$ are the insider

---

[71] Seyhun (1986) provides evidence of passive as well as active trading by insiders around firm-specific nonpublic information.

[72] If data of insider holdings at the end of November are missing, then the data of the prior October will be used to calculate the December change in insider ownership. Similarly, if data of insider holdings at the end of December are missing, then the data of the prior November will be used to calculate the January change in insider ownership. The replacement of the November insider ownership by the October data would probably be adequate for our study. This is because October's level is highly correlated with November's level and hence October is a good instrumental variable. The use of November, rather than December insider ownership in calculating the January change in insider ownership may seriously bias our study since insiders would increase their stock ownership during December for arbitrage profits. Consequently, our study would be biased towards not finding a significantly negative change in January insider ownership for the stocks with a pronounced January effect such as high-risk stocks, long-term losers, and small-firm stocks. Therefore, the regressions of January change in insider ownership are actually testing the joint effect of the change in both December and January.

ownership (in percentage) as of the end of December and November (January and December), respectively, in year t for firm i.

The purpose of applying this transformed function is to smooth the regression, as the logarithmic function of ln(ME), ln(BE/ME) and ln(PTS) used in equation (3). Unlike ME, BE/ME, or PTS, however, $\Delta INSD_{i,t}/INSD_{i,t-1}$ could vary from -1 to a very large number.[73] This form of transformed function allows that $\ln^*(x) = 0$ when $x = 0$, and that $\ln^*(x)$ curve be symmetrical to the original point. Hence, x and $-x$ will obtain the same absolute value of $\ln^*(x)$. $\sigma_{i,t}$, $D_{LTW,i,t}$, and $D_{LTL,i,t}$ are as previously defined in Section 3.2.1. FFS_t is the Federal funds spread measured at the end of November (December) of year t. $D_{low\text{-}ME,i,t}$ is the dummy variable for stocks in the decile portfolio with the lowest market equity (ME). $D_{low\text{-}PRC,i,t}$ is the dummy variable for stocks in the quintile portfolio with the lowest stock price but not in the quintile portfolio with the lowest ME. $D_{low\text{-}INST,i,t}$ is the dummy variable for stocks in the bottom two quintile portfolios with the lowest

[73] For 193 observations, which is about 2.26% of the observations finally used in the regression, $\Delta INSD_{i,t} = 0$ and $INSD_{i,t-1} = 0$. In these cases, we define $\Delta INSD_{i,t}/INSD_{i,t-1} = 0$. The other 17 observations with zero $INSD_{i,t-1}$, and nonzero $\Delta INSD_{i,t}$ are dropped from this study, since $\Delta INSD_{i,t}/INSD_{i,t-1}$ is infinitely large for these observations. In addition to $\Delta INSD_{i,t}/INSD_{i,t-1}$, other alternatives such as $INSD_{i,t}$ and $\Delta INSD_{i,t}$ could also be used to examine the potential arbitrage activity of insiders. However, using a proportion measure, i.e., $INSD_{i,t}$, is probably inadequate in our cross-sectional regression. This is because $INSD_{i,t}$ will not only vary with change in insider ownership, but also vary with other factors such as firm size. On the other hand, though $\Delta INSD_{i,t}$ is more appropriate than $INSD_{i,t}$ in examining change in insider ownership, it may be less powerful for our task, i.e., investigating the potential arbitrage activity of insiders. To illustrate, suppose insider ownership of firm A and firm B at the end of November is 1% and 10%, i.e., $INSD_{i,t-1}$ = 1% and $INSD_{i,t-1}$ = 10%, respectively. In the following December, insider ownership of firm A and firm B increases to 2% and 11%, respectively. That is, $\Delta INSD_{i,t}$ = 1% for both firms in December. If the increase in December insider ownership exclusively reflects the arbitrage activity of insiders to exploit the January effect, then we believe that the activity is much stronger for the lower-insider-ownership firm A than the higher-insider-ownership firm B. Therefore, using the $\Delta INSD_{i,t}$ measure would underestimate the insiders' arbitrage activity for lower-insider-ownership firms, whose stocks tend to have more pronounced January effect and hence are most likely targets for arbitrages. To overcome this problem, we use $\Delta INSD_{i,t}/INSD_{i,t-1}$ in investigating the potential arbitrage activity.

institutional ownership but neither in the quintile portfolio with the lowest ME nor in the quintile portfolio with the lowest stock price. $\varepsilon_{i,t}$ is the error term.

These definitions of low-price and low-institutional-ownership stocks reduce the possible multicollinearity due to the correlations among stock price, ME, and institutional ownership. The ME and stock price are measured at the end of June in year t for firm i, while institutional ownership is as of the end of September. $D_{low\text{-}ME,i,t}$ and $D_{low\text{-}INST,i,t}$ are used to examine whether insiders of small and low-institutional-ownership firms increase their holdings in December or decrease in January, since the firms may have high January stock returns due to individual investors' preference for investing in these stocks. Because Bhardwaj and Brooks (1992) report that the January effect is primarily a low-share price effect and less so a market value effect, $D_{low\text{-}PRC,i,t}$ is added to explore whether insiders arbitrage on low-price stocks.

If the high January returns are exploitable and insiders arbitrage on the stocks which tend to have high January returns according to the empirical results in Sections 4.1-4.2, then we can predict the coefficient signs in equation (8). We present the expected coefficient signs for the regression in Table 3. The detailed explanations for deriving the expected signs are shown in Sections A9.1 and A9.2 of Appendix 9 (p.252).

Further, to compare insider ownership in December (January) with that in the other months, we calculate the moving average insider ownership across stocks and years for each month in the year. If insiders aggregately arbitrage on the January effect, then we expect that average insider ownership should be significantly higher in December and lower in January than in the other months of the year.

Table 3. Expected Coefficient Signs for Regressions of Insider Ownership Change

Coefficient		Expected	Explanations
Panel A: December Regression			
σ	a_1	+	Insiders of risky firms accelerate their planned purchases at the depressed December prices and delay the planned sales until the following January when prices are high.
D_{LTW}	a_2	–	Insiders accelerate their planned sales before stock prices of long-term winners drop in the following January.
D_{LTL}	a_3	+	Insiders accelerate their planned purchases before stock prices of long-term losers increase in the following January.
FFS	a_4	+	Insiders tend to increase their ownership when stock prices are lower during a stringent-monetary-policy period.
$D_{low\text{-}ME}$	a_5	+	Insiders of small firms accelerate their planned purchases in December and delay the planned sales until the following January when prices are high.
$D_{low\text{-}PRC}$	a_6	+	Insiders of low-price firms accelerate their planned purchases in December and delay the planned sales until the following January when prices are high.[a]
$D_{low\text{-}INST}$	a_7	+	Insiders of low-institutional-ownership firms accelerate their planned purchases in December and delay the planned sales until the following January when prices are high.[b]
Panel B: January Regression			
σ	a_1	–	Insiders of risky firms accelerate their planned purchases at the depressed December prices and delay the planned sales until the following January when prices are high.
D_{LTW}	a_2	+	Insiders delay their planned purchase until January when stock prices of long-term winners are depressed.
D_{LTL}	a_3	–	Insiders delay their planned sales until January when stock prices of long-term losers are generally higher.
FFS	a_4	+	Insiders tend to increase their ownership when stock prices are lower during a stringent-monetary-policy period.
$D_{low\text{-}ME}$	a_5	–	Insiders of small firms accelerate the planned purchases in December and delay the planned sales until the following January when prices are high.
$D_{low\text{-}PRC}$	a_6	–	Insiders of low-price firms accelerate the planned purchases in December and delay the planned sales until the following January when prices are high.[a]
$D_{low\text{-}INST}$	a_7	–	Insiders of low-institutional-ownership firms accelerate their planned purchases in December and delay the planned sales until the following January when prices are high.[b]

[a] Bhardwaj and Brooks (1992) report that the January effect is primarily a low-price effect and less so a small-firm effect.

[b] This prediction is based on the assumption that individual investors have a preferred habitat of investing in low-institutional-ownership firms or they tend to increase their stock investments on the firms already owned, rather than on new firms.

3.5.3 Institutional Holders

Though some authors such as Bhardwaj and Brooks (1992) argue that individual investors cannot exploit the arbitrage opportunity of high January returns of small firms due to high transaction costs, the unit costs may be relatively lower for large blockholders who are more likely to be institutional holders. We explore the role they play in December and January transactions by examining the change in institutional ownership in December and January, respectively (However, if most transactions are conducted among institutional holders themselves, then the change will be minimal). Since only quarterly data on the change in institutional ownership are available, we only examine changes in institutional ownership during the fourth and the first calendar quarters.

Similar to equation (8), the following regression is run:

$$\begin{aligned}\ln^*(\Delta \mathrm{INST}_{i,t}/\mathrm{INST}_{i,t\text{-}1}) = \ & a_0 + a_1{*}\sigma_{i,t} + a_2{*}D_{LTW,i,t} + a_3{*}D_{LTL,i,t} + a_4{*}\mathrm{FFS}_t \\ & + a_5{*}D_{low\text{-}ME,i,t} + a_6{*}D_{low\text{-}PRC,i,t} + a_7{*}D_{low\text{-}INST,i,t} \\ & + \varepsilon_{i,t} \qquad (9)\end{aligned}$$

where $\ln^*(\cdot)$ is the transformed logarithmic function defined in equation (8a) and definitions of variables are the same as in equation (8), except that $\Delta\mathrm{INST}_{i,t}$ is the change in institutional ownership in the fourth (first) quarter of year t for firm i. That is, $\Delta\mathrm{INST}_{i,t} = \mathrm{INST}_{i,t} - \mathrm{INST}_{i,t\text{-}1}$. $\mathrm{INST}_{i,t}$ and $\mathrm{INST}_{i,t\text{-}1}$ are the quarterly institutional ownership (in percentage) as of the end of December (March) and September (December), respectively, in year t for firm i.[74]

[74] For 75 observations, which is about 0.6% of the observations finally used in the regression, $\Delta\mathrm{INST}_{i,t} = 0$ and $\mathrm{INST}_{i,t\text{-}1} = 0$. In these cases, we define $\Delta\mathrm{INST}_{i,t}/\mathrm{INST}_{i,t\text{-}1} = 0$. The other 21 observations with zero $\mathrm{INST}_{i,t\text{-}1}$ and nonzero $\Delta\mathrm{INST}_{i,t}$ are dropped from this study, since $\Delta\mathrm{INST}_{i,t}/\mathrm{INST}_{i,t\text{-}1}$ is infinitely large for these observations.

Similarly, if institutional owners can exploit the January effect, then we will expect to observe the coefficient signs similar to those for insiders. However, since the trading behavior of institutional investors are not restricted by the Securities and Exchange Act of 1934, which requires that any profit obtained from a sale and a purchase transaction within six months of each other be returned to the corporation, we expect that institutional investors are more likely to be involved in active arbitrage activities than passive arbitrage activities. In addition to the purpose of investments and realizing profits, the motivation of adjusting equity ownership for insiders is also related to their needs for controlling the corporation. That is, they may maintain a significant amount of stock holdings even when the current price is overvalued. In contrast, for institutional investors who are not insiders, realizing profits is their primary and sole reason for investments.

Thus, relative to institutions, the planned transactions of insiders are more likely for the purpose of corporate control, and insiders may exploit the January effect by accelerating or delaying their planned transactions so that the ownership adjustments are conducted at the time of more favorable stock prices. But for institutional investors, the planned transactions, if any, are for very a short-term planning horizon since the stock market is highly volatile. For example, after conducting research on a variety of stocks, institutional managers may find out that some of stocks are good investments and decide to purchase those stocks.

The managers would probably conduct their planned purchase transactions very soon, say, in a few days, if the market condition does not drastically change such that the investment becomes unworthy. It is very unlikely that the managers would decide to conduct the transaction one month later, after completing their research. Therefore, unlike the case for insiders, the delay or acceleration of the planned transactions would play less important, if any, role in institutional investors' possible arbitrage activities on the January effect. The expected coefficient signs for the regression testing the arbitrage activities and brief explanations are presented in Table 4. The detailed explanations for deriving the expected signs are shown in Sections A9.3 and A9.4 of Appendix 9.

To compare institutional ownership in the fourth (first) quarter with that in the other quarters, we calculate average institutional ownership for the four calendar quarters during the sample period of 1988-1995, respectively. If the institutional investors aggregately arbitrage on the January effect, then we expect that average institutional ownership should be significantly higher in the fourth quarter and lower in the first quarter than in the other quarters.

3.5.4 Participants In Other Financial Markets

In addition to the above-mentioned participants in the stock market, investors in other financial markets may also react to take advantage of the January effect present in the stock market. Specifically, investors in the options and the bond markets may have the opportunity to arbitrage, given the knowledge that some stocks, such as risky stocks, have strong return seasonality in December and January. Investigating these two financial markets may shed additional insight on the validity of the efficient market

Table 4. Expected Coefficient Signs for Regressions of Institutional Ownership Change

Coefficient		Expected	Explanations
Panel A: The Fourth-Quarter Regression			
σ	a_1	?	Institutional investors arbitrage by purchasing risky stocks at depressed December prices and reselling at higher prices in the following January. But the window dressing activity of risk-preference switching decreases (increases) December (January) institutional ownership of risky firms.
D_{LTW}	a_2	–	Institutional owners of long-term winners sell the stocks before prices drop in the following January (five years).
D_{LTL}	a_3	+	Institutional investors purchase the long-term losers before stock prices increase in the following January (five years).
FFS	a_4	+	Institutional investors purchase less stocks when prices are overvalued due to the strong demand by individual investors during an easy-monetary-policy period.
$D_{low\text{-}ME}$	a_5	+	Institutional investors arbitrage by buying small-firm stocks in December and reselling in the following January when prices are high.
$D_{low\text{-}PRC}$	a_6	+	Institutional investors arbitrage by buying low-price stocks in December and reselling in the following January when prices are high.[a]
$D_{low\text{-}INST}$	a_7	+	Institutional investors arbitrage by buying low-institutional-ownership stocks in December and reselling in the following January when prices are high.[b]
Panel B: The First-Quarter Regression			
σ	a_1	?	Institutional investors arbitrage by purchasing risky stocks at depressed December prices and reselling at higher prices in the following January. But the window dressing activity of risk-preference switching decreases (increases) December (January) institutional ownership of risky firms.
D_{LTW}	a_2	–,±	Institutional ownership of long-term winners should not increase since prices would drop in the following five years.
D_{LTL}	a_3	?	Institutional ownership of long-term losers should not decrease since prices would rise in the following five years. However, in January some institutional investors would sell the stocks purchased in the previous December for short-term arbitrage profits
FFS	a_4	+	Institutional investors purchase less stocks when prices are overvalued due to the strong demand by individual investors during an easy-monetary-policy period.
$D_{low\text{-}ME}$	a_5	–	Institutional investors arbitrage by buying small-firm stocks in December and reselling in the following January when prices are high.
$D_{low\text{-}PRC}$	a_6	–	Institutional investors arbitrage by buying low-price stocks in December and reselling in the following January when prices are high.[a]
$D_{low\text{-}INST}$	a_7	+	Institutional investors arbitrage by buying low-institutional-ownership stocks in December and reselling in the following January when prices are high.[b]

[a] Please refer to the footnote *a* of Table 3 on p. 73.
[b] Please refer to the footnote *b* of Table 3 on p. 73.

hypothesis by answering the question: Does the efficient market hypothesis hold across financial markets? This area of research is worthy for future study.

3.5.4.1 Options Market - Do Options Predict January Effect In Stock Market?

From the empirical results in Section 4.1, we know that the institutional managers with good performance tend to switch to low-risk stocks from high-risk stocks at year-end in order to lock in their profits. They can switch back to high-risk stocks at the turn-of-the-year for high expected returns. Consequently, low December and high January returns for high-risk stocks are observed. If the options market reflects this stock seasonality, then the price of the corresponding (American) call options maturing after December should be higher, ceteris paribus. Similarly, prices of the corresponding (American) put options maturing after January should be higher as well. This seasonality in options should also be observed on the long-term winner and loser stocks.[75] Otherwise, there exist arbitrage opportunities in the options market. Therefore, investigating the options market will provide further evidence on market efficiency and potential trading profits.

3.5.4.2 Bond Market - Do Bond Prices Reflect Changed Financial Risk Due To Changed Market Equity Value (Capital Structure) Of The Firm Given The January Effect Of Stock Market?

As argued in the last section, bond markets also offer an additional opportunity to test efficiency across financial markets. Let us again take risky stocks as an example.

[75] Since the firms with stock options traded are usually large firms, their stock returns in January are probably normal and hence are not exploitable.

Since the prices of risky stocks tend to be depressed in December and then rebound in January, debt-to-equity ratios will increase in December and decrease in January, ceteris paribus. Suppose the seasonality of debt-to-equity ratios does exist, then we would like to ask the next question, does the bond price reflect the changed financial risk? If the markets are efficient and no arbitrage opportunities exist, we should observe that the bond price drops in December and increases in the following January to reflect the increased and decreased financial risk, respectively. This is beyond the scope of this dissertation, but should provide a useful direction for future research.

CHAPTER IV

RESULTS AND DISCUSSION

4.1 Simultaneous Test Of The Four Hypotheses: Evidence From Returns

The result of the cross-sectional regression on returns (Section 3.2) is presented in Table 5. Throughout this dissertation, we use a significance level of 0.10 or smaller. The *t*-statistics for two-tailed tests are presented in parentheses. We use two-tailed, rather than one-tailed, *t*-tests in order to be consistent with prior studies. Use of one-tailed *t*-tests gives similar results and does not change our conclusions.

Before discussing our empirical results of testing the four hypotheses, we first demonstrate that failure to simultaneously controlling for the potentially most important factors may induce specification error. Consequently, results and conclusions would be biased. Since the tax-loss selling hypothesis is probably the most widely tested hypothesis of the January effect in the literature, we test this hypothesis for illustration and regress the year-end and turn-of-the-year returns, respectively, on ln(ME), ln(BE/ME), ln(PTS), and INST*ln(PTS). The results are shown as follows.

$$\underset{}{R_{YE}} = \underset{(4.23^{***})}{1.05} + \underset{(2.78^{***})}{0.12}\ln(ME) + \underset{(2.49^{**})}{0.26}\ln(BE/ME) - \underset{(-4.26^{***})}{0.91}\ln(PTS) + \underset{(5.48^{***})}{2.07}\,INST^{*}\ln(PTS) \quad R^2 = 0.005 \qquad (10)$$

$$R_{TOTY} = \underset{(29.81^{***})}{6.92} - \underset{(-23.01^{***})}{0.91}\ln(ME) + \underset{(4.80^{***})}{0.46}\ln(BE/ME) + \underset{(3.17^{***})}{0.63}\ln(PTS) - \underset{(-2.13^{**})}{0.74}\,INST^{*}\ln(PTS) \quad R^2 = 0.074 \qquad (11)$$

Table 5. Estimated Coefficients for Return Regressions[a]

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	1.29 (2.42**)	1.33 (2.79***)	4.00 (5.92***)	1.55 (3.51***)	2.61 (2.71***)
ln(ME)	0.09 (1.53)	0.09 (1.56)	0.01 (0.13)	-0.33 (-6.27***)	-0.28 (-2.46**)
ln(BE/ME)	0.53 (4.05***)	0.42 (3.56***)	0.86 (5.16***)	0.68 (6.31***)	2.88 (12.08***)
ln(PTS)	0.22 (0.75)	-0.08 (-0.30)	0.27 (0.74)	-0.38 (-1.61)	0.53 (1.01)
INST*ln(PTS)	0.11 (0.21)	0.52 (1.06)	0.51 (0.74)	1.13 (2.51**)	1.27 (1.29)
D_{STW}	1.63 (3.00***)	1.34 (2.74***)	2.76 (3.99***)	-1.00 (-2.18**)	0.06 (0.06)
INST*D_{STW}	-2.93 (-2.35**)	-1.60 (-1.42)	-4.38 (-2.75***)	0.46 (0.42)	0.39 (0.16)
D_{STL}	-0.45 (-0.76)	0.41 (0.79)	0.01 (0.01)	3.91 (8.00***)	3.04 (2.84***)
INST*D_{STL}	-1.11 (-0.72)	-1.00 (-0.72)	-1.98 (-1.01)	-6.59 (-4.97***)	-10.61 (-3.65***)
σ	-6.33 (-2.55**)	-4.34 (-1.94*)	-11.89 (-3.77***)	24.44 (11.86***)	55.44 (13.28***)
INST*σ	-13.28 (-2.22**)	30.45 (5.67***)	27.28 (3.58***)	-15.25 (-3.15***)	-36.09 (-3.40***)
D_{LTW}	0.89 (1.50)	0.32 (0.60)	0.96 (1.28)	-0.95 (-1.93*)	-2.52 (-2.33**)
INST*D_{LTW}	-1.32 (-1.00)	-0.22 (-0.19)	-0.88 (-0.53)	0.67 (0.61)	4.29 (1.77*)
D_{LTL}	-1.48 (-2.47**)	0.42 (0.77)	-0.11 (-0.14)	4.65 (9.18***)	7.48 (6.73***)
INST*D_{LTL}	2.80 (1.65*)	-1.66 (-1.09)	-0.75 (-0.35)	-5.86 (-3.81***)	-7.59 (-2.25**)
FFS	-0.72 (-3.16***)	-0.81 (-3.95***)	-1.34 (-4.60***)	-0.04 (-0.26)	-2.29 (-7.52***)
INST*FFS	1.49 (2.85***)	-0.57 (-1.22)	0.39 (0.59)	-0.29 (-0.91)	1.74 (2.51***)
No. of Obs.	10,682	10,680	10,680	9,021	9,018
Adj-R^2	0.009	0.017	0.015	0.122	0.089

[a] *t*-statistics are displayed in parentheses below the estimated coefficients. [b] The early-December period is defined as remaining December trading days which are prior to the year-end period. [c] The year-end period is defined as the 10-trading-day period prior to the last trading day in the year. [d] The turn-of-the-year period is defined as the five-trading-day period beginning from the last trading day in the previous year.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

where R_{YE} and R_{TOTY} are holding-period return in the year-end and turn-of-the-year periods, respectively; *t*-statistics are presented in parentheses; *** and ** denote the significance levels of 0.01 and 0.05, respectively.

Equations (10) indicates that the observed coefficients of ln(PTS) and INST*ln(PTS) are significantly negative and positive, respectively. This result implies that the higher the tax-loss selling pressure, the more depressed the year-end returns. Further, the higher the institutional ownership, the higher the year-end returns. Similarly, the significantly positive and negative coefficients of ln(PTS) and INST*ln(PTS) in equation (11), respectively, imply that stock prices rebound more strongly in the turn-of-the-year period for heavier year-end tax-loss selling and the higher the institutional ownership, the weaker the price rebound. These observations are exactly the same as those predicted by the tax-loss selling hypothesis.[76] Based on the observed coefficients of ln(PTS) and INST*ln(PTS) in equations (10) and (11), therefore, we could have suggested that the evidence strongly supports the tax-loss selling hypothesis.

However, when we test the tax-loss selling hypothesis by simultaneously including the other potentially important factors in the regression, the empirical results completely change. As shown in Table 5, when we conduct a simultaneous test, nearly all the observed coefficients of ln(PTS) and INST*ln(PTS) become statistically insignificant. In fact, the significantly positive coefficient of INST*ln(PTS) in the regression of the turn-of-the-year returns does not support tax-loss selling, either. Based

[76] As shown in Panel A of Table 1 on p. 48, the tax-loss selling hypothesis predicts that the coefficient of INST*ln(PTS) in January (or turn-of-the-year period) should be negative, if the stock prices rebound back to their fundamental levels in January (or turn-of-the-year period).

on the above results of the simultaneous test in Table 5, we would conclude that the evidence overwhelmingly rejects the tax-loss selling hypothesis.

The above example for testing the tax-loss selling hypothesis clearly shows that we could reach an opposite conclusion if some potentially important factors are omitted in the analysis. Since prior studies reporting a significantly positive relation between tax-loss selling pressure and stock returns in January (or the turn-of-the-year) do not simultaneously control for these potentially important factors, the relation that they find is very possibly spurious. That is, the inconclusive evidence in the literature on testing the tax-loss selling hypothesis could result from inadequate methodology used in some prior studies.

Next, we compare the observed coefficients of ln(ME) and ln(BE/ME) in Table 5 with those in Fama and French (1992). Table 5 shows that the estimated coefficient of ln(ME) is 0.01 and not significant in regression of December returns, but it is -0.28 and significant at the 0.05 level for January returns. This finding indicates that the small firm effect is pronounced in January and is consistent with previous studies. For ln(BE/ME), we get 0.86 and 2.88 for December and January returns, respectively, both significant at the 0.01 level. Compared with -0.11 and 0.35 of ln(ME) and ln(BE/ME), respectively, in Fama and French (1992) using monthly data, our coefficient on ln(ME) in December is higher than the monthly average of -0.11 and in January it is more negative than the monthly average.

On the other hand, the coefficient magnitudes on ln(BE/ME) for both December and January in this study are larger than the monthly average in Fama and French. These differences may result from the additional explanatory variables in our regression and the different sample period in this study.

To investigate this possibility, we rerun Fama and French's two-factor model on monthly returns of the NYSE/AMEX stocks during 1988-1995. The observed coefficients of ln(ME) and ln(BE/ME) are -0.11 and 0.18, respectively, and they are both significant at the 0.01 level. That is, the observed coefficient of ln(ME) is the same as the value in Fama and French (1992) who investigate stock returns during 1963-1990, and our coefficient of ln(BE/ME) becomes much closer to their value of 0.35. Therefore, this result confirms our previous suspicion. In addition to different sample periods used in our and Fama and French's studies, the difference in coefficient estimates may also result from the included sample stocks, since Fama and French examine the NYSE/AMEX/NASDAQ nonfinancial-firm stocks while our sample covers all stocks traded on the NYSE/AMEX.

Further, since the firm size effect concentrates in January and the risk premium may be paid only in January (Tinic and West (1984)), the observed coefficients of ln(ME) and ln(BE/ME) for January returns may be distinctly different from those for returns in the other months. In addition, if any one of the tax-loss selling, window dressing, and risk-preference switching hypotheses is correct, then the coefficient estimates on ln(ME) and ln(BE/ME) for December returns could also be different.[77] Therefore, we run Fama and French's two-factor model for the 1988-1995 NYSE/AMEX stock returns in January, December, and February-November, respectively.

The results of the estimated equations are shown in the following:

$$R_{Jan} = \underset{(30.03^{***})}{11.10} - \underset{(-17.76^{****})}{1.15\ln(ME)} + \underset{(10.25^{***})}{1.61\ln(BE/ME)} \qquad R^2 = 0.034 \tag{12}$$

$$R_{Dec} = \underset{(1.79^{*})}{0.48} + \underset{(9.21^{***})}{0.43\ln(ME)} + \underset{(5.20^{***})}{0.60\ln(BE/ME)} \qquad R^2 = 0.006 \tag{13}$$

$$R_{Feb\text{-}Nov} = \underset{(14.88^{***})}{1.31} - \underset{(-4.15^{***})}{0.06\ln(ME)} - \underset{(-0.05)}{0.002\ln(BE/ME)} \qquad R^2 = 0.0001 \tag{14}$$

where R_{Jan}, R_{Dec}, and $R_{Feb\text{-}Nov}$ are monthly returns in January, December, and February-November, respectively; *t*-statistics are presented in parentheses; *** and * denote the significance levels of 0.01 and 0.10, respectively.

As expected, the absolute magnitudes of the observed coefficients on ln(ME) and ln(BE/ME) are largest for the January regression. The absolute magnitudes of the observed coefficients are also larger for December than for February-November. If ln(ME) and ln(BE/ME), as suggested by Fama and French (1992), are proxies for unknown economic risks, then equations (12)-(14) show that investors pay a positive risk premium on small-firm stocks during January-November but in contrast, pay a negative risk premium in December. This might be consistent with the risk-preference switching hypothesis. However, this switching does not occur on the risk proxied by ln(BE/ME), since the coefficient estimates are positive for both January and December returns. In fact, the risk premium on ln(BE/ME) is only paid in January and December. The insignificant coefficient estimate of ln(BE/ME) for February-November seems consistent with the finding of Fant and Peterson (1995) shown below.

---

[77] In contrast, the overreaction hypothesis implies that the price correction occurs only in January and the liquidity hypothesis claims higher January returns due to larger year-end liquid profits. These two hypotheses do not predict any abnormal stock returns or trading activities in December.

Fant and Peterson (1995), investigating the NYSE/AMEX/NASDAQ nonfinancial firms during 1976-1991, regress January returns and holding-period-returns during February-December, respectively, on four explanatory variables including ln(ME), ln(BE/ME), prior-three-year returns, and beta. They report that the observed coefficients of ln(ME) and ln(BE/ME) are -1.16 and 0.34, respectively, for January returns. Both coefficient estimates are significant at the 0.05 level. Their observed coefficient of ln(BE/ME) is very close to Fama and French's 0.35, but the absolute magnitude of their coefficient estimate on ln(ME) is much larger than -0.11 of Fama and French.

In contrast, Fant and Peterson's coefficient estimates of ln(ME) and ln(BE/ME) are both insignificant at the 0.10 level for February-December holding-period-returns. If we rerun Fama and French's two-factor model with non-January monthly returns, i.e., we pool the observations used in equations (13) and (14), then the observed coefficients of ln(ME) and ln(BE/ME) are insignificant at the 0.10 level as well.[78] Therefore, though the magnitudes of observed coefficients on ln(ME) and ln(BE/ME) in Table 5 are not as expected, they are consistent with the findings of Fama and French (1992) and Fant and Peterson (1995).

Next, we examine the observed estimated coefficients for the other independent variables used to test the four major hypotheses. For simplicity, we omit the expected estimated coefficients that require additional assumptions. To facilitate comparison of

---

[78] The estimated equation for monthly returns during February-December is as follows:

$$R_{Feb\text{-}Dec} = \underset{(14.69^{***})}{1.23} - \underset{(-1.18)}{0.02}\,\ln(ME) + \underset{(1.48)}{0.05}\,\ln(BE/ME) \qquad R^2 = 0.0000$$

If ln(ME) and ln(BE/ME) are proxies for economic risk, then the above insignificant coefficient estimates are consistent with the view of Tinic and West (1984) that the risk premium is paid only in January.

the observed and the expected coefficient signs for each tested hypothesis, both expected and observed coefficient signs are displayed side-by-side in Table 6. It will be easier to judge the validity of these hypotheses by directly comparing the signs in Table 6. The detailed discussions on the empirical results are in the remainder of this section.

4.1.1 The Tax-Loss Selling/Parking-The-Proceeds Hypothesis[79]

We examine the tax-loss selling/parking-the-proceeds hypothesis by inspecting the coefficients on ln(PTS), D_{STW}, D_{STL}, and their interaction terms with institutional ownership variable, INST. Table 5 shows that the coefficients of ln(PTS) and INST*ln(PTS) for returns in every period are not significantly different from zero, except that the coefficient of INST*ln(PTS) is significantly positive at the 0.05 level for the turn-of-the-year return. This implies that there is no evidence supporting the relation between

---

Specifically, they find that high-beta stocks earn the same ex-post monthly returns as low-beta stocks for all months in the year except January.

[79] As mentioned in Section 3.2.2.1, if our PTS proxy is an adequate measure and tax-loss selling is the sole explanation of the January effect, then we will expect that the coefficient of ln(ME) should be constant across regressions of stock returns for December, January, or any other months. That is, once PTS is controlled, investors should not pay a higher risk premium for small-firm stocks in January than in the other months. However, as mentioned earlier, the observed coefficient of ln(ME) is insignificantly different from zero in the December return regression but significantly negative in the January return regression. This suggests that risk premium for small-firm stocks is higher in January than in December. Therefore, the evidence does not support the joint hypothesis that our PTS proxy is an adequate measure and tax-loss selling is the sole explanation of the January effect.

Table 6. Expected and Observed Coefficient Signs for Return Regressions[a]

		December Returns[b]		January Returns[c]	
		Expected	Observed	Expected	Observed
Panel A: Tax-Loss Selling/Parking-the-Proceeds Hypothesis					
ln(PTS)	b_1	–	±	+	±
INST*ln(PTS)	b_2	+	±	(–)	+,±
D_{STW}	c_1	+,±	+	–,±	–,±
INST*D_{STW}	c_2	–,±	–	+,±	±
D_{STL}	d_1	–,±	±	+,±	+
INST*D_{STL}	d_2	+,±	±	(–,±)	–
Panel B: Window Dressing Hypothesis					
D_{STW}	c_1	+	+	–,±	–,±
INST*D_{STW}	c_2	(+)	–	(–,±)	±
D_{STL}	d_1	–	±	+	+
INST*D_{STL}	d_2	–	±	(+,±)	–
σ	e_1	–	–	+	+
INST*σ	e_2	–	–(+)[d]	(+,±)	–
D_{LTW}	f_1	+	±	–,±	–
INST*D_{LTW}	f_2	(+)	±	(–,±)	+,±
D_{LTL}	g_1	–	–(±)[e]	+	+
INST*D_{LTL}	g_2	–	+,±	(+,±)	–
Panel C: Overreaction Hypothesis					
D_{LTW}	f_1		±	–	–
INST*D_{LTW}	f_2		±	+	+,±
D_{LTL}	g_1		–(±)[e]	+	+
INST*D_{LTL}	g_2		+,±	–	–
Panel D: Liquidity Hypothesis					
ln(ME)	a_1	–	±	–	–
FFS	h_1	–	–	–	–,±
INST*FFS	h_2	+,±	+,±	+,±	+,±

[a] "+" stands for significantly positive, "–" for significantly negative, "±" for insignificant. To get a "+" ("–"), the coefficients must be significantly positive (negative) in at least two subperiods.
[b] This column includes returns in December, the early-December (ED), and the year-end (YE) periods for all four hypotheses, except the liquidity hypothesis which excludes the YE period.
[c] This column includes monthly return in January and return in the turn-of-the-year (TOTY) period.
[d] Coefficient is negative for the ED period and is positive for the YE period and the whole December.
[e] Coefficient is negative for the ED period and is not significant for the YE period and December.

tax-loss selling pressure and stock returns. As shown in Panel A of Table 6, nearly all empirical results on the coefficients of ln(PTS) and INST*ln(PTS) are against the hypothesis.

On the other hand, since our PTS proxy is, as indicated in Appendix 2, still an imperfect proxy for real potential tax-loss selling pressure, the above opposing evidence may result from some reason other than absence of a relation between return and tax-loss selling. There are several possible reasons. First, our PTS proxy may be wrong due to invalid assumptions or failure to include unknown but relevant factors. As mentioned earlier in Section 3.3.1, the exact functional form for $G(YV_{end})$ is unknown, but we assume $\frac{1}{YV_{end}}$ for $G(YV_{end})$ in the empirical tests of this dissertation. We may have a wrong functional form for $G(YV_{end})$. Also, in deriving the PTS formula, the assumption of constant $F(TC,RSCG,RLCG,DTAX,LD,AUCL,EV,IR)$ may be invalid. Or perhaps institutional ownership should be directly included in the PTS formula, instead of using ln(PTS) and INST*ln(PTS) as explanatory variables.

Second, we may test the hypothesis with a sample period (1988-1995) with less motivation for tax-loss selling. As shown in Appendix 3, the Tax Reform Act of 1986 rules that both short-term and long-term net capital gains (losses) are taxed as (deducted from) ordinary income, but the maximum tax rate for net long-term capital gains is 28%. Since the highest personal tax rate was 28% during 1986-1989, actually there is no distinction between short-term and long-term capital gains (losses) for our earlier sample period, 1988 and 1989.

The tax rates are slightly different for the individuals in the highest tax-bracket during 1990-1992 (31% for short-term and 28% for long-term capital gains) and indifferent for others. After 1992, the largest possible spread between the tax rates on personal capital gains is 39.6% for short-term and 28% for long-term. This means the long-term capital gains are taxed at about 71% of the short-term rate. However, according to Constantinides (1984) and Chan (1986), long-term capital gains are taxed at only 40-50% of the investor's marginal tax rate on ordinary income during 1942-1985. That is, the long-term gains are taxed at about half the short-term rate during 1942-1985.

As pointed out by Constantinides (1984), the distinction of short- and long-term tax rates gives investors strong motivation to realize capital losses short-term and capital gains long-term and reduces the barrier for security trading due to transaction costs. Without the distinction between the rates, the only motivation left for year-end tax-loss selling is deferring current tax payments to the next tax-year.[80] This motivation will probably be mostly, if not fully, offset by transaction costs and, if the selling pressure depresses stock price, the lower December stock price. Therefore, we are testing the tax-loss selling/parking-the-proceeds hypothesis in a time period with less motivation for year-end tax-loss selling.[81]

---

[80] However, the deduction of capital losses from ordinary income will expire if the capital loses are not realized in the current tax year. During our sample period, the deduction is limited at $3,000 in any tax year and can be carried forward indefinitely. To benefit from the deduction, however, individual investors can realize the capital losses anytime during the year, rather than in December, since there is no distinction between short-term and long-term tax rates.

[81] We rerun the regression by subset of the sample: one for 1988-1989, when motivation for tax-loss selling is lower, and the other for 1990-1995, when the motivation is higher (result not shown here). However, the empirical result does not provide any evidence supporting the conjecture that tax-loss selling is stronger for 1990-1995 than 1988-1989.

Next, we focus on returns of short-term winners. Table 5 indicates that the coefficient of D_{STW} is significantly positive in December and the two subperiods, the early-December (ED, hereafter) and the year-end (YE, hereafter) periods, and is significantly negative in the turn-of-the-year (TOTY, hereafter) period. This may seem to support the hypothesis, since in December individual investors would postpone realizing capital gains until the turn of the following year.

The evidence from the observed coefficients of INST*D_{STW} also supports the hypothesis. Table 5 shows that the coefficient of INST*D_{STW} is significantly negative for returns in the ED period (-2.93) and December (-4.38). This is consistent with the predictions of the hypothesis that December returns for winners with higher institutional ownership will be lower, since those firms have a lower percentage of individual shareholders who postpone selling winners in December. Therefore, as shown in Panel A of Table 6, the overall evidence from return of short-term winners tends to support the tax-loss selling hypothesis.

Lastly, we examine the coefficients for short-term losers, D_{STL} and INST*D_{STL}. Table 5 shows that coefficients of D_{STL} and INST*D_{STL} are not significant for December or any subperiod in December. But the coefficient of D_{STL} is significantly positive for both the TOTY period and January. As shown in Table 6, these observations are consistent with the hypothesis. They imply that stock prices of short-term losers begin to increase in January (TOTY period) after depressed returns during the previous January-November period. In addition, this price increase is larger for low-institutional-ownership stocks than for high-institutional-ownership stocks.

In summary, the evidence from the PTS variable is strongly against the tax-loss selling hypothesis, while the evidence from short-term winners and losers tends to supports it. However, the opposing evidence from the PTS variable may be due to imperfection of the proxy itself or testing the hypothesis during a sample period with weaker motivation for year-end tax-loss selling.[82] On the other hand, as argued earlier, since prior return is not an adequate proxy for capital gain/loss, we allow the coefficients of D_{STW}, INST*D_{STW}, D_{STL}, and INST*D_{STL} to be zero in testing the tax-loss selling hypothesis. As shown in Table 6, about half of the observed coefficients of these four variables are insignificantly different from zero. If we regard these insignificant results as evidence against, rather than consistent with, tax-loss selling, then the evidence from short-term winners and losers is mixed. Consequently, the overall results tend to reject the tax-loss selling hypothesis.

4.1.2 The Window Dressing Hypothesis

To examine this hypothesis, we inspect return patterns for short-term winners (losers), long-term winners (losers), and the own standard deviation variable. The

---

[82] Prior studies using different PTS proxies, such as Reinganum (1983) and Roll (1983), report a positive relation between tax-loss selling and January return. However, as shown in our sensitivity test (Section A10.2), using Roll's proxy turns the insignificant estimated coefficients of PTS and INST*PTS into significant, but most of the changes provide stronger evidence against the hypothesis (Section A10.2.2). In contrast, using Reinganum's proxy makes the observed return pattern almost identical to the expected result, but the evidence from trading volume is still against the hypothesis (Section A10.2.1). Therefore, using other proxies widely used in the literature does not change our conclusion. Further, since our PTS is probably positively correlated with D_{STL} and negatively correlated with D_{STW}, one may suspect that the insignificant results of PTS may be the consequence of multicollinearity. To investigate this possibility, we rerun the regressions by deleting D_{STL}, D_{STW}, INST*D_{STL}, and INST*D_{STW}. We find that, however, none of the estimated coefficients of ln(PTS) and INST*ln(PTS) are significant at the 0.10 level. The result is the same after we further drop D_{LTL}, D_{LTW}, INST*D_{LTL}, and INST*D_{LTW} from the regression. Alternatively, if we drop ln(PTS) and INST*ln(PTS) from equation (3), the findings from the coefficients of D_{STL}, D_{STW}, INST*D_{STL}, and INST*D_{STW} are exactly the same as those from the original regression.

hypothesis does not have sign predictions on the institution-ownership interaction terms for some time periods. Please refer to Panel B of Table 6 for the coefficients predicted by the window dressing hypothesis.

As mentioned in the above section, the coefficient of D_{STW} is significantly positive for returns in the ED period, the YE period, and December but is significantly negative in the TOTY period. This is consistent with the view that institutional investors buy winners before year-end and resell them in the following January or later. However, the results from short-term losers do not support the hypothesis. As pointed out earlier, Table 5 shows that the coefficients of D_{STL} and INST*D_{STL} are not significant for December or any subperiod in December. As shown in Table 6, this finding is not consistent with the window dressing hypothesis,[83] which states that institutional investors would sell losers for window dressing such that the December return on losers is depressed and the depressed return is more prominent for stocks with higher institutional ownership.

Next, we inspect the coefficient of own standard deviation, σ. Table 5 shows that the coefficient of σ is significantly negative for returns in the ED period, the YE period, and December, and then becomes significantly positive for returns in the TOTY period and January. This risk-preference switching pattern is strongly consistent with Haugen and Lakonishok's version of window dressing, since it implies that high-risk stocks are sold in December and bought back in January.

[83] The significantly positive coefficient of D_{STL} for January (TOTY) agrees with the window dressing hypothesis, however.

We next direct our attention to the coefficient of INST* σ for December trading volume (the window dressing hypothesis does not explicitly imply a relation between institutional ownership and January trading volume). Table 5 shows that the coefficient of INST* σ is significantly positive for returns in the YE period and December, but is significantly negative for returns in the ED period. The positive sign for the YE period and December is not consistent with the window dressing hypothesis, since it implies that stocks with higher institutional ownership will be less actively sold in these periods. On the contrary, the negative sign for the ED period supports the hypothesis. Therefore, if there is risk-preference switching before year-end, it occurs in the ED period.[84]

Next, we examine long-term winners. Table 5 indicates that the coefficient of D_{LTW} is significantly negative for the TOTY period and January, but not significantly different from zero for any period in December. The negative coefficient of D_{LTW} implies that long-term winners are sold in January (TOTY), and is consistent with window dressing. However, the insignificant coefficient of D_{LTW} for December does not provide any further support for this hypothesis. Therefore, the evidence from long-term winners only weakly supports window dressing.

Lastly, Table 5 shows that the coefficient of D_{LTL} is significantly positive for the TOTY period and January, but is only significantly negative for the ED period. This finding agrees with the hypothesis of window dressing (Panel B of Table 6). The negative coefficient of D_{LTL} for the ED period implies that long-term losers are sold in the ED period, and the positive coefficient of D_{LTL} for January (TOTY) implies that

[84] Risk-preference switching might occur earlier in the year such as October or November. However, this

institutional investors aggregately repurchase these long-term losers in January (TOTY). Therefore, it is consistent with window dressing. In addition, similar to the case of σ, if institutional investors do window dress by selling long-term losers before year-end, it happens in the ED period only.

If the above argument is true, we will also expect that long-term losers with higher institutional ownership should be more actively sold and hence have more depressed returns in the ED period than those with lower institutional ownership. However, we find that the coefficient of INST*D_{LTL} for return in the ED period is significantly positive, contradicting the above prediction. Therefore, the evidence from long-term losers does not support the window dressing hypothesis.

In summary, evidence from short-term winners strongly supports window dressing (but it also tends to support the tax-loss selling/parking-the-proceeds hypothesis). Also, evidence from examining stock riskiness provides strong support for window dressing. However, in general, the evidence from short-term losers, long-term winners, and long-term losers does not support this hypothesis. Therefore, our overall empirical evidence tends to be against the traditional window dressing hypothesis, but strongly supports the risk-preference switching explanation.

4.1.3 The Overreaction Hypothesis

To test the overreaction hypothesis, we inspect the coefficients of D_{LTW}, INST*D_{LTW}, D_{LTL}, and INST*D_{LTL} for January and the TOTY period. Table 5 shows that

---

scenario is less likely. Please refer to footnote 27 on p. 27 for detailed discussion.

the coefficient of D_{LTW} is significantly negative for the TOTY period and January, and that the coefficient of INST*D_{LTW} is significantly positive for January. This is consistent with investor overreaction, since it implies that long-term winners are an unattractive investment in January (and hence have lower January returns), and that the winners with higher institutional ownership are less unattractive (and hence have higher January returns) than those with lower institutional ownership, because of lower probability of being overvalued due to prior overreaction of their individual shareholders.[85]

More convincingly, Table 5 indicates that the coefficients of D_{LTL} are significantly positive for returns in both the TOTY period and January. Consistently, the coefficients of INST*D_{LTL} are significantly negative for returns in both the TOTY period and January. In contrast to long-term winners, these findings imply that long-term losers are more attractive investments in January (and hence have higher January returns), and that the losers with higher institutional ownership are less so attractive (and hence have relatively lower January returns) because of a lower probability of being undervalued due to prior overreaction of their individual shareholders. These results strongly support investor overreaction. Further, the observed coefficients of D_{LTL} and INST*D_{LTL} are much greater than those of D_{LTW} and INST*D_{LTW} (in absolute magnitude).

In summary, evidence from long-term winners supports the overreaction hypothesis and evidence from long-term losers is even stronger, since the observed coefficients of D_{LTL} and INST*D_{LTL} are the same as the expected and are much greater than those of D_{LTW} and INST*D_{LTW}. This phenomenon itself is consistent with the

[85] The overreaction hypothesis does not state that the price correction concentrates in the TOTY period and hence the absence of significantly positive coefficient of D_{LTW} for the TOTY period does not weaken the

hypothesis, since previous studies report that overreaction is asymmetric, i.e., the market overreacts to losers at a larger extent than winners. Therefore, we conclude that the overall empirical evidence strongly supports the overreaction hypothesis.

4.1.4 The Liquidity Hypothesis

The liquidity hypothesis claims that individual investors prefer investing in small firm stocks such that the January effect is especially pronounced for small firms. Table 5 shows that the coefficient of ln(ME) is significantly negative for returns in the TOTY period and January. Obviously, this result is consistent with the liquidity hypothesis. However, the coefficient is not significant for returns in any period of December. As shown in previous discussions, those stocks which are short-term or long-term losers, or exhibit greater variability (and hence greater risk), tend to have depressed returns in December. We also know that small, i.e., low market equity, firms are on average riskier (have higher beta) than large firms, and losers tend to be smaller firms.

Therefore, other things being equal, the December return for smaller firms is likely to be lower than that for larger firms. Consequently, the corresponding coefficient of ln(ME) would become more positive.[86] This may explain why the coefficient is positive, though not significant, for December's return. On the other hand, the liquidity hypothesis argues that the small-firm effect is strongest in January, since individual

---

hypothesis substantially.

[86] That is, though the stock riskiness (σ) and dummy variables for short-term and long-term losers are all specified in the regression, we suspect that the correlations between firm size and these variables could incur multicollinearity problem and result in the insignificant and positive estimates for ln(ME).

investors receive most of their yearly liquid profits before year-end.[87] The insignificant coefficient of ln(ME) for December return is not as discouraging as it would be if found for January.

Further, as mentioned in Section 3.2.2, if Fama and French's two-factor model is valid in explaining cross-sectional returns and the liquidity hypothesis is an underlying explanation of the January effect, we expect that the observed coefficient of ln(ME) for the January return regression (-0.28) should be significantly lower than -0.11, which is the monthly average both for the NYSE/AMEX stocks during 1988-1995 in this study and for the NYSE/AMEX/NASDAQ stocks during 1963-1990 in Fama and French (1992). Therefore, we also conduct a F-test testing the hypothesis that the observed coefficient of ln(ME) in the January return regression is equal to -0.11. The result (not shown here) shows that we can not reject the above hypothesis at the 0.10 level, but the p-value is marginally significant with a value of 0.11. Therefore, this finding tends to offer additional support for the liquidity hypothesis.

Except for the minor inconsistency due to the insignificant coefficient of ln(ME) in the December return regression, other observations are the same as those predicted by the hypothesis and hence strongly support the liquidity hypothesis. Table 5 shows that the coefficient of FFS is significantly negative for returns in the ED period, December, and January. Further, the coefficient of INST*FFS is significantly positive for returns in the ED period and January. In contrast, the coefficient of FFS is negative but

[87] This implies that, as mentioned in Section 3.2.2.4, the coefficient of ln(ME) should be more negative in the return regression of January than of December. Since the observed coefficient of ln(ME) is significantly negative in the January return regression and insignificantly different from zero in the

insignificant for returns in the TOTY period. Nevertheless, the TOTY period covers a period with the length of only five trading days, rather than about 10 trading days in one half of a typical month. Therefore, the negative but not significant coefficient of FFS for the TOTY return may not be a serious problem for the hypothesis, especially given the fact that the coefficient is significantly negative for January return.[88] Similarly, the observed insignificant coefficient of INST*FFS for returns in the TOTY period could be due to the same reason, though it is negative, rather than positive. Therefore, in general, evidence from ln(ME), FFS, and INST*FFS strongly supports the liquidity hypothesis.

4.1.5 Diagnostic Test on Multicollinearity

Our regression equation (3) on p. 41 contains many independent variables, and as shown later in Table 14 (p. 139) of Section 4.4, there exists strong correlation between ln(ME) and INST.[89] If multicollinearity is present, the estimated coefficient will not really measure the influence of the independent variable upon the mean value of the dependent variable. Rather, it measures only a partial influence, and the estimated coefficient depends upon which of the correlated independent variables are in the model. Extreme cases of multicollinearity can cause the least squares point estimates to be far

---

December return regression, this finding suggests that the small-firm effect is stronger in January and hence is consistent with the liquidity hypothesis.

[88] On the other hand, the insignificant coefficient of FFS in the TOTY trading volume regression may result from the delay for getting bonus checks cashed. This is because there may be few business days during the TOTY period due to New Year's Day.

[89] Table 14 on p. 139 indicates that the Pearson correlation coefficient for ln(ME) and INST is 0.6087 and significant at the 0.01 level.

from the true values of the regression parameters. In fact, some of the least squares point estimates may have the wrong sign.[90]

More importantly, when multicollinearity exists, the standard error for estimated coefficients will become very large, resulting in smaller *t*-statistics (in absolute value). Consequently, we tend to find an insignificant relation between dependent variable and independent variables. There are several methods to examine the presence and the extent of multicollinearity. In this dissertation, the variance inflation factor is used. A brief introduction about this method is presented in Section A10.1 (Appendix 10).

We calculate the variance inflation factor (*VIF*) for each independent variable in regressions of returns and trading volumes, though most of the estimated coefficients in our regressions are statistically significant. If the largest *VIF* in a regression is larger than 10, then multicollinearity may be considered as serious.[91] The obtained *VIF*s are presented in Table A10-1 of Appendix 10. Table A10-1 shows that none of those *VIF*s is larger than 10, and the largest *VIF* in the five regressions is 6.85. Therefore, multicollinearity is unlikely to be a serious problem in these regressions.

4.1.6 Sensitivity Tests On Independent Variables

To make sure that the results in Table 5 are methodologically and statistically robust so that our conclusions do not depend upon specially-defined independent variables used in the regressions, we conduct a series of sensitivity tests on the

---

[90] Bowerman, B. L. and R. T. O'Connell, 1990, *Linear Statistical Methods: An applied approach*, 2nd ed., p. 440-441, Boston, MA: PWS-Kent.
[91] The value of 10 is somewhat arbitrary, but is conventionally used as the benchmark indicating serious multicollinearity.

regressions by using independent variables of alternative definitions. These tests include a variety of changes in the independent variables used in our regressions, and the results and detailed discussions are presented in Appendix 10. We consider all empirical evidence from these sensitivity tests in our final conclusions on testing the four hypotheses. The changes in the independent variables are introduced and briefly explained in the following.

4.1.6.1 Maximum-To-End Price Ratio As The PTS Proxy

As pointed out in Section 4.1.1, the evidence from the PTS variable is strongly against the tax-loss selling/parking-the-proceeds hypothesis, while the evidence from short-term winners and losers supports it. Although our PTS proxy is more adequate than those used in the literature, it is still imperfect due to the omission of some relevant factors. To investigate the possibility that the opposing evidence is obtained solely because of the special PTS proxy employed in this dissertation, we replace our PTS proxy, ln(PTS), by the ones used in previous studies.

We first apply the ratio of maximum stock price in the year to year-end stock price, P_{max}/P_{end}, which is used in Reinganum (1983), Berges, McConnell, and Schlarbaum (1984), and Chan (1986), as the measure for potential tax-loss selling pressure.[92] The results of regressions are displayed in Table A10-2 (Appendix 10). Briefly, we find that use of this proxy makes the observed return patterns almost identical to those expected by

[92] These studies actually use P_{end}/P_{max}, rather than P_{max}/P_{end}. But for the illustration purpose, we employ P_{max}/P_{end} in this study. The empirical results (not shown here) show that our conclusion will not be changed by the use of different measures.

the tax-loss selling hypothesis, but the results from trading volumes (Section A11.1) remain against the hypothesis. Detailed discussions are shown in Section A10.2.1.

4.1.6.2 Prior January-November Return As The PTS Proxy

In this section, we employ the holding-period-return in the prior January-November, $R_{Jan\text{-}Nov}$, as the measure for potential tax-loss selling pressure. This measure is used in Roll (1983) and Brauer and Chang (1990). The results of regressions are presented in Table A10-3. In short, this proxy has somewhat different results from our PTS, but they both lead to the same conclusion. That is, the evidence is still against the tax-loss selling hypothesis. Detailed discussions are shown in Section A10.2.2. Noteworthily, $R_{Jan\text{-}Nov}$ is expected to have a negative relation with our PTS proxy. That is, higher-PTS stocks should have lower $R_{Jan\text{-}Nov}$. Therefore, the coefficient signs of $R_{Jan\text{-}Nov}$ and INST*$R_{Jan\text{-}Nov}$ expected by the tax-loss selling hypothesis should be opposite to ln(PTS) and INST*ln(PTS) shown in Table 6, respectively.

4.1.6.3 Five-Percent Ranking For Winners And Losers

We next investigate whether regression results change when definitions of other independent variables are slightly different. First, rather than defining losers and winners (both short-term and long-term) as the stocks in the top and bottom return-decile, respectively, we narrow the definition of winners and losers to those with the top and bottom 5% ranking, respectively.[93] The regressions are rerun accordingly, and the results

[93] Prior studies testing the overreaction hypothesis, such as De Bondt and Thaler (1985), define long-term winners (losers) as the 50 NYSE stocks with the highest (lowest) cumulative excess return over the past

are presented in Table A10-4. Briefly, we get changed statistical significance levels for some estimated coefficients. That is, some significant estimates now become insignificant and some insignificant ones turn to significant. Specifically, the observed coefficient of INST*D_{LTW} for January returns become insignificant. These changes slightly weaken the overreaction hypothesis.

4.1.6.4 Four-Year Estimation Period For Long-Term Winners And Losers

Since the long-term winners and losers are obtained by calculating their cumulated monthly excess returns over the past five years before the prior December, they could be correlated with the short-term winners and losers measured over the prior January-November period. As mentioned earlier, if the correlation is strong, then serious multicollinearity could appear.[94] To investigate whether this potential multicollinearity problem changes our results or not, the cumulated excess return is measured over the four-year period ending on the last trading day in the prior year. The regressions are rerun and the results are displayed in Table A10-5. Table A10-5 shows that the outcomes are very similar to those in Table 5.

---

five years. This is equivalent to the top (bottom) 5% ranking, because there are approximately 1,000 stocks traded on the NYSE stock market. However, they then run regressions on these 100 stocks only, rather than using dummy variables to mark these winners and losers in the regression of all NYSE stocks.

[94] As shown earlier, the diagnostic test in Section 4.1.5 indicates that multicollinearity is not serious in our regressions. However, since some of our independent variables are highly correlated, we may not exclude the possibility that some of the observed insignificant coefficients in Table 5 could result from multicollinearity. Specifically, both the Pearson and Spearman analyses show that the correlation coefficient between the dummy variables for long-term and short-term winners (losers) is 0.21 and significant at the 0.01 level. The Pearson (Spearman) correlation between ln(PTS) and D_{LTL} is 0.18 (0.21). In contrast, the correlation between ln(PTS) and D_{STL} is much stronger. We obtain 0.63 and 0.54 for the Pearson and Spearman correlation coefficients, respectively. All the above correlation coefficients are significant at the 0.01 level.

4.1.6.5 Non-Systematic Risk To Replace Own Standard Deviation

According to the CAPM (Capital Asset Pricing Model), own standard deviation can be decomposed into two components, the systematic (non-diversifiable) risk and the non-systematic (diversifiable) risk. That is,

$$\sigma_i = \beta_i{*}\sigma_m + \sigma_i^{\mathrm{NS}} \tag{15}$$

where σ_i = own standard deviation for stock i; $\beta_i{*}\sigma_m$ = systematic (non-diversifiable) risk for stock i; σ_i^{NS} = non-systematic (diversifiable) risk for stock i; β_i = beta for stock i; σ_m = standard deviation for market return.

Since the explanatory power of the CAPM is dubious, our regressions do not include beta, but employ Fama and French's two-factor expected return model instead.[95] However, if beta really does not have explanatory power for cross-sectional stock returns, the inclusion of the systematic risk, $\beta_i{*}\sigma_m$, in regressions may be redundant. Therefore, we drop the systematic risk and replace σ_i by the non-systematic risk (σ_i^{NS}) in our regressions. The results are shown in Table A10-6. They are slightly different from those that we got previously, but do not change any of our preliminary conclusions.

4.1.6.6 Beta And Non-Systematic Risk To Replace Own Standard Deviation

To examine whether the regression results drastically change if beta is present in regressions, we also add beta, together with non-systematic risk, into the regressions.

[95] Fama and French (1992) find that beta has no explanatory power for the cross-sectional stock returns during 1963-1990. Instead, firm size (market equity) and book-to-market equity ratio are the two most

The results are displayed in Table A10-7. We find that β and INST*β have no explanatory power in explaining December returns. In contrast, the coefficients of β and INST*β are significantly positive and negative, respectively, for January returns, which are very similar to the patterns for coefficients of σ and INST*σ.[96] Other results are very similar to those previously found in Table 5.

4.1.7 Statistical Significance Of The Four Hypotheses

In order to examine the four hypotheses by including all empirical results obtained in the above sensitivity tests (Table A10-2 to Table A10-7), we summarize all the regression results in Table 7, which shows only coefficient signs as Table 6 does. Most of the results in Table A10-2 to Table A10-7 are very similar to those in Table 5. Therefore, when the results from the sensitivity tests are different from those in Table 6, they are typed in a larger font size to distinguish them from the original coefficient signs in Table 6. Use of these broader test results, though making some examinations on independent variables inconclusive, strengthens the power of our regression analysis. Consequently, our conclusions on testing the four hypotheses are more conservative and convincing.

---

significant factors in explaining the cross-sectional returns. They argue that these two factors are both proxies for economic risk of firms. Please refer to Section 3.2.2 on p. 45 for detailed explanation.

[96] This finding may suggest that β and σ are proxies for each other.

Table 7. Comprehensive Comparisons for Expected and Observed Coefficient Signs in Return Regressions[a]

		December Returns[b]		January Returns[c]	
		Expected	Observed	Expected	Observed
Panel A: Tax-Loss Selling/Parking-the-Proceeds Hypothesis					
ln(PTS)	b_1	–	–,±	+	–,±
INST*ln(PTS)	b_2	+	+,–,±	(–)	+,±
D_{STW}	c_1	+,±	+	–,±	–,±
INST*D_{STW}	c_2	–,±	–	+,±	±
D_{STL}	d_1	–,±	±	+,±	+,±
INST*D_{STL}	d_2	+,±	+,±	(–,±)	–
Panel B: Window Dressing Hypothesis					
D_{STW}	c_1	+	+	–,±	–,±
INST*D_{STW}	c_2	(+)	–	(–,±)	±
D_{STL}	d_1	–	±	+	+,±
INST*D_{STL}	d_2	–	+,±	(+,±)	–
σ	e_1	–	–	+	+
INST*σ	e_2	–	–(+–)[d]	(+,±)	–
D_{LTW}	f_1	+	+,±	–,±	–,±
INST*D_{LTW}	f_2	(+)	±	(–,±)	+,±
D_{LTL}	g_1	–	–,±	+	+,±
INST*D_{LTL}	g_2	–	+,–,±	(+,±)	–,±
Panel C: Overreaction Hypothesis					
D_{LTW}	f_1		+,±	–	–,±
INST*D_{LTW}	f_2		±	+	+,±
D_{LTL}	g_1		–,±	+	+,±
INST*D_{LTL}	g_2		+,–,±	–	–,±
Panel D: Liquidity Hypothesis					
ln(ME)	a_1	–	+,–,±	–	–,±
FFS	h_1	–	–	–	–,±
INST*FFS	h_2	+,±	+,±	+,±	+,±

[a] "+" stands for significantly positive, "–" for significantly negative, "±" for insignificant. To get a "+" ("–"), the coefficients must be significantly positive (negative) in at least two subperiods.
[b] This column includes returns in December, the early-December (ED), and the year-end (YE) periods for all four hypotheses, except the liquidity hypothesis which excludes the YE period.
[c] This column includes monthly return in January and return in the turn-of-the-year (TOTY) period.
[d] Coefficient is negative for the ED period and is positive for the YE period and the whole December.

Our rule for determining the validity of each tested hypothesis is as follows. When the observed coefficient signs are different across the results of the original and the sensitivity-test regressions, the empirical evidence is regarded as inconclusive, if there is at least one observed coefficient sign matching the corresponding expected sign. In determining whether the results support the hypotheses, for simplicity, we look for any opposing evidence, rather than for supporting evidence. Our conclusions will not change if we center the attention on supporting evidence instead. Therefore, we only focus on those expected-observed coefficient pairs with the completely opposite results. Each expected-observed coefficient pair with contradicting results will be discussed and the border of the cell in which the pair is located is marked with solid lines. A hypothesis will be judged as valid or strongly supported if there is no opposing evidence.

We first examine the tax-loss selling/parking-the-proceeds hypothesis by inspecting Panel A of Table 7. After taking alternative PTS proxies into account, we still find that the observed coefficient of ln(PTS) for January return is opposite to the expected result. Other results from coefficients of short-term winners and losers are not distinctively different from the expected signs. Therefore, we conclude that the empirical evidence from stock returns, at most, weakly supports the tax-loss selling/parking-the-proceeds hypothesis.[97]

Next, we inspect Panel B of Table 7 for the window dressing hypothesis. The results show that the observed coefficients of D_{STL} and INST*D_{STL} for December returns are opposite to their expected signs. That is, we have two contradicting expected-observed pairs. Therefore, similar to the tax-loss selling hypothesis, we conclude that the empirical evidence from stock returns, at most, weakly supports the traditional window dressing hypothesis. In contrast, the evidence from the coefficients of σ and INST*σ supports the risk-preference switching version of window dressing.

Finally, we find no contradicting pairs from Panels C and D of Table 7. Therefore, we conclude that the empirical evidence strongly supports the overreaction and the liquidity hypotheses.

4.1.8 Economic Significance Of The Four Hypotheses

From the above section, we discover that the overreaction and the liquidity hypotheses are possibly the real underlying driving forces for the January effect, based on their relatively superior statistical significance. One thing remaining unclear is, what is their relative economic importance in affecting the January effect? That is, we are asking a quantitative question — what is the relative economic significance of these hypotheses in affecting the January effect? To answer this question, we calculate the component contribution of each independent variable.[98] The component contribution is obtained from the product of the variable's estimated coefficient times its sample mean. The

[97] If we regard the insignificant coefficients on INST*D_{STW} and D_{STL} in Table 7 as evidence against, rather than consistent with, tax-loss selling, then the evidence from short-term winners and losers is mixed. Consequently, the overall results will tend to reject the tax-loss selling hypothesis.
[98] The method used in this dissertation is same as the one employed in Chan, Chen, and Hsieh (1985) and De Bondt and Thaler (1987).

results are presented in Table 8.

The first row under the panel header is the sample mean for the dependent variable, i.e., stock return. The row immediately above the number of observations (No. of Obs.) is the unexplained intercept term. To identify the most economically important factors for returns in each time period, we pay special attention to those with distinctively larger absolute magnitude. Similar to Table 7, we mark the border of cells containing these important values.

Those results in Table 8 are very similar across the five different time periods. Therefore, for conciseness, we only explain the result from one of the five regressions and take the ED return in Panel A of Table 8 (the second column from the left margin) as the example. The result shows that, given the mean ED return of 0.43%, the unexplained component is as high as 1.29%. Since the R^2 is only 0.009, this is probably not too surprising. At a closer look, however, some independent variables have distinctly larger contributions than others. The variables with the distinctly larger component contribution are FFS, σ, ln(ME), INST*FFS, and INST*σ, with contributions of -0.71%, -0.70%, 0.56%, 0.56%, and -0.51%, respectively. Other variables have only little contribution ranging from 0.03% to 0.22% (in absolute value).

Overall, from the cells with solid-line border in Table 8, we can easily identify those variables with the greatest contributions. The four most important factors in explaining returns during the December-January period are ln(ME), σ, INST*σ, and FFS. These results reveal that the liquidity hypothesis and the risk-preference switching hypothesis are, economically, the most important explanations for the January effect.

Table 8. Component Contribution for Each Independent Variable in Return Regressions[a]

	Early December	Year-End	December	Turn-of-the-Year	January
$\bar{R}$	0.43	1.58	2.76	1.65	3.76
ln(ME)	0.56	0.51	0.06	-1.90	-1.63
ln(BE/ME)	-0.22	-0.17	-0.36	-0.27	-1.15
ln(PTS)	0.15	-0.05	0.19	-0.29	0.39
INST*ln(PTS)	0.04	0.16	0.16	0.37	0.41
D_{STW}	0.17	0.14	0.28	-0.10	0.01
INST*D_{STW}	-0.10	-0.06	-0.16	0.02	0.01
D_{STL}	-0.04	0.03	0.00	0.32	0.25
INST*D_{STL}	-0.03	-0.02	-0.05	-0.15	-0.24
σ	-0.70	-0.48	-1.31	2.71	6.15
INST*σ	-0.51	1.18	1.06	-0.59	-1.39
D_{LTW}	0.08	0.03	0.09	-0.09	-0.23
INST*D_{LTW}	-0.04	-0.01	-0.03	0.02	0.14
D_{LTL}	-0.11	0.03	-0.01	0.32	0.52
INST*D_{LTL}	0.06	-0.03	-0.01	-0.10	-0.13
FFS	-0.71	-0.80	-1.31	-0.04	-2.75
INST*FFS	0.56	-0.21	0.15	-0.13	0.79
Unexplained	1.29	1.33	4.00	1.55	2.61
No. of Obs.	10,682	10,680	10,680	9,021	9,018
Adj-R^2	0.009	0.017	0.015	0.122	0.089

[a] The early-December period is defined as remaining December trading days which are prior to the year-end period. The year-end period is defined as the 10-trading-day period prior to the last trading day in the year. The turn-of-the-year period is defined as the five-trading-day period beginning from the last trading day in the previous year.

The overreaction hypothesis, though statistically important, seems to play little role in explaining the magnitude of the January effect. Since investor overreaction only occurs on the extreme-winner or extreme-loser stocks, which account for only 10% of the sample, the little economic significance of the overreaction hypothesis is understandable. On the other hand, as indicated later by the economic significance of tax-loss selling in explaining December trading volumes (Section 4.2.7), the statistically or economically insignificant results do not prove that trading behavior implied by the tested factor is not present. The corresponding trading activities may be obscured by other more intense and important trading activities. For example, individual investors may actually sell losers in December for tax purposes, but perhaps the trading does not depress December returns of those losers.

4.2 Simultaneous Test Of The Four Hypotheses: Evidence From Trading Volumes

The results of the cross-sectional regressions on trading volume ratios (Section 3.3) are presented in Table 9. As mentioned earlier, we use a significance level of 0.10 or smaller in this dissertation. Both expected and observed coefficient signs are displayed side-by-side in Table 10 for comparison.

The observed intercept is 14.49 and 13.32 for December and January, respectively. Since the trading volume ratio is expressed as the total volumes traded during the measurement period in percentage of yearly trading volumes, if stock trading is evenly distributed during the year, then the average trading volume ratio for any

Table 9. Estimated Coefficients for Trading Volume Regressions[a]

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	6.51 (20.79***)	6.71 (27.81***)	14.19 (30.78***)	4.00 (13.01***)	13.32 (19.71***)
ln(ME)	-0.21 (-5.64***)	-0.25 (-8.72***)	-0.53 (-9.86***)	-0.14 (-3.83***)	-0.20 (-2.49**)
ln(BE/ME)	0.09 (1.12)	0.18 (2.97***)	0.27 (2.41**)	-0.05 (-0.67)	0.14 (0.84)
ln(PTS)	-0.48 (-2.79***)	-0.14 (-1.05)	-0.56 (-2.23**)	-0.03 (-0.19)	-0.29 (-0.80)
INST*ln(PTS)	1.62 (5.00***)	0.98 (3.94***)	2.59 (5.44***)	0.15 (0.48)	0.83 (1.20)
D_{STW}	0.78 (2.42**)	0.14 (0.58)	0.79 (1.68*)	0.88 (2.75***)	3.90 (5.56***)
INST*D_{STW}	0.19 (0.26)	0.86 (1.51)	1.26 (1.16)	-0.95 (-1.24)	-2.85 (-1.70*)
D_{STL}	1.95 (5.66***)	1.17 (4.41***)	3.35 (6.61***)	-0.79 (-2.31**)	-2.75 (-3.66***)
INST*D_{STL}	-3.27 (-3.59***)	-0.78 (-1.10)	-4.25 (-3.17***)	1.86 (2.00**)	5.18 (2.55**)
σ	0.66 (0.45)	-0.69 (-0.61)	0.69 (0.32)	-1.00 (-0.70)	5.28 (1.67*)
INST*σ	-14.24 (-4.03***)	-13.80 (-5.07***)	-29.65 (-5.71***)	-10.56 (-3.12***)	-34.00 (-4.57***)
D_{LTW}	0.35 (-1.00)	-0.41 (-1.54)	-1.07 (-2.08**)	-0.42 (-1.23)	-1.22 (-1.61)
INST*D_{LTW}	1.24 (1.60)	1.61 (2.71***)	3.40 (2.99***)	1.48 (1.91*)	4.39 (2.58***)
D_{LTL}	1.33 (3.77***)	1.99 (7.29***)	3.63 (6.96***)	2.29 (6.47***)	4.78 (6.14***)
INST*D_{LTL}	-2.45 (-2.44**)	-1.38 (-1.79*)	-4.03 (-2.73***)	-5.39 (-5.01***)	-9.58 (-4.05***)
FFS	-0.84 (-6.26***)	-0.46 (-4.44***)	-1.26 (-6.33***)	-0.54 (-5.56***)	-2.21 (-10.36***)
INST*FFS	0.50 (1.63)	0.04 (0.17)	0.39 (0.86)	0.57 (2.58***)	2.46 (5.08***)
No. of Obs. Adj-R^2	10,675 0.026	10,675 0.052	10,685 0.061	9,019 0.015	9,021 0.032

[a] *t*-statistics are displayed in parentheses below the estimated coefficients; the early-December period is defined as remaining December trading days which are prior to the year-end period; the year-end period is defined as the 10-trading-day period prior to the last trading day in the year; the turn-of-the-year period is defined as the five-trading-day period beginning from the last trading day in the previous year.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Table 10. Expected and Observed Coefficient Signs for Trading Volume Regressions[a]

		December Trading Volumes[b]		January Trading Volumes[c]	
		Expected	Observed	Expected	Observed
Panel A: Tax-Loss Selling/Parking-the-Proceeds Hypothesis					
ln(PTS)	b_1	+	–	+	±
INST*ln(PTS)	b_2	–	+	(–,±)	±
D_{STW}	c_1	–,±	+,±	+,±	+
INST*D_{STW}	c_2	+,±	±	–,±	–,±
D_{STL}	d_1	+,±	+	+,±	–
INST*D_{STL}	d_2	–,±	–	(–,±)	+
Panel B: Window Dressing Hypothesis					
D_{STW}	c_1	+	+,±	+,±	+
INST*D_{STW}	c_2	(+)	±	(+,±)	–,±
D_{STL}	d_1	+	+	+	–
INST*D_{STL}	d_2	+	–	(+,±)	+
σ	e_1	(+,±)	±	(+,±)	+,±
INST*σ	e_2	+,±	–	(+,±)	–
D_{LTW}	f_1	+	–,±	+,±	±
INST*D_{LTW}	f_2	(+)	+	(+,±)	+
D_{LTL}	g_1	+	+	+	+
INST*D_{LTL}	g_2	+	–	(+,±)	–
Panel C: Overreaction Hypothesis					
D_{LTW}	f_1		–,±	–	±
INST*D_{LTW}	f_2		+	+	+
D_{LTL}	g_1		+	+	+
INST*D_{LTL}	g_2		–	–	–
Panel D: Liquidity Hypothesis					
ln(ME)	a_1	–	–	–	–
FFS	h_1	–	–	–	–
INST*FFS	h_2	+,±	±	+,±	+

[a] "+" stands for significantly positive, "–" for significantly negative, "±" for insignificant. To get a "+" ("–"), the coefficients must be significantly positive (negative) in at least two subperiods.
[b] This column includes trading volume ratios in December, the early-December (ED), and the year-end (YE) periods for all four hypotheses, except the liquidity hypothesis which excludes the YE period.
[c] This column includes trading volume ratios in January and the TOTY period.

calendar month in the year should be about 8.33 (in percent), which is equivalent to one twelfth of yearly trading volumes. Therefore, the relatively higher monthly averages of 14.49 and 13.31 implies that stocks are generally more actively traded around the year-end.

To confirm this, we calculate the trading volume ratios for each calendar month during 1988-1995. The result (not shown here) shows that the trading volume ratio is higher for December than for any other months and January is the month with the second largest value.[99] Both the *F*- and Kruskal-Wallis tests reveal that the difference between December (January) and each of the remaining months is significant at the 0.01 level. In contrast, Lakonishok and Smidt (1986, p. 958), examining stock turnover rate by months for the stocks traded on the NYSE and AMEX during 1966-1982, respectively, report that "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." Their result is slightly different from ours, since we find the abnormal December stock trading while they do not.[100]

Table 9 also shows that the coefficients of ln(ME) in trading volume ratio regressions are significantly negative at the 0.05 level for all time periods. This is consistent with the finding of Lakonishok and Smidt (1984) that small-firm stocks are more actively traded around the turn-of-the-year. In contrast, the coefficients of

---

[99] The observed trading volume ratios for December and January are 10.90% and 9.81%, respectively. The ratios for the remaining months range from 7.07% of July to 9.17% of February.

[100] In addition to the different sample periods, the difference may be partly explained by the different methodologies employed. Lakonishok and Smidt (1986) use turnover rates, which are obtained from dividing monthly trading volumes by total number of shares outstanding. In contrast, we divide monthly trading volumes by total trading volume in the year.

ln(BE/ME) in trading volume ratio regressions are significantly positive only for the year-end period and December. Because there is no theory supporting the existence of a relation between trading volume and ln(BE/ME), it is unclear whether there is any economic rationale behind this. The observed estimated coefficients for other independent variables will be discussed in the following sections, and for simplicity, we omit the expected estimated coefficients that require additional assumptions.

4.2.1 The Tax-Loss Selling/Parking-The-Proceeds Hypothesis

We examine the tax-loss selling/parking-the-proceeds hypothesis by inspecting the coefficients on ln(PTS), D_{STW}, D_{STL}, and their interaction terms with the institutional ownership variable, INST. Table 9 shows that the coefficient of ln(PTS) for the early December and the whole December trading volumes are significantly negative (-0.48 and -0.56, respectively). Meanwhile, the corresponding coefficients of INST*ln(PTS) are 1.62 and 2.59, respectively, both with significance levels of 0.01. These findings indicate that zero- or low-institutional-ownership stocks are actually less actively traded in the early December (ED, hereafter) period and the whole December, and that trading volume increases with institutional ownership. Further, the result of negative, though insignificant, coefficients of ln(PTS) in the regressions of January and the TOTY period does not support tax-loss selling.

As shown in Table 10, nearly all empirical results on coefficients of ln(PTS) and INST*ln(PTS) are against the hypothesis. On the other hand, since our PTS proxy is, as indicated earlier, still an imperfect proxy for real potential tax-loss selling pressure, the above opposing evidence may result from some reason other than absence of a relation between trading volume and tax-loss selling. Please refer to Section 4.1.1 for the detailed discussion.

Next we focus on trading volumes of short-term winners. Table 9 indicates that short-term winners (with zero or low institutional ownership) are actually more actively traded during both December (ED period) and January (TOTY period), since the coefficient of D_{STW} is significantly positive in these periods. The active December trading does not quite agree with the tax-loss selling hypothesis (it is not significant in the YE period, though). As shown in Panel A of Table 10, the tax-loss selling hypothesis predicts that the coefficient of D_{STW} for December trading volume will be less than or equal to zero.

On the other hand, Table 9 shows that the coefficient of D_{STW} for January trading volume (3.90) is much higher than that for December trading volume (0.79). Even the coefficient for the five-trading-day TOTY period (0.88) is larger than the ED period (0.78), which includes about 10 trading days. In contrast, the coefficient for the 10-trading-day YE period is as low as 0.14. Obviously, short-term winners are more actively traded in January than in December. In this aspect, the result is consistent with the tax-loss selling hypothesis.

The evidence from the observed coefficients of INST*D_{STW} also supports the hypothesis. Table 9 shows that the coefficient of INST*D_{STW} is positive, though insignificant, for trading volume during December and its two subperiods, and in contrast, the coefficient is significantly negative in January (-2.85). This is consistent with the predictions of the hypothesis that December trading volumes for winners with higher institutional ownership will be relatively higher, since those firms have a lower percentage of individual shareholders who postpone selling winners in December. Consequently, in January those stocks will be less actively traded than winners with lower institutional ownership. Therefore, as shown in Panel A of Table 10, though December trading does not quite agree with the hypothesis, the overall evidence from trading volume of short-term winners tends to support the tax-loss selling hypothesis.

Lastly, we examine the coefficients for short-term losers, D_{STL} and INST*D_{STL}. Table 9 shows that the coefficients of D_{STL} and INST*D_{STL} are significantly positive and negative, respectively, for both the ED period and December. The pattern is reversed in the following month. That is, the coefficients become significantly negative and positive, respectively, for both the TOTY period and January. More active December stock trading for short-term losers but less active for higher-institutional-ownership stocks is consistent with the tax-loss selling hypothesis. At a closer look, Table 9 also reveals the presence of this pattern in the ED period, which is somewhat surprising. In contrast, this pattern in the YE period is weaker and less significant.

Both the tax-loss selling and the window dressing hypotheses state that investors would sell losers in December or before year-end. Dyl (1977) reports that loser stocks with less than -20% return during the previous January-November period have significantly positive abnormal trading volume in December.[101] But there are no studies in the literature documenting abnormal trading activity for losers in the early December period. The finding of active stock trading for losers in the ED period, rather than in the YE period, is thus very interesting.

Some may argue that informed investors, who acknowledge the existence of the January effect in the past two decades during which much relevant research was conducted and issues were widely discussed in the financial press, would avoid selling losers at the then-depressed year-end price by trading them a little earlier instead. Consequently, when most investors sell losers in the ED period, rather than in the YE period, the depressed returns and abnormally high trading volumes disappear in the YE period but emerge in the ED period. This scenario seems reasonable.[102] The preliminary work of this dissertation (not shown here), which covers the sample period of July 1962-December 1994, reveals that stock markets, as a whole, experience a price drop in the ED period and a mild price increase in the YE period. Consistent with the above finding, Lakonishok and Smidt (1988), examining the Dow Jones Industrial Average returns during 1897-1986, also report that the last-half of December has exceptionally higher returns than the first-half of December.[103] Therefore, the depressed ED returns probably

---

[101] Dyl (1977) find that winner stocks with larger than +20% return during the previous January-November period have significantly negative abnormal trading volume in December, but he does not find any abnormal trading in the following January (February) for either winners or losers.

[102] We do not find any strongly supporting evidence for this scenario, since Table 5 shows that the observed coefficients of D_{STL} and INST*D_{STL} for the ED returns are not statistically significant. However, since short-term losers may be, as argued earlier, an inadequate proxy for tax-loss selling, the insignificant results are not against the tax-loss selling hypothesis or the advancing loser-selling explanation.

[103] Lakonishok and Smidt (1988) define the first-half of the month as the first through the fifteenth calendar day of the month, if it is a trading day, or if not, through the next trading day. The last-half of the month consists of the remaining days. Therefore, in contrast to the definition of Ariel (1987), their last-half of the month includes the last trading day in the month, and their first-half of the month excludes the last trading day in the previous month. Lakonishok and Smidt show that the higher last-half return for December is possibly because the period includes the trading days before two major holidays, Christmas and New Year's Day. The finding of higher rates of return before holidays has been well documented in the literature and is referred to as the holiday effect (e.g., Merril (1965), Lakonishok and Smidt (1988), Pettengill (1989), and Ariel (1990)).

have existed well before the finding of the January effect and the hypothesis of advancing loser-selling is probably incorrect.[104]

Though the results from December trading volume support the tax-loss selling hypothesis, those for January do not. As mentioned earlier, the coefficient of D_{STL} becomes significantly negative for both the TOTY period and January. This means that short-term losers are traded less in the TOTY period (January). As shown in Panel A of Table 10, this finding is inconsistent with tax-loss selling.

In summary, the trading volume evidence from the PTS variable is strongly against the tax-loss selling hypothesis, while the evidence from short-term winners and losers weakly supports it. However, the opposing evidence from the PTS variable may be due to imperfection of the proxy itself or testing the hypothesis during a sample period with weaker motivation for year-end tax-loss selling. Prior studies using different PTS proxies, such as Reinganum (1983) and Roll (1983), report a positive relation between tax-loss selling and January return. But as shown in our sensitivity tests (Sections 4.2.5.1 and 4.2.5.2), when either Reinganum's or Roll's proxy is used to replace our PTS in the trading volume regressions, the results remain against tax-loss selling. Therefore, using other proxies widely used in the literature does not change our conclusion. On the other hand, as for the return analysis in Section 4.1.1, if we regard the insignificant coefficients

[104] To formally test the advancing loser-selling hypothesis, we need to compare the difference in the ED and YE returns between losers and non-losers (or between high-PTS and low-PTS stocks) over the time period before and after the finding of the January effect. Specifically, we may examine the time period before and after the year of 1976 when Rozeff and Kinney presented the first serious evidence for the January effect. If the evidence shows that loser stocks have lower YE returns than non-losers before 1976 and the difference becomes smaller or disappears after 1976, then the validity of the advancing loser-selling hypothesis is strongly supported. Further, if this hypothesis is correct, we will also expect that losers should have lower ED returns than non-losers after 1976 and this difference should be smaller before 1976.

on D_{STW} and INST*D_{STW} in the December trading volume regression (Table 10) as evidence against, rather than consistent with, tax-loss selling, then the evidence from short-term winners and losers is mixed. Consequently, the overall results will tend to reject the tax-loss selling hypothesis.

4.2.2 The Window Dressing Hypothesis

To examine this hypothesis, we inspect trading volume patterns for short-term winners (losers), the own standard deviation variable, and long-term winners (losers). As found in the last section, short-term winners are more actively traded during both December (ED period) and January (TOTY period). This is consistent with the view that institutional investors buy winners before year-end and resell them in the following January or later.

However, the results from short-term losers do not support the hypothesis. Table 9 indicates that the coefficient of D_{STL} in the trading volume regressions is significantly positive for the ED period, the YE period, and December. This seems consistent with the hypothesis, since losers would be more actively traded due to more seller-initiated transactions from institutional investors. However, Table 9 also shows that the coefficients of D_{STL} and INST*D_{STL} are significantly negative, respectively, for the TOTY period (January) and the ED period (December). This is evidence against the hypothesis, since it implies that less stocks will be traded in December for higher institutional-ownership firms, and loser stocks are traded less in the following January.

Next, we inspect the coefficient of own standard deviation, σ. According to the hypothesis, institutional investors switch from high-risk to low-risk stock in December and switch back in the following January, and thus both the high-risk and low-risk stocks should be actively traded in December and January. Therefore, the relation between stock riskiness (σ) and trading volumes in December and January cannot be determined. That is, the coefficient of σ could be significantly positive, significantly negative, or not significantly different from zero.

However, as shown in Table 2 and discussed in Sections A8.3.2 and A8.4.2, if in December institutional managers reinvest part of the proceeds from selling high-risk stocks in other low-risk financial instruments such as bonds, T-bills, market-money funds, or cash, then the trading volume ratio for high-risk stocks will tend to be higher than that for low-risk stocks. Consequently, the trading volume ratio in December will tend to be an increasing function of stock riskiness. In the following January, institutional investors switch back to high-risk stocks, consequently increasing January trading volume for high-risk stocks.

This scenario is very likely, since Athanassakos and Schnabel (1994) provide evidence of the systematic shift in portfolio rebalancing for institutional managers. They find that portfolio allocations of pension and mutual funds early in the calendar are more heavily weighted towards the stock market and less heavily weighted towards cash and cash equivalents than later in the calendar year in Canada. Therefore, in general, the coefficient of σ for December and January trading volumes should not be negative. Table 9 reveals that the coefficient of σ is significantly positive for trading volume in January, and not significantly different from zero in other time periods. As shown in Panel B of Table 10, this is consistent with the aforementioned view.

We next direct our attention to the coefficient of INST*σ for December trading volume. The window dressing hypothesis does not explicitly imply a relation between institutional ownership and January trading volume for high-risk or low-risk stocks, unless an additional assumption is made. Table 9 shows that the coefficient is significantly negative for the ED period, the YE period, and December. According to the hypothesis, given constant σ, stocks with higher institutional ownership should have more shares traded in December window dressing activity and hence the coefficient should not be negative. Therefore, generally speaking, the evidence from σ and INST*σ is inconclusive.

Next, we examine long-term winners. Table 9 indicates that the coefficient of D_{LTW} for December trading volume is significantly negative, but the expected sign is positive (Panel B of Table 10). Further, the observed negative, though insignificant, coefficient of D_{LTW} for trading volume in January (TOTY) does not provide evidence for window dressing. Therefore, the evidence from long-term winners is against the window dressing hypothesis.

Lastly, Table 9 shows that the coefficient of D_{LTL} is significantly positive for all five periods. This finding agrees with the hypothesis of window dressing (Panel B of Table 10). It implies that long-term losers are sold in December and then institutional investors aggregately repurchase them back in the following January (TOTY). However, the hypothesis also predicts that long-term losers with higher institutional ownership should be even more intensely traded than those with lower institutional ownership in December. But Table 9 reveals that the result is opposite to the expectation, since the coefficient of INST*D_{LTL} for trading volume is significantly negative for all of the five periods.[105] Therefore, the evidence from long-term losers is also inconclusive.

In summary, evidence from short-term winners supports the traditional window dressing hypothesis. However, in general, evidence from short-term losers, long-term winners, and long-term losers does not support this hypothesis.[106] Therefore, our overall results from trading volumes tend to be against the traditional window dressing hypothesis. In contrast, the evidence from examining stock riskiness is inconclusive. However, as shown in Section 4.1.2, the evidence from return regressions strongly supports the risk-preference switching hypothesis. Since the January effect is related to the seasonality in stock returns and stock prices could vary drastically without significantly changing trading volumes, the evidence from stock returns may be more important than that from trading volumes. Particularly, all three observed coefficient signs in our return analysis are exactly the same as those predicted by the risk-preference switching hypothesis, while there is only one contradictory observation in our trading volume analysis. Therefore, the overall evidence from returns and trading volumes tends to support risk-preference switching.

---

[105] Given the assumption that loser stocks with higher institutional ownership are more likely to be sold by institutional managers in December than those with lower institutional ownership, if we further assume that institutional managers prefer higher-institutional-ownership stocks when they repurchase, in the aggregate, those stocks in the following January, then we will expect a non-negative coefficient of INST*D_{LTL} for January trading volume regression. Since the observed signs are opposite to the expected, the evidence does not support the window dressing hypothesis, either.

[106] If we regard the insignificant coefficient on D_{LTW} in the January trading volume regression (Table 10) as evidence against, rather than consistent with, window dressing, then the overall evidence further weakens the window dressing hypothesis.

4.2.3 The Overreaction Hypothesis

To test the overreaction hypothesis, we inspect the coefficients of D_{LTW}, INST*D_{LTW}, D_{LTL}, and INST*D_{LTL} for January and the TOTY period. Table 9 indicates that the coefficient of D_{LTW} is negative but not significant for trading volumes in the TOTY period and January, and the coefficient of INST*D_{LTW} is significantly positive for trading volumes in both the TOTY period and January. The insignificant, though negative, coefficient of D_{LTW} for January trading volume tends to weaken support for the overreaction hypothesis. But as shown later in sensitivity tests, it becomes significant when we use a four-year estimation period, in an attempt to reduce potential multicollinearity with short-term winners and losers, in defining long-term winners and losers.

On the other hand, the significantly positive coefficient of INST*D_{LTW} for trading volumes in January is consistent with the overreaction hypothesis. In general, the results imply that long-term winners are an unattractive investment in January (and hence have lower January trading volumes), and that the winners with higher institutional ownership are less unattractive (and hence have relatively higher January trading volumes) than those with lower institutional ownership, because of lower probability of being overvalued due to prior overreaction of their individual shareholders. In short, the evidence from long-term winners supports investor overreaction.

More convincingly, Table 9 indicates that the coefficient of D_{LTL} is significantly positive for trading volumes in both the TOTY period and January. Consistently, the coefficient of INST*D_{LTL} is significantly negative for trading volumes in both the TOTY period and January. In contrast to long-term winners, these findings imply that long-term losers are more attractive investments in January (and hence have higher January trading volumes), and that the losers with higher institutional ownership are less so attractive (and hence have relatively lower January trading volumes) because of a lower probability of being undervalued due to prior overreaction of their individual shareholders. These results strongly support investor overreaction.

In summary, evidence from long-term winners supports the overreaction hypothesis and evidence from long-term losers is even stronger. This phenomenon itself is consistent with the hypothesis, since previous studies report that overreaction is asymmetric, i.e., the market overreacts to losers at a larger extent than winners. Therefore, we conclude that the overall empirical evidence from trading volumes strongly supports the overreaction hypothesis.

4.2.4 The Liquidity Hypothesis

The liquidity hypothesis claims that individual investors prefer investing in small firm stocks such that the January effect is especially pronounced for small firms. As mentioned earlier, Table 9 indicates that the coefficient of ln(ME) is significantly negative for trading volumes in any one of the five testing periods. Therefore, the evidence is consistent with both the literature and the liquidity hypothesis.

Table 9 also shows that the coefficient of FFS is significantly negative for trading volumes in all of the five testing periods. Further, the coefficient of INST*FFS is significantly positive for trading volumes in the TOTY periods and January. As shown in Panel D of Table 10, these findings support the liquidity hypothesis, since they imply that an easier monetary policy increases aggregate liquid profits of individual investors, which then result in higher stock returns in the following turn-of-the-month period, and the lower institutional ownership (or firm size) of the stocks, the higher the returns. In contrast, the coefficient of INST*FFS is insignificant, though positive, in the regressions of December and its two subperiods. However, these insignificantly positive results are not against the liquidity hypothesis.[107] In fact, the *p*-value of 0.103 is marginally significant at the 0.10 level in the ED regression. Further, as shown later in Section 4.2.5.3, when winners (losers) are defined as the stocks with prior returns in the top (bottom) 5% ranking, the coefficient of INST*FFS in the ED regression becomes significantly positive. Therefore, in general, the trading volume evidence from ln(ME), FFS, and INST*FFS strongly supports the liquidity hypothesis.

4.2.5 Sensitivity Tests On Independent Variables

Similar to Section 4.1.6 for stock return regressions, we conduct sensitivity tests on independent variables by slightly changing their definitions. The multicollinearity test for independent variables has been conducted in Section 4.1.5 and the result is shown in Table A10-1 on p. 268. As mentioned earlier, since the largest *VIF* in the five regressions is 6.85, multicollinearity is unlikely to be a serious problem in our regressions of stock returns and trading volumes. The results and detailed discussions for the sensitivities

[107] If we regard the insignificant coefficient on INST*FFS in the December and ED trading volume regression (Table 10) as evidence against, rather than consistent with, the liquidity hypothesis, then the

tests are presented in Appendix 11 on p. 279. We consider all empirical evidence from these sensitivity tests in our final conclusions on testing the four hypotheses. The changes in the independent variables are introduced and briefly explained in the following.

4.2.5.1 Maximum-To-End Price Ratio As The PTS Proxy

As pointed out in Section 4.2.1, the evidence from the PTS variable is strongly against the tax-loss selling/parking-the-proceeds hypothesis, while the evidence from short-term winners and losers weakly supports it. To investigate the possibility that the opposing evidence is obtained solely because of the special PTS proxy employed in this dissertation, we replace our PTS proxy, ln(PTS), by the ones used in previous studies.

We first apply the ratio of maximum stock price in the year to year-end stock price, P_{max}/P_{end}, which is used in Reinganum (1983), Berges, McConnell, and Schlarbaum (1984), and Chan (1986), as the measure for potential tax-loss selling pressure.[108] The results of regressions are displayed in Table A11-1 on p. 280 (Appendix 11). Briefly, we find that use of this proxy makes the observed trading volumes pattern similar to the those in Table 9. Therefore, the evidence remains against the hypothesis. Detailed discussions are shown in Section A11.1.

---

supporting evidence for this hypothesis will be slightly weakened.

[108] As mentioned in footnote 92, these studies actually use P_{end}/P_{max}, rather than P_{max}/P_{end}. But for the illustration purpose, we employ P_{max}/P_{end} in this study. The empirical results (not shown here) show that our conclusion will not be changed by the use of different measures.

4.2.5.2 Prior January-November Return As The PTS Proxy

In this section, we employ the holding-period-return in the prior January-November, $R_{Jan\text{-}Nov}$, as the measure for potential tax-loss selling pressure. This measure is used in Roll (1983) and Brauer and Chang (1990). The results of regressions are presented in Table A11-2 on p. 281. In short, this proxy has somewhat different results from our PTS, but they both lead to the same conclusion. That is, the evidence is still against the tax-loss selling hypothesis. Detailed discussions are shown in Section A11.2.

4.2.5.3 Five-Percent Ranking For Winners And Losers

We next investigate whether regression results change when definitions of other independent variables are slightly different. First, rather than defining losers and winners (both short-term and long-term) as the stocks in the top and bottom return-decile, respectively, we narrow the definition of winners and losers to those with the top and bottom 5% ranking, respectively.[109] The regressions are rerun accordingly, and the results are presented in Table A11-3 on p. 283. Briefly, we get changed statistical significance levels for some estimated coefficients. Specifically, the observed coefficients of D_{LTL} and INST* D_{LTL} for January trading volumes become insignificant. These changes weaken the overreaction hypothesis and hence alter our preliminary conclusions. On the other hand, the observed coefficient of INST*FFS in the ED trading volume regression

[109] Prior studies testing the overreaction hypothesis, such as De Bondt and Thaler (1985), define long-term winners (losers) as the 50 NYSE stocks with the highest (lowest) cumulative excess return over the past five years. This is approximately equivalent to the top (bottom) 5% ranking. Please refer to footnote 93 on p. 102 for details.

becomes significantly positive, providing further evidence supporting the liquidity hypothesis.

4.2.5.4 Four-Year Estimation Period For Long-Term Winners And Losers

Next, as mentioned in Section 4.2.3, we observe a negative but not significant coefficient of D_{LTW} for January trading volume. Since the long-term winners and losers are obtained by calculating their cumulated monthly excess returns over the past five years before the prior December, they could be correlated with the short-term winners and losers measured over the prior January-November period. As mentioned earlier, if the correlation is strong, then serious multicollinearity could appear. This may explain why the observed coefficient of D_{LTW} for January trading volume is negative but not significant. To investigate this possibility, the cumulated excess return is measured over the four-year period ending on the last trading day in the prior year. The regressions are rerun and the results are displayed in Table A11-4 on p. 285. The outcomes are very similar to those in Table 9. Noteworthily, the coefficient of D_{LTW} for January trading volume now becomes significantly negative, which supports the overreaction hypothesis.

4.2.5.5 Non-Systematic Risk To Replace Own Standard Deviation

In this test, we drop the systematic risk portion of own standard deviation, i.e., we replace own standard deviation, σ, by the non-systematic risk (σ^{NS}) in our regressions. The results are shown in Table A11-5 on p. 286. They are slightly different from those that we got previously, but do not change any of our preliminary conclusions.

4.2.5.6 Beta And Non-Systematic Risk To Replace Own Standard Deviation

As mentioned earlier in Section 4.1.6.6 for stock returns, in order to examine whether the regression results drastically change if beta is present in regressions, we add beta, together with the non-systematic risk, into the regressions. For the purpose of comparison, we also conduct the same test for trading volumes. The results are displayed in Table A11-6 on p. 288. Briefly, we find that β and INST*β have no explanatory power in explaining trading volumes in December, which is not surprising. However, the coefficients of β and INST*β are significantly positive and negative, respectively, for trading volume in January, which are very similar to the patterns for coefficients of σ and INST*σ. Other results are very similar to those previously found.

4.2.6 Statistical Significance Of The Four Hypotheses

In order to examine the four hypotheses by including all empirical results obtained in the above sensitivity tests (Table A11-1 to Table A11-6), we summarize all the regression results in Table 11, which shows only coefficient signs as Table 10 does. Most of the results in Table A11-1 to Table A11-6 are very similar to those in Table 9. Therefore, when the results from the sensitivity tests are different from those in Table 10, they are typed in a larger font size to distinguish them from the original coefficient signs in Table 10.

As in Section 4.1.7 for stock returns, for simplicity, we only focus on those expected-observed coefficient pairs with completely opposite results. Our conclusions do

Table 11. Comprehensive Comparisons for Expected and Observed Coefficient Signs in Trading Volume Regressions[a]

		December Trading Volumes[b]		January Trading Volumes[c]	
		Expected	Observed	Expected	Observed
Panel A: Tax-Loss Selling/Parking-the-Proceeds					
ln(PTS)	b_1	+	−,±	+	−,±
INST*ln(PTS)	b_2	−	+,±	(−)	+,−,±
D_{STW}	c_1	−,±	+,±	+,±	+,±
INST*D_{STW}	c_2	+,±	+,±	−,±	−,±
D_{STL}	d_1	+,±	+	+,±	−,±
INST*D_{STL}	d_2	−,±	−,±	(−,±)	+,±
Panel B: Window Dressing Hypothesis					
D_{STW}	c_1	+	+,±	+,±	+,±
INST*D_{STW}	c_2	(+)	+,±	(+,±)	−,±
D_{STL}	d_1	+	+	+	−,±
INST*D_{STL}	d_2	+	−,±	(+,±)	+,±
σ	e_1	(+,±)	+,±	(+,±)	+,±
INST*σ	e_2	+,±	−	(+,±)	−
D_{LTW}	f_1	+	−,±	+,±	−,±
INST*D_{LTW}	f_2	(+)	+	(+,±)	+,±
D_{LTL}	g_1	+	+	+	+,±
INST*D_{LTL}	g_2	+	−,±	(+,±)	−,±
Panel C: Overreaction Hypothesis					
D_{LTW}	f_1		−,±	−	−,±
INST*D_{LTW}	f_2		+	+	+,±
D_{LTL}	g_1		+	+	+,±
INST*D_{LTL}	g_2		−,±	−	−,±
Panel D: Liquidity Hypothesis					
ln(ME)	a_1	−	−	−	−
FFS	h_1	−	−	−	−
INST*FFS	h_2	+,±	+,±	+,±	+

[a] "+" stands for significantly positive, "−" for significantly negative, "±" for insignificant. To get a "+" ("−"), the coefficients must be significantly positive (negative) in at least two subperiods.
[b] This column includes trading volume ratios in December, the early-December (ED), and the year-end (YE) periods for all four hypotheses, except the liquidity hypothesis which excludes the YE period.
[c] This column includes trading volume ratios in January and the TOTY period.
[d] Coefficient is negative for the ED period and is positive for the YE period and the whole December.

not change if we focus on the supporting evidence instead. We first examine the tax-loss selling/parking-the-proceeds hypothesis by inspecting Panel A of Table 11. After taking alternative PTS proxies into account, we still find that the observed coefficient of ln(PTS) for both December and January trading volumes and the coefficient of INST*ln(PTS) for December trading volume are opposite to the expected ones. Other results from coefficients of short-term winners and losers are not distinctively different from the expected signs. Totally, we have three contradicting pairs. Based on the above findings, we conclude that the empirical evidence from trading volumes, at most, weakly supports the tax-loss selling/parking-the-proceeds hypothesis. Therefore, we have similar conclusions from the return and trading volume data.

Next, we inspect Panel B of Table 11 for the window dressing hypothesis. The results show that the observed coefficient of D_{STL} for January trading volume is opposite to their expected signs. Similarly, the coefficients of INST*D_{STL} for December trading volume, and the coefficients of INST*σ, D_{LTW}, and INST*D_{LTL} for December trading volume have contradicting results. In sum, we have five contradicting expected-observed pairs: four for the trading version and one for the risk-preference switching version of window dressing. Therefore, we conclude that the empirical evidence from trading volumes are against both versions of the window dressing hypothesis.

However, as mentioned in Section 4.2.2, the observed coefficient of σ in the January trading volume regression is significantly positive. If institutional managers switch from high-risk stocks to other low-risk financial instruments such as T-bills, rather than only low-risk stocks, in December and reverse the switch in January, then risky stocks should be more actively traded in January than less risky stocks (Table 2). That is, the expected coefficient of σ in the January trading volume regression should be positive, which is exactly what we observe. Since the above assumption is supported by the finding of Athanassakos and Schnabel (1994), our evidence from trading volumes is not fully against risk-preference switching.

In contrast, the evidence from return data does not support the traditional window dressing hypothesis but strongly supports the risk-preference switching hypothesis. Hence, in general, the overall evidence is against the traditional version but tends to support the risk-preference switching version of the window dressing hypothesis. Finally, we find no contradicting pairs from Panels C and D of Table 11. This finding is exactly the same as that from the return data. Therefore, we conclude that the empirical evidence strongly supports the overreaction and the liquidity hypotheses.

4.2.7 Economic Significance Of The Four Hypotheses

As in Section 4.1.8 for the return regressions, we conduct a component contribution analysis for trading volume regressions and present the result in Table 12. As before, we mark the border of cells containing distinctly larger values. Table 12 shows that the variables with the distinctly larger component contribution for each testing period are ln(ME), INST*σ, and FFS. Further, INST*ln(PTS) has a larger contribution for the ED period and December and INST*FFS for January. Other variables have only relatively little contribution.

Table 12. Component Contribution for Each Independent Variable in Trading Volume Regressions[a]

	Early December	Year-End	December	Turn-of-the-Year	January
$\overline{V/YV}$	4.53	4.61	9.71	2.44	10.29
ln(ME)	-1.21	-1.44	-3.12	-0.81	-1.16
ln(BE/ME)	-0.04	-0.07	-0.11	0.02	-0.06
ln(PTS)	-0.34	-0.10	-0.40	-0.02	-0.22
INST*ln(PTS)	0.50	0.30	0.80	0.05	0.27
D_{STW}	0.08	0.01	0.08	0.09	0.39
INST*D_{STW}	0.01	0.03	0.05	-0.03	-0.09
D_{STL}	0.16	0.10	0.28	-0.06	-0.23
INST*D_{STL}	-0.08	-0.02	-0.10	0.04	0.12
σ	0.07	-0.08	0.08	-0.11	0.59
INST*σ	-0.55	-0.53	-1.15	-0.41	-1.31
D_{LTW}	-0.03	-0.04	-0.10	-0.04	-0.11
INST*D_{LTW}	0.04	0.05	0.11	0.05	0.14
D_{LTL}	0.10	0.14	0.26	0.16	0.33
INST*D_{LTL}	-0.05	-0.03	-0.08	-0.09	-0.17
FFS	-0.83	-0.45	-1.24	-0.65	-2.66
INST*FFS	0.19	0.01	0.15	0.26	1.12
Unexplained	6.51	6.71	14.19	4.00	13.32
No. of Obs.	10,675	10,675	10,685	9,019	9,021
Adj-R^2	0.026	0.052	0.061	0.015	0.032

[a] The early-December period is defined as remaining December trading days which are prior to the year-end period. The year-end period is defined as the 10-trading-day period prior to the last trading day in the year. The turn-of-the-year period is defined as the five-trading-day period beginning from the last trading day in the previous year.

Therefore, as from the return data, these results reveal that the liquidity hypothesis and the risk-preference-switching hypothesis are the most economically important explanations for the January effect. On the other hand, since INST*ln(PTS) also has a large contribution for trading volumes in the ED period and December, we acknowledge that the statistically or economically insignificant results do not prove that trading behavior implied by the tested factor is not present. The corresponding trading activities may be obscured by other more intense and important trading activities. For example, individual investors may actually sell losers in December for tax purposes, but perhaps the trading does not depress December returns of those losers.

4.3 Consolidated Summary And Conclusions On Testing The Four Hypotheses: Evidence From Returns And Trading Volumes

Our consolidated conclusions include all the empirical results of returns and trading volumes in Sections 4.1-4.2. In fact, the evidence from return data and trading volume data is very similar. The only difference is that the return data strongly support risk-preference switching, while the single prediction from trading volume data does not. However, since the January effect is related to the seasonality in stock returns and stock prices may vary drastically without significantly changing trading volumes, the evidence from returns should be more heavily weighted than that from trading volumes. Further, the results of the sensitivity tests are similar to those of the original regressions.

Therefore, our final conclusions are the same as the preliminary ones based on Table 6 and Table 10.[110] The final conclusions are as follows.

[1] The tax-loss selling/parking-the proceeds hypothesis is weakly supported as one of the underlying explanations of the January effect. The evidence from returns and trading volumes is mixed. Major findings against this hypothesis come from the PTS variable. The result from trading volumes indicates that tax-motivated transactions may be economically significant in December, but not in January. However, in our sample period, 1988-1995, individual investors may have less motivation for tax-loss selling, since the distinction between short-term and long-term tax rates for capital gains and losses disappears for 1988-1989.

[2] The evidence tends to reject the traditional version of the window dressing hypothesis. However, the risk-preference-switching version receives some support. The institutional managers may switch from high-risk to low-risk stocks in early December, rather than in late December. In the following January, they then switch back to high-risk stocks for higher expected returns. The stock trading due to risk-preference switching plays an important role in explaining the magnitude of the January effect. Risk-preference switching is both statistically and economically significant in explaining the January effect.

[3] Investor overreaction is strongly supported. Individual investors tend to overreact, while institutional investors do not. Since the investor overreaction concentrates on

[110] The four tested hypotheses allow some expected regression coefficients to be zero and hence the insignificant results are still consistent with the tested hypotheses. However, as mentioned in Sections 4.1.1, 4.2.1, and 4.2.2, if we regard the insignificant coefficients as evidence against, rather than consistent

extreme winners and losers, it probably explains only a small part of the January effect. That is, investor overreaction is statistically significant, but not economically significant, in explaining the January effect.

[4] The evidence strongly supports the liquidity hypothesis. Individual investors receive most of their yearly liquid profits before year-end and invest them in January. And since individual investors prefer small-firm stocks, these stocks earn abnormally high returns in January. The evidence shows that high January returns may be related to macroeconomic factors, since the Fed's monetary policy has an important effect on individual investors' year-end profits and accompanying stock investments. Monetary policy and firm size are both statistically and economically significant explanatory factors for the January effect.

4.4 Relation Of Stock Ownership With Stock Price And Firm Size

The results of regressing institutional ownership on stock price and firm size (Section 3.4) are displayed in Table 13. Regressions 1 and 2 in Table 13 show that the coefficients of both ln(Price) and ln(ME) are significant at the 0.01 level when they are the only independent variable in the regression, respectively. But Regression 3 in Table 13 also shows that the coefficients of ln(Price) and ln(ME) are significant when they are both present in the regression.

Table 14 further reveals that mean values of ln(Price) and ln(ME) are very close

---

with, the tested hypotheses, then this change further weakens the tax-loss selling and window dressing hypotheses.

Table 13. Estimated Coefficients for Regressions of Institutional Ownership on ln(Price) and ln(ME)[a]

[1] $INST_{i,t} = \alpha_1 + \beta_1 * \ln(Price)_{i,t} + \varepsilon_{i,t}$

[2] $INST_{i,t} = \alpha_2 + \beta_2 * \ln(ME)_{i,t} + \mu_{i,t}$

[3] $INST_{i,t} = \alpha_3 + \beta_3 * \ln(Price)_{i,t} + \gamma_3 * \ln(ME)_{i,t} + \nu_{i,t}$

	Regression 1	Regression 2	Regression 3
Intercept	-4.46 (-18.89***)	-2.32 (-10.79***)	-7.04 (-30.57***)
ln(Price)[b]	14.44 (177.84***)		6.87 (50.78***)
ln(ME)[c]		6.81 (186.40***)	4.25 (68.54***)
Observation No.	59,025	59,025	59,025
Adj-R^2	0.35	0.37	0.40

[a] *t*-statistics are displayed in parentheses below the estimated coefficients. INST is the institutional ownership (in percentage) at quarter-end.
[b] Price is the stock price at the end of calendar quarter.
[c] ME is the market equity obtained from the product of stock price and total common shares outstanding at the end of calendar quarter and is in million dollars.
*** Significant at the 0.01 level.

Table 14. Correlation Analysis for Institutional Ownership, ln(Price), and ln(ME)

	INST[a]		ln(Price)[b]		ln(ME)[c]	
Panel A: Pearson Correlation Coefficients						
INST						
ln(Price)	0.5907***					
ln(ME)	0.6087***		0.8163***			
Panel B: Spearman Correlation Coefficients						
INST						
ln(Price)	0.6082***					
ln(ME)	0.6296***		0.8203***			
	Obs. No.	Mean	Std Dev	Median	Minimum	Maximum
Panel C: Sample Statistics						
INST	59,025	35.11	23.78	33.48	0.00	99.99
ln(Price)	59,025	2.74	0.97	2.90	0.03	10.38
ln(ME)	59,025	5.49	2.12	5.57	-1.90	11.70

[a] INST is the institutional ownership (in percentage) at quarter-end.
[b] Price is the stock price at quarter-end.
[c] ME is the market equity obtained from the product of stock price and total common shares outstanding at quarter-end and is in millions of dollars.
*** Significant at the 0.01 level.

to their median values, and the correlation coefficients obtained from Pearson analysis are very similar to those from Spearman analysis. These findings strongly suggest that using ln(Price) and ln(ME) is better than using Price and ME in the regressions, since the evidence in Appendix 12 shows that stock price and market equity are not normally distributed and therefore the normality assumption of ordinary least square regression is violated.[111] In fact, the R^2 is as low as 0.03 when Price and ME are used as the independent variables, in contrast to 0.40 for ln(Price) and ln(ME). Panels A and B in Table 14 show that the correlation coefficient between ln(Price) and ln(ME) is as high as 0.82. Consequently, the true relationship between institutional ownership and firm size (stock price) is ambiguous, since the significant observed coefficient of ln(ME) (ln(Price)) could be merely a reflection of the true relation between institutional ownership and stock price (firm size). Although firm size and stock price may both be the important determinants of institutional ownership, we cannot exclude the possibility that one of the relations may be spurious. We address this possibility next.

Because the January effect is more pronounced for stocks with smaller firm-size or lower price, we are especially interested in examining the explanatory power of market equity and stock price on institutional ownership in these subsets of stocks. Therefore, we construct 100 portfolios by jointly sorting stocks on their price and market equity. We then assign the stocks into one of the 100 portfolios according to their joint rankings of price and market equity deciles. For example, if a stock is within both the smallest-price decile and the smallest-market-equity decile, then we categorize it into the

[111] For reference, we present the result of using Price and ME in the regressions and the correlation analysis in Appendix 12 on p. 289.

PRC1/ME1 portfolio. Similarly, if the stock is within both the largest-price decile and the largest-market-equity decile, then we categorize it into the PRC10/ME10 portfolio. Then we regress institutional ownership on ln(Price) and ln(ME) for each of the 100 portfolios. The estimated coefficients for ln(Price) and ln(ME) are displayed in Table 15. Due to space limitation, we omit *t*-statistics and report statistical significance by placing asterisk sign(s) directly on each observed coefficient.

For simplicity of exhibition, however, we present both the observed signs for the coefficients which are statistically significant and number of observations for each portfolio in Table 16. The signs for ln(Price) are displayed in parentheses but not for ln(ME). Table 16 shows that firms with lower market equity, such as ME1, tend to have lower stock prices. That is, the ME1 decile portfolio tends to have a larger number of observations in the lower PRC decile, such as PRC1 and PRC2. Similarly, the higher ME decile portfolios, such as ME10, have more observations in the higher PRC deciles, such as PRC9 and PRC10. These distribution pattern reflects the positive correlation between stock price and market equity.

Now we turn our attention to small firms, specifically ME1 and ME2 stocks. Table 16 reveals that stock price has no power in explaining cross-sectional variation in institutional ownership for the smallest-ME-decile stocks (ME1), since none of its estimated coefficients is significant across different PRC deciles. On the other hand, its estimated coefficients are significant in only three regressions for the ME2 stocks, but in two of them the coefficients for ln(ME) are significant as well. In contrast, the estimated

Table 15. Estimated Coefficients in Regressions of Institutional Ownership on ln(Price) and ln(ME) for PRC/ME Portfolios

	PRC1[a]	PRC2	PRC3	PRC4	PRC5	PRC6	PRC7	PRC8	PRC9	PRC10[b]
ME1[c]	-0.55[e]	-0.82	2.11	4.72	20.10	-15.28	38.59	-49.44	-3.43	
	2.01***	6.39***	10.56***	8.59***	-1.03	12.32	6.30	2.98	8.41***	
ME2	3.98***	9.72***	-3.49	7.70	7.70	4.26	59.09**	-51.42	-30.37	34.57
	5.02***	6.21***	11.56***	13.72***	2.36	10.49***	-9.78	5.44	-10.20	-18.26
ME3	6.52***	9.77***	11.89***	15.32***	-12.44	-1.99	18.31	-8.61	-6.85	-13.30*
	7.40***	11.60***	3.85**	10.14***	9.87***	23.86***	-7.97	22.17***	35.62***	0.90
ME4	2.95	0.64	-8.31*	20.87***	-3.85	6.50	1.73	35.85**	-50.28***	-24.15
	2.48	0.55	-3.77	0.78	3.55	23.00***	20.30***	5.77	-13.75*	2.64
ME5	-14.48**	38.81***	0.43	13.04**	24.09***	15.07*	-14.76	-16.04	-46.32**	-21.11***
	-6.07	-2.52	12.51***	4.36	3.66	20.06***	11.20***	6.38	25.92***	17.35
ME6	58.35***	3.13	18.54*	-11.33	18.82**	3.76	17.09	-7.87	-9.97	-18.42***
	-41.80*	-12.14	-20.26***	9.01**	2.58	6.65*	6.35	6.87	16.8***	7.78
ME7	-64.54**	-17.69	21.09*	34.01***	37.86***	-7.49	33.82***	15.75	17.65*	-7.52
	39.72**	48.79***	3.17	-7.31	1.99	0.88	-2.57	5.12	15.46***	10.26
ME8		-82.12***	-18.34	22.44*	-7.17	21.00	40.36***	18.99**	21.88***	-4.58
		59.82***	36.82***	20.24***	2.69	11.72***	-5.12	10.44***	12.32***	11.68**
ME9			-39.53	42.7*	65.71***	17.26	4.02	-8.26	15.13***	4.67***
			-4.08	-27.67**	-20.53***	-10.73***	-8.52***	2.60	-4.54**	4.26**
ME10[d]			-214.17***	76.46*	-70.19**	55.09***	8.87	13.87	2.62	-2.99***
			110.50**	-18.89	23.50*	4.11	-4.66***	-4.40***	-7.16***	-7.66***

[a] PRC1 denotes the stocks in the smallest-price decile portfolio.
[b] PRC10 denotes the stocks in the largest-price decile portfolio.
[c] ME1 denotes the stocks in the smallest-market-equity decile portfolio.
[d] ME10 denotes the stocks in the largest-market-equity decile portfolio.
[e] This row includes the estimated coefficients of ln(Price) for the portfolios from PRC1/ME1 to PRC10/ME1. The next row includes the estimated coefficients of ln(ME) for the corresponding portfolios. Similarly, in the other rows of this table, the upper and lower rows always present the coefficients of ln(Price) and ln(ME), respectively, for the portfolio PRCn/ME1 to PRCn/ME10, where n = 2 to 10.
* Significant at the 0.10 level.
** Significant at the 0.05 level.
*** Significant at the 0.01 level.

Table 16. Coefficient Signs and Number Of Observations for Regressions of Institutional Ownership on Stock Price and Market Equity[a]

	PRC1	PRC2	PRC3	PRC4	PRC5	PRC6	PRC7	PRC8	PRC9	PRC10
ME1	+ 3,773	+ 1,417	+ 434	+ 170	48	19	20	12	+ 10	0
ME2	+[b](+)[c] 1,272[d]	+(+) 1,968	+ 1,336	+ 614	313	+ 202	(+) 92	59	36	9
ME3	+(+) 495	+(+) 1,138	+(+) 1,705	+(+) 1,282	+ 642	+ 299	167	+ 120	+ 38	(–) 17
ME4	216	717	(–) 1,097	(+) 1,348	1,151	+ 608	+ 370	(+) 230	–(–) 123	43
ME5	(–) 90	(+) 303	+ 691	(+) 960	(+) 1,234	+(+) 1,078	+ 781	487	+(–) 202	(–) 76
ME6	–(+) 29	182	–(+) 332	+ 766	(+) 943	+ 1,126	979	798	+ 509	(–) 239
ME7	+(–) 18	+ 98	(+) 263	(+) 416	(+) 673	1,017	(+) 1,104	1,101	+(+) 811	402
ME8	0	+(–) 12	+ 79	+(+) 306	488	+ 760	(+) 1,159	+(+) 1,261	+(+) 1,242	+ 595
ME9	0	0	26	–(+) 72	–(+) 294	–(+) 596	– 824	1,084	–(+) 1,524	+(+) 1,483
ME10	0	3	+(–) 8	(+) 15	+(–) 48	(+) 179	– 426	– 769	– 1,406	–(–) 3,048

[a] PRC1 denotes the stocks in the smallest-price decile portfolio; PRC10 denotes the stocks in the largest-price decile portfolio; ME1 denotes the stocks in the smallest-market-equity decile portfolio; ME10 denotes the stocks in the largest-market-equity decile portfolio. "+"denotes that the coefficient is significantly positive at the level of 0.10, 0.05 or 0.01 and "–" denotes a significantly negative coefficient. The blank denotes statistical insignificance at the 0.10 level.

[b] Coefficient sign for ln(ME).

[c] Coefficient sign for ln(Price) in parenthesis.

[d] Number of observations for the regression.

coefficients of ln(ME) are significant in almost all regressions with observations greater than 100 for the ME1 and ME2 stocks.

Next, we examine the low-price deciles, PRC1 and PRC2. Stock price has six significantly positive estimated coefficients in the 15 regressions (there are no regressions conducted for the five PRC/ME portfolios which have three or zero observations). However, it also obtains three significantly negative estimated coefficients, which implies that individual investors have a higher percentage of ownership in stocks with higher prices, rather than lower prices.

In contrast, market equity has nine significantly positive estimated coefficients in the 15 regressions, and only one significantly negative estimated coefficient. The significantly positive coefficients are observed in most of the PRC/ME portfolios with larger observations. Therefore, we conclude that market equity has the much stronger positive relationship with institutional ownership than does stock price among the stocks with either low price or low market equity. That is, the evidence supports the view that the small-firm January effect is due to individual investors' investment preference in small-firm stocks. But the high January return for low-price stocks is probably not because of the preference in low-price stocks. The low-price January effect could be related with the higher transaction costs and larger bid-ask spread for low-price stocks, as suggested by Bhardwaj and Brooks (1992).

4.5 Reactions Of Stockholders And Agency Problems

4.5.1 Management

After collecting the stock repurchase and issuance data from the 1995 CRSP monthly stock files covering a 70-year sample period from December 1925 to December 1995, we obtain only 26 observations for stock repurchase and 168 for stock sale.[112] Since the CRSP files do not contain a complete record of these data items and these observations account for only a very small portion of total stock repurchase and issuance activity during the sample period,[113] the result of our study may not represent the aggregate behavior of management.[114] Since 26 observations for stock repurchase are too few for our analysis, we focus on the stock sale activities. The earliest observed stock sale in the sample is August 12, 1980. Since 167 out of the 168 events occur after August 1988, which is about three years after De Bondt and Thaler (1985) first report that prior long-term losers (winners) earn excess positive (negative) returns during the following five years, we limit our sample period as September 1988-December 1995 for the study of management behavior in stock sales. As pointed out earlier, in this dissertation, "management" is referred to as managers of the firms whose stock repurchase and

[112] The corresponding CRSP distribution codes are 6561 and 6581, respectively.
[113] For example, according to Dann, Masulis, and Mayers (1991), there are 122 repurchase tender offers by 101 NYSE/AMEX firms during the period 1969-1978. Slovin, Sushka, and Polonchek (1991) use a sample including 47 seasoned common stock issues by 33 banking firms listed on the NYSE/AMEX during December 1981-December 1989. In contrast, the sample examined in Slovin, Sushka, and Polonchek (1992) contains 240 announcements of seasoned common stock issues by the NYSE/AMEX industrial firms during 1980-1985. Their industrial firms are all NYSE/AMEX firms excluding those financial and utility firms.
[114] As pointed out by the associate director of CRSP Products and Services department in the University of Chicago, CRSP cannot be used as an exhaustive source for repurchases and offers. The distributions that CRSP has coded are "relatively recent and researched based on output in share change filters rather than from a list of all such events."

issuance activities are being analyzed, rather than the portfolio or institutional managers mentioned elsewhere.

Among the 167 observations, only 41 of them occur during November-March, and even worse, we find that merely four are in January. Obviously, given the very few observations, we cannot analyze the possible variation among the January observations. We could, however, examine whether the firms with January stock sales have some characteristics, such as higher risk and smaller firm size than those firms with October-November and February-March stock sales. To test whether the difference is significant, we also conduct both F-test and Kruskal-Wallis test and present the result in Table 17.

Table 17 reveals that there is no significant difference between the firms with the stock-issuance events occurring in January and those with the events in the other months during November-March, except that FFS, the Federal funds spread, is different at the time of the events. This significant difference is, however, contradictory to the view that management may exploit the January effect by issuing stocks at the time of easy monetary policy when stock prices are generally higher. Therefore, we find no evidence supporting the hypothesis that management responds to the January effect by adjusting the schedule of their stock issuance event. But since our study is seriously limited by a very small sample size, the above result may be less meaningful.

4.5.2 Inside Holders

Before we examine the cross-sectional variation of insider ownership, we first present average stock ownership of insiders during our sample period. The average

Table 17. Expected and Observed Difference for Stock Issuance In January and Other Months

	Stock Issuance During November-March					
	January	Other Months	Diff. In Mean: Jan - Other			
	Mean	Mean	Expt	Obsv	*F*-test	K-W test
σ	0.16	0.15	+	+	0.04	0.04
No. of Obs.	2	36				
% of long-term winners	0.25	0.12	–	+	0.52	0.52
No. of Obs.	4	57				
% of long-term losers	0.00	0.07	+	–	0.29	0.30
No. of Obs.	4	57				
FFS	1.96	1.14	–	+	4.48**	2.80*
No. of Obs.	4	57				
ME	1,186	448	–	+	1.10	0.17
No. of Obs.	4	57				
Price	13.70	13.73	–	–	0.00	0.17
No. of Obs.	4	57				
INST (in %)	59.10	27.00	–	+	1.95	1.95
No. of Obs.	1	35				

* Significant at the 0.10 level.
** Significant at the 0.05 level.
*** Significant at the 0.01 level.

insider ownership for the NYSE/AMEX firms during August 1992-January 1997 is displayed in Figure 1. As shown in the figure, insider ownership shows a declining trend during the time period from 18.46% to 12.50%. Since we are interested in knowing whether insiders arbitrage on the January effect by adjusting their ownership in December and January, average insider ownership is presented by calendar months in Figure 2 (all June observations are missing[115]). Given the well-documented finding that the stock market returns are, in the aggregate, higher in January than during the other months,[116] if insiders can exploit the January effect for arbitrage profits, then we expect that average insider ownership would be higher in December or lower in January than during other months.[117]

As shown in Figure 2, December is one of the months with the highest level of insider ownership, and January has the lowest insider ownership. The nonparametric Kruskal-Wallis test of Table 18 indicates that insider ownership is significantly higher (lower) in December (January) than during February-November. In contrast, the *F*-test shows that only the difference between January and February-November is statistically significant. The difference between December and February-November is insignificant at the 0.10 level but the *p*-value of 0.11 is very close to 0.10. In fact, as indicated by Figure 3, insider ownership is not normally distributed, and hence using the Kruskal-Wallis test would be more appropriate. Therefore, the above findings support the view that insiders,

[115] The CD/SEC file of Disclosure Inc. does not keep a continuous time-series record for monthly insider ownership data. Some observations for a specific calendar month may be missing during the sample period of August 1992-January 1997. There is no observation for June in the sample period.
[116] This finding is reported and confirmed in many studies such as Rozeff and Kinney (1976), Keim (1983), and Roll (1983).
[117] All insider ownership data are measured as of the end of the month in our study.

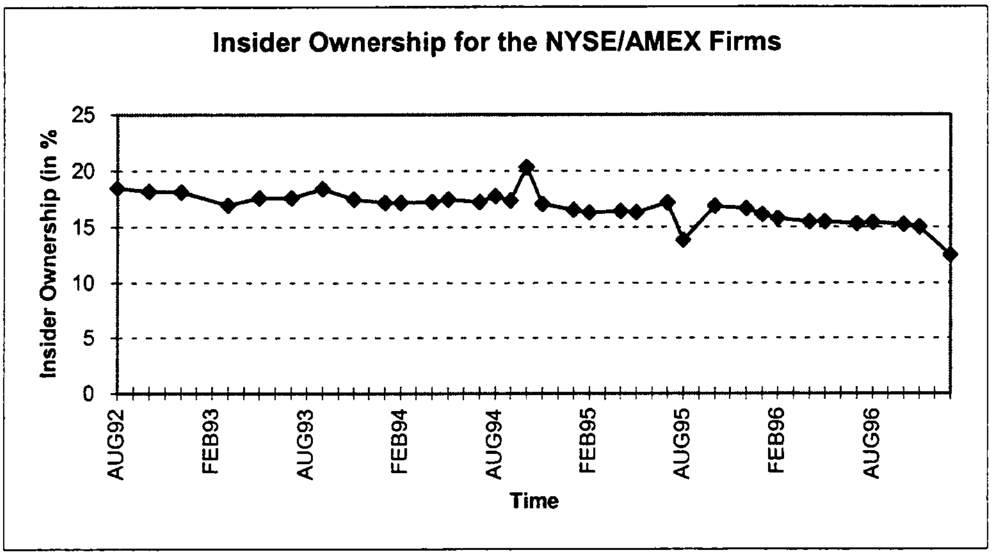

Figure 1. Average Insider Ownership for the NYSE/AMEX Firms During August 1992-January 1997

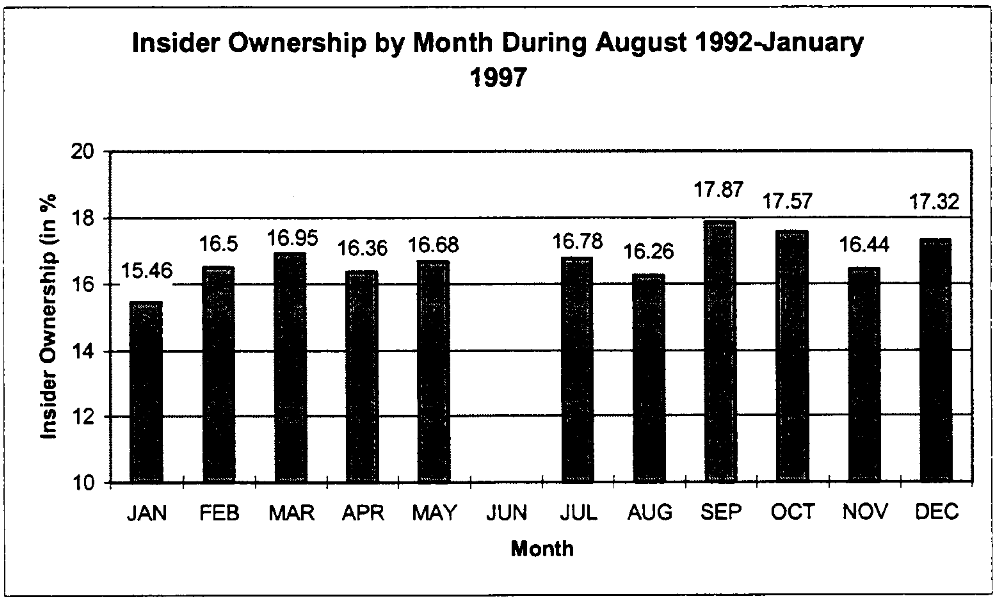

Figure 2. Average Insider Ownership by Month for the NYSE/AMEX Firms During August 1992-January 1997

Table 18. *F*-Test and Kruskal-Wallis Test for Insider Ownership Between December (January) and February-November

	Dec or Jan	Feb-Nov	F-test	K-W test
Panel A: December Insider Ownership (in %)				
Insider Own.	17.32	16.77	2.54	4.24**
Obs.	4,507	64,468		
Panel B: January Insider Ownership (in %)				
Insider Own.	15.46	16.77	29.43***	49.43***
Obs.	9,150	64,468		

* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

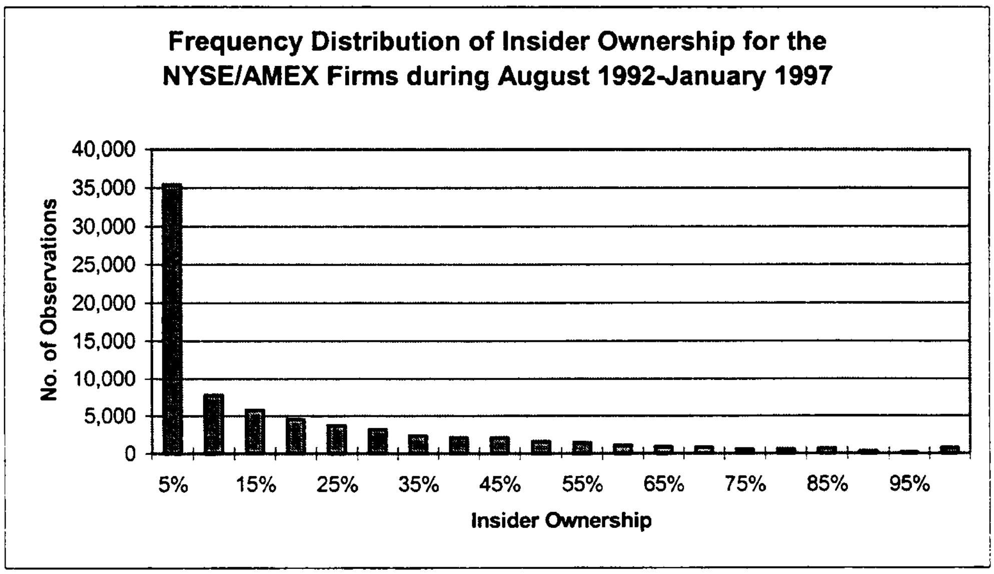

Figure 3. Frequency Distribution of Insider Ownership for the NYSE/AMEX Firms During August 1992-January 1997

in the aggregate, adjust their stock holdings in December and January to exploit the January effect.[118]

Next, we examine the cross-sectional variation of insider ownership changes for December and January, respectively. Since some data items, such as stock prices and returns after 1995, are not available at the time of this dissertation, the sample period for the cross-sectional analysis is from December 1992 to January 1996. The results of regressions are presented in Table 19.[119] The R^2s for all three regressions in the table are very low (0.001-0.002). This may suggest model misspecification due to omitted variables.[120]

---

[118] Nevertheless, if we delete the observation of January 1997 which shows a distinctive decrease in insider ownership from 15.01% to 12.50% (the rightmost observation in Figure 1), then the average January insider ownership during our sample period increases to 16.56 and becomes no more significantly lower than the value of February-November in both *F*- and Kruskal-Wallis tests. This result, however, is consistent with the finding of Seyhun (1988) that insiders in small firms tend to accelerate their planned purchases and postpone their stock sales in December but do not increase selling activity in January. Seyhun claims that the evidence supports the interpretation that the seasonal pattern of aggregate insider trading is more likely to be due to passive adjustments by insiders rather than to actively buying and selling their own firms' stock to exploit the January effect. In addition to the above interpretation for insignificant increased selling activity in January, the finding may also reflect the effect of other important factors. For example, insiders may actually, in the aggregate, move their planned sale transactions to January, but this activity is obscured by the January purchase transactions of some non-institution insiders such as CEO or other high-level managers who have received large year-end bonus. This scenario is very likely, since our empirical results of Section 4.2 support the liquidity hypothesis that individual investors tend to receive large liquid profits before year-end and invest in the following January. This excess liquidity position may motivate the managers to increase their holdings in January and as a consequence, insignificantly lower January insider ownership is observed.

[119] The result of a multicollinearity test (not shown here) indicates that the maximum variance inflation factor (*VIF*) of the independent variables is below 1.57 for the December and the January regressions. The maximum *VIF* for the joint December/January regression is 8.46, which is still lower than the serious level of 10. Please refer to p. 266 in Appendix 10 for the methodology used for the multicollinearity test.

[120] McConnell and Servaes (1990), investigating the relation between Tobin's Q and the structure of equity ownership, report a significant curvilinear relation between Tobin's Q and insider ownership. They also find a significantly positive relationship between Tobin's Q and institutional ownership. McConnell and Servaes conclude that their findings are consistent with the hypothesis that corporate value is a function of the structure of equity ownership. That is, their results imply that firm size may be an important determinant of insider and institutional ownership. Therefore, adding firm size (market equity) as an independent variable in the regressions of insider ownership change may correct the specification error and increase R^2.

Table 19. Estimated Coefficients for Regressions of Insider Ownership Change[a]

	$\ln^*(\Delta INSD/INSD)$		
	December	January	Dec and Jan
Intercept	-0.056 (-2.69***)	-0.008 (-0.78)	-0.005 (-0.43)
σ	0.074 (0.85)	-0.032 (-0.42)	0.082 (0.90)
D_{LTW}	-0.017 (-0.98)	0.027 (1.73*)	-0.018 (-1.01)
D_{LTL}	0.014 (0.79)	0.020 (1.33)	0.011 (0.63)
FFS	0.109 (2.87***)	-0.010 (-1.28)	0.002 (0.22)
$D_{low\text{-}ME}$	0.005 (0.30)	0.031 (1.98**)	0.009 (0.50)
$D_{low\text{-}PRC}$	-0.001 (-0.03)	-0.006 (-0.36)	0.000 (0.01)
$D_{low\text{-}INST}$	0.003 (0.22)	0.026 (2.32**)	0.003 (0.22)
D_{Jan}			-0.004 (-0.29)
σ^*D_{Jan}			-0.114 (-0.96)
$D_{LTW}^*D_{Jan}$			0.044 (1.91*)
$D_{LTL}^*D_{Jan}$			0.008 (0.35)
FFS^*D_{Jan}			-0.012 (-1.03)
$D_{low\text{-}ME}^*D_{Jan}$			0.022 (0.94)
$D_{low\text{-}PRC}^*D_{Jan}$			-0.007 (-0.25)
$D_{low\text{-}INST}^*D_{Jan}$			0.023 (1.34)
No. of Obs.	3,404	5,136	8,540
Adj-R^2	0.001	0.002	0.001

[a] *t*-statistics are displayed in parentheses below the estimated coefficients.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

For December, the significantly negative intercept seems inconsistent with the high average December insider ownership shown in Figure 2. However, the regression measures cross-sectional variation in December insider ownership among stocks, rather than time-series variation. Since FFS is the only independent variable with a statistically significant coefficient estimate in the December regression, the negative intercept may reflect that insiders reduce their stock ownership when the Fed's monetary policy is extremely easy, i.e., FFS = 0. If this is the case, then the negative intercept supports the view that insiders sell their stocks when the stock prices are high, since the extremely easy monetary policy would induce high turn-of-the-month returns.

In contrast, for the regression on January insider ownership change, the coefficients of the intercept and FFS now become insignificant at the 0.10 level. However, the coefficient of D_{LTW} is significantly positive at the 0.10 level, and the coefficients of $D_{low\text{-}ME}$ and $D_{low\text{-}INST}$ are significantly positive at the 0.05 level. Other coefficients remain statistically insignificant at the 0.10 level. To facilitate the comparison between expected and observed estimated coefficients, we summarize the expected and observed coefficients signs in Table 20. If the observed sign is consistent with the arbitrage activities of insiders' stock trading, then the cell is marked with thick lines, and if it is contradicting, then the signs are displayed in larger font size and bold face.

As shown in Table 20, given the finding that institutional managers switch away from high-risk stocks in December and switch back in the following January, if insiders exploit the January effect, then we should observe increased and decreased insider

Table 20. Expected and Observed Coefficient Signs for Regressions of Insider Ownership Change[a]

		ln*(ΔINSD/INSD)					
		December		January		Dec and Jan	
		Expted	Obsved	Expted	Obsved	Expted	Obsved
σ	a_1	+	±	–	±	+	±
D_{LTW}	a_2	–	±	+	+	–	±
D_{LTL}	a_3	+	±	–	±	+	±
FFS	a_4	+	+	+	±	+	±
$D_{low\text{-}ME}$	a_5	+	±	–	+	+	±
$D_{low\text{-}PRC}$	a_6	+	±	–	±	+	±
$D_{low\text{-}INST}$	a_7	+	±	–	+	+	±
$\sigma{*}D_{Jan}$	a_8					–	±
$D_{LTW}{*}D_{Jan}$	a_9					+	+
$D_{LTL}{*}D_{Jan}$	a_{10}					–	±
$FFS{*}D_{Jan}$	a_{11}					+	±
$D_{low\text{-}ME}{*}D_{Jan}$	a_{12}					–	±
$D_{low\text{-}PRC}{*}D_{Jan}$	a_{13}					–	±
$D_{low\text{-}INST}{*}D_{Jan}$	a_{14}					–	±

[a] "+" stands for significantly positive, "–" for significantly negative, and "±" for insignificant, at the 0.10 level.

ownership in December and January, respectively. The observed signs for coefficients on σ are exactly the same as expected, but the coefficients are all statistically insignificant.

Similarly, if insiders exploit the January return seasonality of long-term winners, then the coefficient of D_{LTW} should be negative and positive for the December and January regressions, respectively. The observed pattern for D_{LTW} is consistent with the expected result. However, only the coefficient for the January regression is statistically significant. The significantly positive coefficient implies that insiders of long-term winners increase their stock ownership in January when the stock price is depressed. Therefore, it offers positive evidence for January arbitrage activity. On the other hand, since long-term winners would earn negative excess returns during the next five years (De Bondt and Thaler (1987)), some may argue that the evidence is against, rather than supporting, the arbitrage activity. Nevertheless, in addition to the motivation of adjusting stock holdings for short-term arbitrage profits, insiders also need to maintain their control on the firms by holding some minimum amount of shares. Our finding that most of the observed coefficients in Table 20 are insignificant supports the view that insiders only passively adjust their holdings to exploit the January effect, rather than actively buying or buying during December and January (Seyhun (1988)).

Therefore, the significantly positive coefficient of D_{LTW} in the January regression may imply that insiders defer the planned purchase transactions until the following January, or accelerate purchases they have planned for later in the following year to January, when the stock price is low. In contrast, the coefficients of D_{LTL} for both December and January are insignificant and hence do not support insiders' arbitrage activity. The significantly positive coefficient of FFS in the December regression is consistent with the explanation that insiders accelerate or postpone their planned purchases and trade in December when the Fed's monetary policy is stringent.

As shown in Section 4.1, stock returns are negatively related to FFS, i.e., stock returns tend to be higher in a stringent monetary policy period than in an easy monetary policy period. This implies that insiders tend to increase their holdings when the stock price is relatively lower during the period of stringent monetary policy. Therefore, this evidence supports the passive trading behavior of insiders who accelerate or postpone their planned transactions to maximize expected profits.

Next, let us examine the coefficients of $D_{low\text{-}ME}$, $D_{low\text{-}PRC}$, and $D_{low\text{-}INST}$. As shown in Table 20, the observed coefficients of $D_{low\text{-}PRC}$ for both December and January regressions are insignificant at the 0.10 level and do not support insiders' arbitrage activity of exploiting the January effect. Further, the significantly positive coefficients of $D_{low\text{-}ME}$ and $D_{low\text{-}INST}$ in the January regression are opposite to the expected results for the arbitrage activity. In fact, the increased January insider ownership of small firms may imply that insider trading is part of the reasons for the small-firm January effect. Since insiders include high-level managers and representatives of institutional owners, we suspect that the above finding may be explained by the different trading behavior between individual owners, i.e., managers, and institutional owners, among insiders.

As mentioned in footnote 118 on p.151, those managers who have received large year-end bonuses may hold a large amount of cash in the portfolio of their personal investments. The excess liquidity position would then motivate the managers to purchase additional shares of their own firm's stock in January and as a consequence, the increased insider ownership in January is observed. This explanation is supported by the empirical evidence in Section 4.1, that individual investors tend to receive large liquid profits before year-end and invest in the following January.

Furthermore, some of our regression results also support this view. First, it can explain why the coefficient of FFS in the January regression is insignificantly negative, rather than significantly positive. Since the effect of the Fed's monetary policy on stock returns is stronger in January than other months, it is difficult to argue that insiders tend to postpone (accelerate) their planned stock sales and trade in December when the stock price is higher under the easy monetary policy to maximize profits, but they will not do so in January when the price is probably much higher under the easy monetary policy.

On the other hand, if the managers tend to have excessive liquidity during the easy monetary policy period due to greater year-end bonuses, then they will be motivated to invest part of the fund in investments with higher expected returns, including stocks of their own firms, ceteris paribus.[121] Under this scenario, the managers will increase their stock holdings in January during an easy monetary policy period, which offsets the decreased January holdings of the other institutional insiders who passively exploit the January effect. Consequently, the insignificant change in insider ownership during January is observed.

Similarly, since high-level managers of long-term winners are more likely to receive huge year-end bonuses due to excellent performance of the firms for the past five

[121] If their existing ownership is already very high, then the managers may have little motivation to further increase stock holding in their own firms.

years, they may have excess liquid profits and are motivated to increase their stock holdings in January.[122] That is, at least part of the increased January insider ownership for long-term winners could be related to the huge year-end bonuses received by high-level managers. Further, as shown in Section 4.1.3, the January returns of long-term winners are more depressed for the firms with lower institutional ownership than those with higher institutional ownership. Therefore, insiders of long-term winners with lower institutional ownership would have stronger motivation to exploit the January effect, when they decide to increase their stock holdings in January either by adjusting the planned transactions or by investing the year-end bonus. That is, the observed significantly positive coefficient of $D_{low\text{-}INST}$ in the January regression could reflect the increased January insider ownership on long-term winners.

As indicated by Table 20, if insiders exploit the January effect, we would expect a distinct change in trading behavior of insiders around year-end. For example, the insider ownership change for high-risk firms should be positive in December but negative in January. As mentioned above, among insiders the trading behavior of managers may be different from that of institutional owners. We doubt that the observed insignificant coefficients of σ may result from this difference. Specifically, some institutional insiders in high-risk firms could reduce their stock holdings in December to lock in the overall performance of portfolios that they manage, and then increase their holdings at the

[122] The managers may exercise their stock options around year-end as well. If the options are exercised in December, then December insider ownership will increase, which offsets the effect of the passive adjustment in insider ownership of long-term winners when their insiders exploit the January effect by accelerating the planned sales in December, or by delaying the planned December purchases until the following January. If this scenario is true, then it explains why the observed coefficient of D_{LTW} is

beginning of each calendar quarter for high expected returns, as suggested by the risk-preference switching hypothesis. These trading activities are just opposite to those for arbitrage purposes and hence could be the reason for the insignificant result.

To investigate the possibility that the arbitrage activities of insiders are covered up by trading activities for other purposes, we rerun the regression on the data set containing both December and January observations of insider ownership change. We also add an interaction term for each independent variable in the regression. All the interaction terms include a dummy variable denoting the January observations. The result is presented in Table 19 and summarized in Table 20 (the rightmost column in both tables). The expected coefficient signs on a_1 to a_7 are the same as those for the original December regression and the expected signs on the interaction terms, i.e., a_8 to a_{14}, are exactly the same as those on each corresponding variable in the original January regression.

Table 20 shows that the coefficient of $\sigma^* D_{Jan}$ is negative but insignificant and therefore does not support the distinctive change in insiders' trading behavior for arbitrage. The significant result for $D_{LTW}{}^* D_{Jan}$ is consistent with the previous finding on D_{LTW} in the regression of January. The coefficient of FFS is significant in the December regression; however, it becomes insignificant in the joint December/January regression. In contrast, the insignificant results for $D_{low\text{-}ME}{}^* D_{Jan}$ and $D_{low\text{-}INST}{}^* D_{Jan}$ do not support the distinctive change in insiders' trading behavior for exploiting the January effect. Therefore, our previous findings of significantly positive December insider ownership

insignificant for the December regression. On the other hand, if the managers exercise the options in changes for small and low-institutional-ownership firms are less convincing. That is, we only have weak evidence supporting the view that insider trading is part of the reason for the small-firm January effect.

In summary, since most of the observed coefficients either are statistically insignificant or have unexpected signs, our evidence is consistent with the finding of Seyhun (1988) that insiders do not actively buy and sell their own firms' stocks to exploit the January effect. One the other hand, the results from the coefficients of FFS and D_{LTW} support the view that insiders recognize the January seasonality of stock returns and correspondingly adjust their holding by accelerating or postponing their planned transactions into December or January. Therefore, our conclusion is very similar to that of Seyhun (1988).

However, we find that the passive adjustment occurs on stocks of long-term winners and also varies according to the stringency of the Fed's monetary policy. In contrast, Seyhun (1988) reports increased December purchases by insiders of small firms. Our result is not necessarily contradictory to Seyhun's, since the Fed's monetary policy has a greater effect on small firms than large firms. That is, insiders of small firms would have stronger motivation to exploit the small-firm January effect by increasing their stock holding in December than do insiders of large firms. Since Seyhun does not include FFS in his analysis, his result may reflect the effect of the Fed's monetary policy.[123]

January, then the coefficient of D_{LTW} for the January regression will be more positive, ceteris paribus.

[123] In contrast, our coefficient of $D_{low\text{-}ME}$ for the December regression is positive but insignificant. This insignificant result may be due to the multicollinearity in our regression. For example, the strong and negative correlation between riskiness and firm size (or positive correlation between σ and $D_{low\text{-}ME}$) may partly explain the insignificant estimated coefficients observed for σ and $D_{low\text{-}ME}$.

Lastly, we also observe significantly positive coefficients of $D_{low\text{-}ME}$ and $D_{low\text{-}INST}$ in the January regression. This finding, together with the insignificant coefficient of FFS in the January regression, may suggest that insider trading by high-level managers who receive huge year-end bonuses may actually be part of the reason for the small-firm January effect. But since we do not find the distinctive change in insider trading behavior from December to January, the evidence is inconclusive.

4.5.3 Institutional Holders

We first present average quarterly institutional ownership for the NYSE/AMEX firms during 1988-1995 in Figure 4. The figure shows an increasing trend for institutional ownership from 27.07% as of March 1988 to 38.38% as of December 1995. However, the level of average institutional ownership seems to have become stable since March 1994, which has the value of 38.76%. To examine seasonal change in institutional ownership across quarters, average institutional ownership for the four calendar quarters is further shown in Figure 5. Figure 5 indicates that average institutional ownership is lower in the first quarter, higher in the fourth quarter, and the same between the second and the third quarters.

This finding is consistent with the view that institutional owners, in the aggregate, exploit the January effect by purchasing more stocks in December (the fourth quarter) and resell them in the following January (the first quarter). To test the statistical significance of the difference, we conduct both an *F*-test and a Kruskal-Wallis test on the quarterly

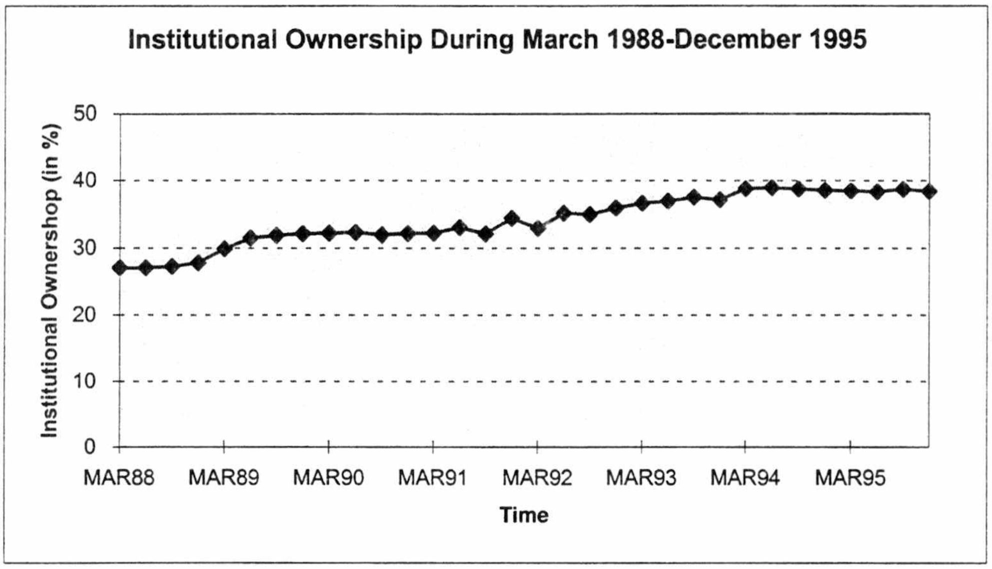

Figure 4. Average Quarterly Institutional Ownership for the NYSE/AMEX Firms During 1988-1995

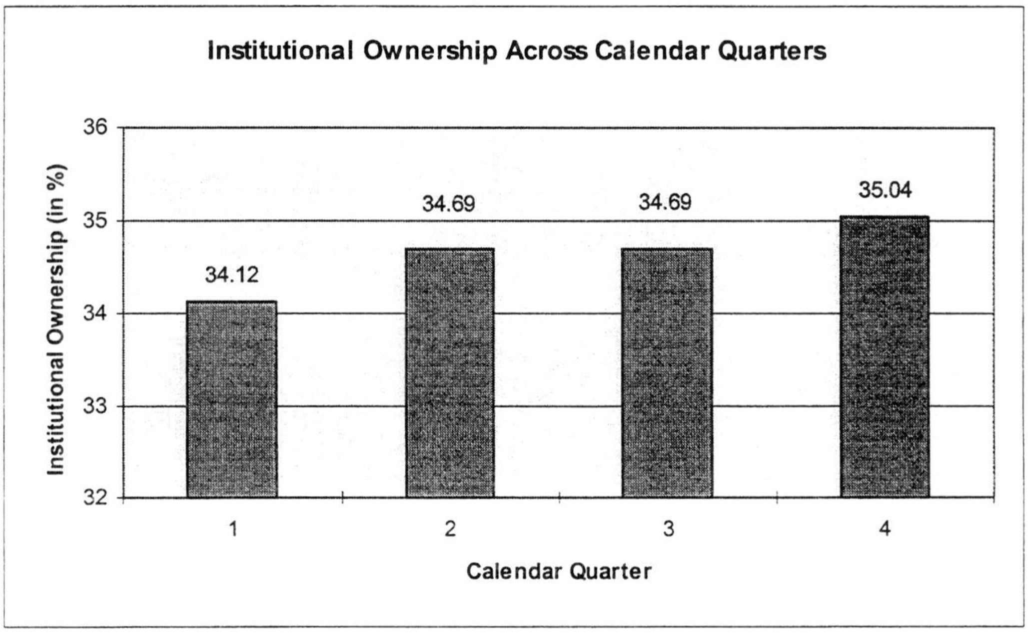

Figure 5. Average Institutional Ownership Across Calendar Quarters for the NYSE/AMEX Firms During 1988-1995

institutional ownership. The results are presented in Table 21. The non-parametric Kruskal-Wallis test is employed because institutional ownership may be not normally distributed as indicated by Figure 6.

Table 21 shows that the difference in institutional ownership between the fourth and the second/third quarters is insignificant at the 0.10 level for both *F*-test and Kruskal-Wallis test.[124] In contrast, the difference between the first and the second/third quarters is significant at the 0.05 level for both tests. Therefore, the evidence from aggregate institutional ownership supports the view that institutional owners exploit the January effect, but probably not by actively buying and selling around year-end. Instead, it implies that institutional owners may sell stocks when the high prices are observed in January and then, in the aggregate, buy back those shares later.

Next, we examine the cross-sectional variation of institutional ownership change during the fourth and the first quarters, respectively. For completeness, the regressions are conducted for each calendar quarter and the results are displayed in Table 22.[125] To facilitate the comparisons between the expected and the observed coefficient signs, the results for the fourth and the first quarters are summarized in Table 23. As in the last

---

[124] In an analysis testing whether institutional ownership in the fourth (first) quarter is different from that in each other quarter, respectively (not shown here), we find that institutional ownership in the fourth quarter is significantly higher than the first quarter, but not than the second or the third quarters. In contrast, the ownership in the first quarter is significantly lower than any one of the three other quarters. The results from the *F*-test and the Kruskal-Wallis test are the same in testing the significance of the difference.

[125] The result of a multicollinearity test (not shown here) indicates that the maximum variance inflation factor (*VIF*) of the independent variables is below 1.46 for the regressions of the first to the fourth quarter. The maximum *VIF* for the joint fourth/first quarter regression is 7.89, which is still lower than the serious level of 10. Please refer to p. 266 in Appendix 10 for the methodology used for the multicollinearity test. Further, the low R^2 in Table 22 (0.002-0.010) may suggest model misspecification for our regression model. As indicated in footnote 120 on p. 151, since institutional ownership is positively related to firm size, we may add firm size (market equity) as an independent variable in our regression to correct the specification error.

Table 21. *F*-Test and Kruskal-Wallis Test for Institutional Ownership Between the Fourth (First) and the Second/Third Quarters

	Q4 or Q1	Q2 and Q3	*F*-test	K-W test
Panel A: 4th Quarter Institutional Ownership (in %)				
INST	35.04	34.69	2.11	2.06
Obs.	15,105	30,114		
Panel B: 1st Quarter Institutional Ownership				
INST	34.12	34.69	5.60**	4.69**
Obs.	14,920	30,114		

* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

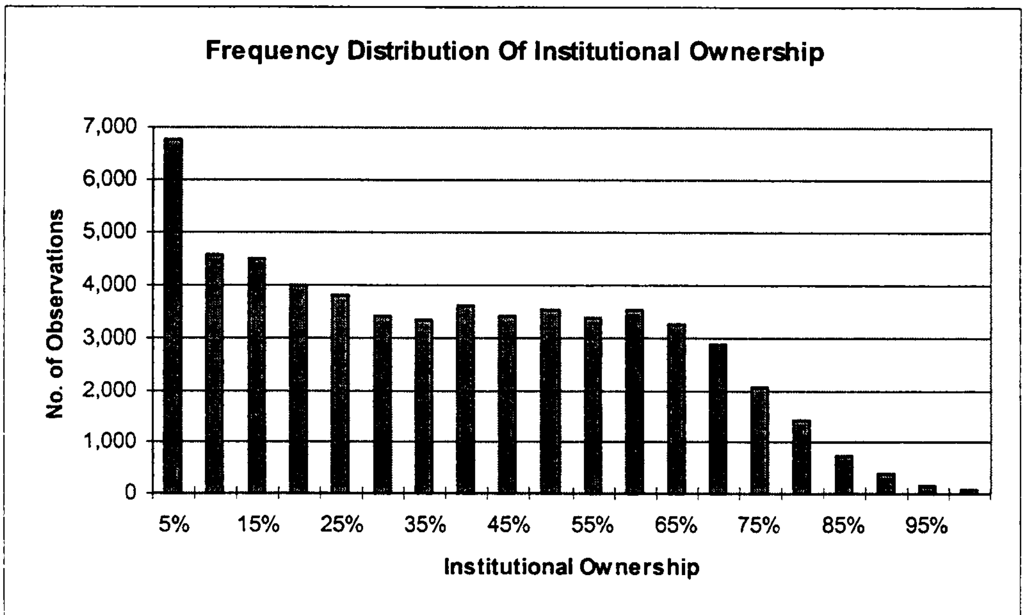

Figure 6. Frequency Distribution of Institutional Ownership for the NYSE/AMEX Firms During 1988-1995

Table 22. Estimated Coefficients for Regressions of Institutional Ownership Change[a]

	ln*(ΔINST/INST)				
	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	Q4 & Q1
Intercept	0.012 (2.91***)	0.002 (0.48)	0.007 (2.02**)	-0.000 (-0.06)	0.010 (2.19**)
σ	0.130 (4.36***)	0.014 (0.50)	0.105 (4.16***)	0.137 (3.66***)	0.121 (3.69***)
D_{LTW}	0.036 (6.14***)	0.007 (1.24)	0.006 (1.19)	0.014 (2.00**)	0.012 (1.94*)
D_{LTL}	-0.020 (-3.46***)	-0.024 (-4.24***)	-0.018 (-3.60***)	-0.019 (-2.54**)	-0.019 (-2.93***)
FFS	-0.005 (-1.11)	0.002 (0.50)	-0.010 (-5.53***)	-0.004 (-2.03**)	-0.010 (-5.48***)
$D_{LOW\text{-}ME}$	-0.023 (-3.75***)	-0.012 (-1.99**)	0.008 (1.50)	0.022 (2.96***)	0.005 (0.74)
$D_{LOW\text{-}PRC}$	0.001 (0.14)	0.004 (0.56)	0.024 (3.93***)	0.051 (5.67***)	0.026 (3.28***)
$D_{LOW\text{-}INST}$	-0.001 (-0.12)	-0.004 (-0.97)	0.022 (5.95***)	0.023 (4.30***)	0.022 (4.55***)
D_{Q1}					-0.008 (-1.25)
σ*D_{Q1}					0.016 (0.33)
D_{LTW}*D_{Q1}					0.002 (0.24)
D_{LTL}*D_{Q1}					0.000 (0.02)
FFS*D_{Q1}					0.003 (1.26)
$D_{low\text{-}ME}$*D_{Q1}					0.017 (1.85*)
$D_{low\text{-}PRC}$*D_{Q1}					0.025 (2.24**)
$D_{low\text{-}INST}$*D_{Q1}					0.002 (0.22)
No. of Obs. Adj-R^2	12,581 0.008	12,646 0.002	12,684 0.009	10,701 0.009	21,570 0.010

[a] *t*-statistics are displayed in parentheses below the estimated coefficients.

* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Table 23. Expected and Observed Coefficient Signs for Regressions of Institutional Ownership Change[a]

		ln*(ΔINST/INST)					
		4th Quarter		1st Quarter		Q4 & Q1	
		Expted	Obsved	Expted	Obsved	Expted	Obsved
σ	a_1		+		+		+
D_{LTW}	a_2	−	±	−,±	+	−	+
D_{LTL}	a_3	+	−		−	+	−
FFS	a_4	+	−	+	−	+	−
$D_{low\text{-}ME}$	a_5	+	±	−	+	+	±
$D_{low\text{-}PRC}$	a_6	+	+	−	+	+	+
$D_{low\text{-}INST}$	a_7	+	+	−	+	+	+
σ^*D_{Q1}	a_8						±
$D_{LTW}^*D_{Q1}$	a_9					+	±
$D_{LTL}^*D_{Q1}$	a_{10}					−	±
FFS^*D_{Q1}	a_{11}					+	±
$D_{low\text{-}ME}^*D_{Q1}$	a_{12}					−	+
$D_{low\text{-}PRC}^*D_{Q1}$	a_{13}					−	+
$D_{low\text{-}INST}^*D_{Q1}$	a_{14}					−	±

[a] "+" stands for significantly positive, "−" for significantly negative, "±" for insignificant, and "+,±" for greater than or equal to zero. The significance level for the observed coefficients is 0.10.

section, if the observed sign is consistent with the arbitrage activities of institutional owners' stock trading, then the cell is marked with thick lines, and if it is contradicting, then the sings are displayed in larger font size and bold face.

As mentioned in Section 3.4.3 and shown in Table 23, the expected signs of σ are indeterminate, but the observed signs of σ are significantly positive for both the fourth and the first quarters.[126] The results of positive estimated coefficients of D_{LTW} for the fourth and the first quarters do not support arbitrage activity on long-term winners, though only the coefficient for the first quarter is statistically significant. Similarly, the significantly negative coefficient of D_{LTL} is inconsistent with arbitrage trading as well. But by a closer look at Table 22, we find that coefficient signs for most independent variables are the same across quarters.

For example, the observed coefficient signs of both σ and D_{LTW} are positive and the coefficient of D_{LTL} is significantly negative for all four quarters. In fact, Table 22 shows that the regression results are very similar between the fourth and the first quarters, since their estimated coefficients on each independent variable have the same signs. The estimated coefficients in the first quarter regression are all statistically significant, except the intercept term. In contrast, the coefficients of D_{LTW} and $D_{low\text{-}ME}$ in the fourth quarter regression are insignificant and the intercept is significantly positive.

---

[126] This finding may be explained by the institutional managers' trading behavior of investing in risky stocks for higher expected returns. As discussed in footnotes 203 (p. 258) and 208 (p. 262), the December window dressing activities of selling risky stocks would be followed by the January switching back to risky stocks, and therefore the corresponding arbitrage trading strategy should be buying in December and selling in January. That is, both trading patterns should reverse around year-end. In contrast, the investment preference for risky stocks is probably held constant across quarters. Since the coefficient of σ is significantly positive for the three of four quarters, the evidence supports the investment preference of institutional managers for risky stocks.

We suspect that the same coefficient signs across all four quarters may imply some active all-the-year-round trading behaviors of institutional investors. If this scenario is true, then the potential arbitrage activities of exploiting the January effect may be obscured by these year-round activities. For example, the significantly negative coefficient estimates of D_{LTL} could result from the trading strategy of dumping-the-losers before each quarter-end. The December arbitrage activity of buying long-term losers may be overwhelmed by the strong year-end dumping-the-losers trading.

If institutional investors really exploit the January effect, then we will expect, as indicated in Section 4.3.2 for insider trading, a distinct reversion in trading behavior around the year-end for institutional investors. Instead of running a regression for each quarter, if we examine the institutional ownership change between the fourth and the first quarters, then we may disentangle the effects of these year-round activities. Therefore, we run the regression including both the fourth and the first quarter observations, with dummy variables for estimating marginal effects of the first-quarter observations.

The result is presented in the rightmost column of Table 22 and Table 23. As shown in Table 23, the expected coefficient signs of a_1 to a_7 for the joint regression are the same as those for the fourth quarter regression. Similarly, the signs of a_8 to a_{14} for the joint regression are the same as those for the first quarter regression, except the signs of a_9 and a_{10}, i.e., the coefficient signs of $D_{LTW}*D_{Q1}$ and $D_{LTL}*D_{Q1}$.[127] As in the fourth quarter

[127] Since the long-term winners tend to earn negative excess returns during the next five years, institutional investors could sell these stocks during the following first quarter, i.e., the very early period of the five years, to avoid further price depreciation. However, given the finding that most of the price depreciation occurs in the month of January during the following five years, institutional investors should sell the stocks in December, right before the beginning of price depreciation. Therefore, the fourth quarter selling should dominate the first quarter selling for long-term winners and the expected sign of $D_{LTW}*D_{Q1}$ would be

regression, the coefficient signs of D_{LTW} and D_{LTL} in the joint fourth/first quarter regression remain the same and do not support arbitrage activities of institutional owners in the fourth quarter. Further, the result in Table 23 reveals that the observed coefficients for σ^*D_{Q1}, $D_{LTW}{}^*D_{Q1}$ and $D_{LTL}{}^*D_{Q1}$ are all statistically insignificant. That is, the evidence does not support the reverse trading patterns expected by the potential arbitrage activities.

Now, let us inspect the coefficient of FFS. The observed coefficients are significantly negative for the fourth and the first quarter regressions, and hence do not support the hypothesis of arbitrage activity. However, the sign of FFS*D_{Q1} in the joint regression is positive, as expected, though insignificant at the 0.10 level. Next, since firm size, stock price, and institutional ownership are correlated with one another, we discuss the observed coefficients of $D_{low\text{-}ME}{}^*D_{Q1}$, $D_{low\text{-}PRC}{}^*D_{Q1}$, and $D_{low\text{-}INST}{}^*D_{Q1}$ together. In fact, the results from the fourth quarter, the first quarter, and the joint regressions are very similar, i.e., the observed coefficients of $D_{low\text{-}ME}{}^*D_{Q1}$, $D_{low\text{-}PRC}{}^*D_{Q1}$, and $D_{low\text{-}INST}{}^*D_{Q1}$ are all positive, though the coefficients of $D_{low\text{-}ME}$ in the fourth quarter and the joint regressions and the coefficient of $D_{low\text{-}INST}{}^*D_{Q1}$ in the joint regression are insignificant.

As shown in Table 23, the significantly positive observed coefficients of $D_{low\text{-}PRC}{}^*D_{Q1}$ and $D_{low\text{-}INST}{}^*D_{Q1}$ for the fourth quarter regression are consistent with the arbitrage activity. But since we also obtain inconsistent or contradicting evidence from the

---

positive. As for long-term losers, the expected sign of D_{LTL} for the first quarter regression is indeterminate because institutional investors could either buy the losers in December and sell in the following January for short-term arbitrage profits, or purchase the losers in the following first quarter to capture the expected price appreciation in the coming five years. However, since the price appreciation concentrates in the month of January during the following five years as well, the investors should purchase in the December prior to the five-year period, rather than waiting until the first quarter. Therefore, the institutional ownership change in the first quarter should be more negative than that in the fourth quarter, i.e., we expect a negative coefficient of $D_{LTT}{}^*D_{Q1}$.

observed signs of $D_{low\text{-}ME}$, $D_{low\text{-}PRC}$, and $D_{low\text{-}INST}$ in the first quarter regression and from those of $D_{low\text{-}ME}*D_{Q1}$, $D_{low\text{-}PRC}*D_{Q1}$, and $D_{low\text{-}INST}*D_{Q1}$ in the joint regression, the seemingly supporting evidence from the fourth quarter regression may only reflect some unknown trading behavior of institutional investors during these two quarters.

If we further compare the results from the regressions of all four quarters in Table 22, then the observed coefficients of $D_{low\text{-}ME}$ and $D_{low\text{-}PRC}$ seem to reveal an increasing trend across quarters. That is, the observed coefficients are monotonically increasing from the second quarter regression until the first quarter regression.[128] This seasonal trend of increasing stock holdings on small-firm and low-price stocks for institutional investors is interesting. It may be worthy of future investigation to understand trading behavior of institutional investors better.

In summary, the evidence from quarterly changes in institutional ownership does not support the hypothesis of arbitrage behavior of institutional investors around the year-end on the stocks that display January seasonality in returns. Therefore, our overall empirical results of examining trading behavior of insider and institutional holders do not support that these market participants exploit the January effect by actively buying and selling stocks around the year-end, even though they are the most likely candidates to do so. This supports the view of Bhardwaj and Brooks (1992) that the January effect is not exploitable. That is, our study is consistent with the efficient market hypothesis.

[128] Though we did not further investigate whether the shift across quarters is statistically significant, the result from the joint regression confirms that, at least the shift from the fourth to the first quarter is significantly positive. In contrast, the shift for $D_{low\text{-}INST}$ is more obvious from the second and the third quarters to the fourth and the first quarters. That is, the observed coefficients are insignificantly negative for the second and the third quarters but become significantly positive for the fourth and the first quarters.

CHAPTER V

SUMMARY AND CONCLUSIONS

The January effect refers to the anomaly of extraordinarily high average stock returns occurring in January, with most of the excess returns concentrating in the turn-of-the-year period, a five-day period extending from the last trading day of December through the first four trading days of January. Therefore, it is also referred to as the turn-of-the-year effect in the literature. Although numerous studies have been conducted for the past two decades, the January effect remains a puzzling phenomenon. There have been many hypotheses proposed to explain the effect. Among them, the tax-loss selling, window dressing, overreaction, and liquidity hypotheses are the most promising and widely tested.

However, the empirical evidence on these hypotheses is inconclusive and oftentimes contradicting. These contradictory findings may result from inadequate methodologies used in the analyses. The main objectives of this dissertation are to investigate the January effect by simultaneously testing the four hypotheses and to explore whether the effect is exploitable by insiders and institutional investors. Another objective is to examine the power of stock price and firm size in explaining cross-sectional variation in institutional ownership of the NYSE/AMEX firms.

The first problem of prior studies in testing the hypotheses of the January effect is related to the choice of asset pricing model. Specifically, Fama and French (1992) report that beta has no explanatory power for stock returns, while firm size (market equity) and book-to-market equity ratio combine to capture the cross-sectional variation in stock returns. If this finding is true, then it implies that the CAPM may be not an adequate tool for examining the January effect. The January effect could disappear when a correct asset pricing model is used.

In this dissertation, we use Fama and French's two-factor model to explain cross-sectional expected stock returns, since their model is more powerful and incorporates firm size, which is significant in explaining abnormally high January returns (Keim (1993)). We assume that the abnormal returns around year-end, e.g., depressed year-end and high turn-of-the-year returns according to the tax-loss selling hypothesis, result from the effect of some additional explanatory factors.[129] In the absence of these factors, stock returns should follow the expected return-risk relationship described by Fama and French's two-factor model. In fact, the presence of beta does not change our conclusions on testing the four major hypotheses. This result is consistent with the low explanatory power of beta on cross-sectional returns. Therefore, the Fama and French's model used in this study would be more adequate in investigating the January effect than the CAPM approach used in prior studies.

The second problem in previous studies is that they fail to control simultaneously for the most potentially important factors in their analyses. This neglect of important variables may incur specification error and seriously bias their results. Hence, model misspecification in previous studies could be responsible for the observed contradictory empirical evidence. In fact, we show that omitting potentially important factors could lead

[129] Similarly, we assume that the abnormal trading activities around year-end can be explained by these explanatory factors in our analysis of trading volumes.

to opposite conclusions on testing the major hypotheses of the January effect. Therefore, the results of some prior studies are in serious doubt, particularly when there exists a considerable amount of contradicting evidence from other studies.

In contrast, our simultaneous test is not only more methodologically correct but also provides an opportunity to compare the relative strength of tested hypotheses' power in explaining the January effect. It does not presume that the major hypotheses are mutually exclusive, while most of the prior studies implicitly do. Moreover, our simultaneous test examines the evidence from both stock returns and trading volume, while few studies in the literature have examined trading volumes in testing the four major hypotheses. These hypotheses not only predict the return patterns in December and January, but also have implications on trading volume variations in those periods. Therefore, using trading volumes is of great benefit; it could corroborate the evidence from analysis of returns.

Our simultaneous test is also capable of distinguishing between the tax-loss selling and the window dressing hypotheses. Prior studies fail to test these two hypotheses independently. In fact, these two hypotheses have similar implications for the patterns of stock returns and trading volumes, and hence part of the results may be confounding and can be explained by either of the two hypotheses, or both. This confounding effect occurs among the four tested hypotheses but is especially severe for the tax-loss selling and the window dressing hypotheses. In this study, we recognize that a fundamental difference between these two hypotheses lies in the contrasting roles played by different investors, i.e., window dressing by institutional investors versus tax-loss selling by individual investors. After introducing an institutional-ownership interaction term for each tested factor including the dummy variable denoting short-term losers, our simultaneous test can test the relative strength of these two hypotheses.[130]

In fact, the evidence from institutional ownership plays a key role in simultaneously testing all these hypotheses. This is because all four major hypotheses are related to the trading behavior of a subset of stock investors: either institutional or individual investors, but not both. That is, the tax-loss selling, overreaction, and liquidity hypotheses are related to individual investors and the window dressing hypothesis resorts to institutional investors. This distinct role played by institutional and individual investors in December/January stock trading is the basis for each major hypothesis of the January effect. Including the institutional-ownership interaction terms in the simultaneous test allows us to investigate the validity of these hypotheses from a new and essential perspective. Therefore, our simultaneous test is much more powerful in investigating the potential explanations of the January effect than prior studies.

The third problem in prior studies is related to the choice of proxy variable used in previous studies. Among the four major hypotheses of the January effect, the tax-loss selling hypothesis is probably the one that receives the most attention. As pointed out by both Reinganum (1983) and Chan (1986), an ideal measure of tax-loss selling pressure should take into account trading volumes and institutional holdings. More importantly, in measuring potential tax-loss selling (PTS) pressure, what really matter are capital losses,

[130] In this dissertation, we assume that loser stocks with higher (lower) institutional ownership would be more likely sold by institutional (individual) investors in the year-end window dressing (tax-loss selling) activities. Hence, if the window dressing hypothesis is valid, then we expect that losers with higher institutional ownership would have lower December returns than those with lower institutional ownership. In contrast, the tax-loss selling hypothesis predicts that the return pattern should be opposite from that stated above. This different prediction offers an opportunity to compare the relative strength of these two hypotheses.

essentially the difference between the sales price and the purchase price, rather than the average stock return or the relative price ratio used in previous studies testing the tax-loss selling hypothesis.

Therefore, the observed positive relation between tax-loss selling pressure and the January effect in the literature could be due to using fallacious PTS measures; particularly, the empirical evidence from other studies using different approaches to test the tax-loss selling hypothesis tends to reject this hypothesis. Ours study avoids the above potentially serious defects and derives a new PTS proxy. That is, our PTS proxy is potentially more powerful than any other PTS proxies used in the literature.

The major findings and conclusions for our simultaneous test are summarized in Section 5.1. The evidence from returns is very similar to that from trading volumes in testing the four hypotheses, except the risk-preference switching hypothesis. The result of a diagnostic test shows that multicollinearity is not a serious problem in our regressions and the sensitivity tests indicate that our conclusions will not change if slightly different definitions for the explanatory variables are used instead.

5.1 The Cross-Sectional Regressions On Stock Returns And Trading Volumes

[1] The tax-loss selling hypothesis is weakly supported, but economically insignificant:

Our empirical results of testing this hypothesis are mixed: The evidence from PTS is inconsistent with the hypothesis, while the findings from short-term losers (winners) which have negative (positive) prior returns tend to supports it. Specifically, the tax-loss selling hypothesis predicts that the coefficient of ln(PTS) for both returns and trading volumes in the January regressions should be positive, but we get either insignificant or significantly negative observed coefficients.

Similarly, the hypothesis predicts that higher-PTS stocks should have higher December trading volumes, and the higher the institutional ownership, the lower the December trading volumes. Nevertheless, the observed results are just opposite to what are expected. However, our PTS should be a better proxy than prior returns for tax-loss selling pressure and hence provides more convincing results. Further, when we replace our PTS proxy by some widely-used proxies in the literature for our simultaneous test, the empirical results from trading volumes remain inconsistent with tax-loss selling. This finding supports our conjecture that the results of those prior studies which report a positive relation between tax-loss selling pressure and January returns may be biased due to using rough PTS proxies.

In fact, these studies fail to find a corresponding negative relation between tax-loss selling pressure and December returns. Therefore, the validity of this hypothesis is in doubt. In addition, the results of component contribution analyses shows that tax-loss selling contributes little in explaining the cross-sectional variation of stock returns. On the other hand, the evidence indicates that tax-loss selling may play a significant role in explaining December, but not January, trading volumes. Lastly, since our PTS proxy may be imperfect as well and the evidence from short-term winners and losers tends to be consistent with the hypothesis, we conclude that the tax-loss selling/parking-the-proceeds hypothesis is, at most, weakly supported but economically insignificant.

[2] The evidence tends to reject the traditional version of the window dressing hypothesis, but the risk-preference-switching version is probably correct:

Our results reveal that neither short-term nor long-term losers have significantly lower returns in December or any of its subperiods, and those with higher institutional ownership generally have lower trading volumes during these time periods.[131] We also find that long-term winners tend to have lower December trading volumes than other stocks. These findings are inconsistent with the traditional window dressing hypothesis. On the other hand, our results show that both short- and long-term winners tend to have higher December and lower January returns. Moreover, short-term winners are more actively traded in December and January. These are the findings consistent with the traditional window dressing hypothesis. However, most of them also support either the tax-loss selling or the overreaction hypotheses.

Compared with our study, Bildersee and Kahn (1987) report that winners and losers have significantly lower block trading during the last five trading days in the quarter, but without further examining the corresponding returns of winners and losers.[132] Since block trading is a proxy for institutional trading and only accounts for a portion of total stock trading, we conclude that the window dressing activities of

[131] In contrast, this dissertation employs total trading volume, rather than block trading. Our result indicates that short-term losers do not have significantly lower returns in the early December, the year-end, or the whole December period and long-term losers with higher institutional ownership even have higher early-December returns.

[132] Bildersee and Kahn (1987) examine volume data of block trades and report a pattern of abnormally high trading during days -15 to -6 followed by abnormally low trading during the last five trading days in the calendar quarter (days -5 to -1) for the NYSE stocks during 1978-1983. Winners and losers are defined as the 30 stocks with the highest and the lowest returns, respectively, in the prior two months of the quarter.

dumping losers and buying winners may exist, but it is probably not an important explanation for the January effect.

On the other hand, Ritter and Chopra (1989) document that smaller firms have higher January returns and the higher the beta, the greater the returns. Their finding is consistent with risk-preference switching, however, it could also be partly explained by other reasons such as the January price correction to long-term losers suffering from investor overreaction. Our result confirms that their evidence is robust in a simultaneous test of the overreaction and window dressing hypotheses. It further reveals that risky stocks have depressed December returns and the higher the institutional ownership, the more depressed the returns.

On the other hand, the evidence from trading volumes tends to weaken the risk-preference switching hypothesis. However, since the January effect is related to the seasonality in stock returns and stock prices may vary drastically without significantly changing trading volumes, the evidence from the return analysis should be more important than that from the trading volume analysis. Further, the opposing trading volume evidence comes from a single coefficient estimate, in contrast to three from the return analysis. Therefore, we conclude that the consolidated evidence tends to support risk-preference switching.

Also, the results of component contribution analyses support that the risk-preference switching hypothesis is an economically significant explanation of the January effect, but do not support the traditional window dressing hypothesis.

Therefore, our study greatly strengthens the validity of the risk-preference switching explanation.

[3] Investor overreaction is strongly supported:

The result of our simultaneous test shows that prior long-term losers (winners) have higher (lower) January returns than other stocks. Prior studies investigating investor overreaction such as De Bondt and Thaler (1987) and Chopra, Lakonishok, and Ritter (1992) notice that part of their finding of high (low) January returns on long-term losers (winners) is attributed to short-term return reversals, which could reflect tax-motivated trading. Therefore, our finding shows that the price correction on long-term losers (winners) remains statistically significant after controlling short-term losers (winners) and other important factors such as firm size and riskiness.

Further, the overreaction hypothesis also propounds that individual investors overreact, while institutional investors do not. Since we find that the higher the institutional ownership of long-term losers (winners), the lower (higher) their January returns, our study provides the first evidence to support this proposition. Additionally, our new supporting evidence from trading volume data greatly enhances the validity of the overreaction hypothesis. However, since overreaction only occurs on extreme winners and losers, the results of component contribution analyses indicate that the investor overreaction explanation for the January effect may be economically insignificant.

[4] Liquid profits are both statistically and economically significant:

Ogden (1990) reports that the standardization of payments at the end of the month induces a rise in stock prices at the turn of each calendar month. Since individual investors receive most of their liquid profits in December, he suggests that the liquidity hypothesis may provide a partial explanation for the January effect.[133] Ogden further argues that individual investors prefer small-firm stocks so that the January effect is more pronounced for small-firm stocks.[134] Our study, examining data on institutional ownership, stock returns, and trading volumes, offers the first complete evidence from the U.S. stock markets to support this hypothesis.

Specifically, we find that an easier monetary policy, which increases aggregate liquid profits, generally results in higher turn-of-the-month returns in both December and January, and the lower the institutional ownership of the stocks (or the smaller the firm size), the larger the returns. The result of our simultaneous test also confirms that smaller firms earn higher January stock returns than larger firms. Lastly, the results of component contribution analyses further reveal that firm size, stock riskiness, and monetary policy are important determinants of both stock returns and trading volumes in December and January. Therefore, we conclude that the liquidity hypothesis is both statistically and economically significant in explaining the January effect in the presence of other potential candidates.

[133] Ogden (1990) finds that stock returns are greater following the month of December and vary inversely with the stringency of monetary policy.
[134] Ogden (1990) does not examine whether monetary policy has greater impact on stock returns of smaller firms.

5.2 Individual Investors' Preference: Small-Firm Or Low-Price Stocks?

Both the overreaction and the liquidity hypotheses imply that the small-firm January effect can be explained by the trading behavior of individual investors, i.e., individual investors prefer investing in small firm stocks and hold proportionally more of these stocks. On the other hand, Bhardwaj and Brook (1992) report that the January effect is primarily a low-price effect and less so a firm size effect. If this is true, then at least part of these two hypotheses, i.e., their explanations for the small-firm effect on January returns, will be invalid.

However, their finding is not necessarily completely inconsistent with the overreaction and the liquidity hypotheses, since individual investors may actually prefer low-price, rather than small-firm stocks. If this is the case, a small patch on these hypotheses is sufficient. To investigate this possibility and reconcile the explanations of these two hypotheses with the finding of Bhardwaj and Brook (1992), we regress institutional ownership on firm size and stock price. The result shows that the estimated coefficients of firm size and stock price are both significantly positive.

We then divide our sample into 100 portfolios by jointly ranking the stocks into both firm size and price deciles, and rerun the regression for each of the 100 portfolios. The result indicates that firm size is generally more powerful than price in explaining institutional ownership for the stocks with the lowest 20% ranking of either firm size or price. These stocks are generally reported as having abnormally high January returns. Therefore, the above evidence tends to reject the previous conjecture. Instead, it supports the view that individual investors prefer small-firm stocks, rather than low-price stocks, as the explanation of the January effect. Future study to reconcile the seemingly inconsistent evidence from Bhardwaj and Brook (1992) for the overreaction and liquidity hypotheses is worthwhile.

5.3 Is The January Effect Exploitable?

One of the puzzles about the January effect is why the January effect continues to exist, since it has been widely studied in the past two decades and thus well known among investors. Investors recognizing the January seasonality should take advantage of this knowledge in their trading for arbitrage profits, which then eliminates high January returns and the January effect. However, Haugen and Jorion (1996), examining stock returns of the NYSE firms from 1926 through 1993, find that the January effect is still going strong and no significant trend portends its eventual disappearance.

Bhardwaj and Brooks (1992) further show that "failure of informed traders to eliminate significantly large before-transaction-cost excess January returns on low-price stocks is potentially explained by higher transaction costs and a bid-ask bias." In contrast, Maberly and Maris (1991) find a significant reduction in arbitrage opportunities created by the January effect since the introduction of index futures and index options. The exploitability of the January effect is a critical issue for the efficient market hypothesis, which is the foundation of many modern finance theories including the CAPM. If the January effect is exploitable, then its continuous existence is obviously evidence against the efficient market hypothesis. Consequently, many widely-accepted theories need to be reestablished.

Since insiders may have private information and institutional investors may have the advantage of lower transaction and information costs that a typical investor does not have in stock trading, investigating trading behavior of insiders and institutional investors around the year-end provides a powerful approach to address this issue. If the January effect is exploitable, then we should most likely observe the corresponding arbitrage activities by these investors. If neither insiders nor institutional investors are found to arbitrage on the January effect, then our study would offer strong support for the efficient market hypothesis. A brief description of our approach is as follows.

We first examine the average level for insider ownership in December (January), and similarly for institutional ownership during the fourth (first) calendar quarter. Next, the change in insider (institutional) ownership is regressed on the independent variables identified as powerful in explaining the cross-sectional variations of stock returns and trading volumes in the first part of this dissertation. In contrast, prior studies such as Athanassakos (1992) and Porter, Powell, and Weaver (1996) examine only changes in institutional holdings of stocks based on their firm sizes.[135] Further, their studies focus on exploring the relationship between institutional trading and the high January returns. Consequently, they both use measures of absolute change in institutional ownership in the research.

To detect the abnormal change due to the potential arbitrage activity, our study employs a relative measure of institutional ownership change obtained from dividing the absolute change in institutional ownership by the level of institutional ownership as of the

[135] To study the insiders' arbitrage activities on exploiting the January effect, Seyhun (1988) uses number (and dollar value) of purchases and sales for insider trading.

prior quarter-end. This measure has the advantage of detecting lower-in-absolute-magnitude but actually relatively stronger arbitrage activities on the stocks with low institutional ownership. These low-institutional-ownership stocks may have a more pronounced January effect (Eakins and Sewell (1993)) and hence are more likely the targets for arbitrage. Similarly, we use this relative measure for change in insider ownership to detect potential arbitrage activities. The major findings of these tests and the conclusions based on the evidence from insider and institutional ownership data are presented in the remainder of this section.

First, we find that the average insider ownership for the NYSE/AMEX stocks is lower in January and higher in December than the other months. Similarly, the average institutional ownership is lower for the first quarter and higher for the fourth quarter than the remaining quarters. Since stocks on average earn higher returns in January than the other months, the above finding supports that these market participants, in the aggregate, exploit the January effect by adjusting their stock holdings around the year-end.

In contrast, our results from the regressions on the ownership changes do not support that insiders or institutional investors arbitrage and exploit the January effect by actively buying and selling around the year-end. However, we have weak evidence that insiders may acknowledge the January seasonality in stock returns and correspondingly delay or accelerate their planned transactions so that the trading is conducted at more favorable prices. Our evidence on insider ownership changes confirms the finding of Seyhun (1988) who only controls firm size in his analysis. On the other hand, our empirical results from the cross-sectional regression of quarterly change in institutional ownership do not support the corresponding buying and selling arbitrage activities during the fourth and the first quarters on the stocks with return seasonality in December or January. Therefore, our previous finding of lower (higher) average level of institutional ownership for the first (fourth) quarter may be related to other unknown seasonal adjustments in that quarter and be irrelevant to the potential arbitrage trading for exploiting the January effect.

This is because the quarterly change data also include the change in February and March (October and November) and hence could be too noisy to measure the change in January (December). This possibility may explain the low R^2s (0.01) for the regressions, though most of the estimated coefficients are statistically significant. Similarly, the level of institutional ownership measured as of the end of each quarter suffers from the same noise and therefore the unknown seasonal adjustments do not necessarily occur in January (December). In summary, our results from insiders and institutional investors tend to support the view of Bhardwaj and Brooks (1992) that the January effect is not exploitable. That is, our findings are consistent with the efficient market hypothesis.

REFERENCES

REFERENCES

Ariel, R. A., 1987, "A monthly effect in stock returns," *Journal of Financial Economics*, **18**, 161-174.

Ariel, R. A., 1990, "High stock returns before holidays: Existence and evidence on possible causes," *Journal of Finance*, **45**, no. 5, 1611-1626.

Asquith, P. and D. Mullins, 1986, "Equity issues and offering dilution," *Journal of Financial Economics*, **15**, 61-89.

Athanassakos, G., 1992, "Portfolio rebalancing and the January effect in Canada," *Financial Analysts Journal*, **48**, no. 6, 67-78.

Athanassakos, G. and J. A. Schnabel, 1994, "Professional portfolio managers and the January effect: Theory and evidence," *Review of Financial Economics*, **4**, 79-91.

Ball, R., S. P. Kothari, and J. Shanken, 1995, "Problems in measuring portfolio performance: An application to contrarian investment strategies," *Journal of Financial Economics*, **38**, 79-107.

Banz, R. W., 1981, "The relationship between return and the market value of common stocks," *Journal of Financial Economics*, **9**, 3-18.

Berges, A., J. J. McConnell, and G. G. Schlarbaum, 1984, "The turn of the year in Canada," *Journal of Finance*, **39**, no. 1, 185-192.

Bhardwaj, R. K. and L. D. Brooks, 1992, "The January anomaly: Effects of low share price, transaction costs, and bid-ask bias," *Journal of Finance*, **47**, 553-575.

Bildersee, J. and N. Kahn, 1987, "A preliminary test of the presence of window dressing: Evidence from institutional trading," *Journal of Accounting, Auditing and Finance*, **2**, no. 3, 239-265.

Black, F., M. C. Jensen, and M. Scholes, 1972, "The capital asset pricing model: Some empirical tests," in Jensen, ed., *Studies in the theory of capital markets*, Praeger, New York, 79-124.

Blume, M. and I. Friend, 1986, "Recent and prospective trends in institutional ownership and trading of exchange and OTC stocks," Unpublished University of Pennsylvania working paper.

Brailsford, T. J. and S. A. Easton, 1993, "New evidence on the impact of tax-loss selling on the turn of the year effect," *Journal of Banking and Finance*, **17**, no. 1, 131-144.

Branch, B., 1977, "A tax loss trading rule," *Journal of Business*, **50**, no. 2, 198-207.

Brauer, G. A. and E. C. Chang, 1990, "Return seasonality in stocks and their underlying assets: Tax-loss selling versus information explanations," *Review of Financial Studies*, **3**, 255-280.

Brown, P., D. B. Keim, A. W. Kleidon, and T. A. Marsh, 1983, "Stock return seasonalities and the tax-loss selling hypothesis: Analysis of the arguments and Australian evidence," *Journal of Financial Economics*, **12**, no. 1, 105-128.

Chan, K. C., 1986, "Can tax-loss selling explain the January seasonal in stock returns?" *Journal of Finance*, **41**, no. 5, 1115-1128.

Chopra, N., J. Lakonishok, and J. R. Ritter, 1992, "Measuring abnormal performance: Do stocks overreact?" *Journal of Financial Economics*, **31**, 235-268.

Conard, J. and G. Kaul, 1993 "Long-term market overreaction or biases in computed returns?" *Journal of Finance*, **48**, 39-63.

Copeland, T. E. and J. F. Weston, 1988, *Financial Theory and Corporate Policy (third edition)*, Addison-Wesley.

De Bondt, W. F. M. and R. H. Thaler, 1985, "Does the stock market overreact?" *Journal of Finance*, **40**, 793-805.

De Bondt, W. F. M. and R. H. Thaler, 1987, "Further evidence on investor overreaction and stock market seasonality," *Journal of Finance*, **42**, 557-581.

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

Dyl, E. A. and E. D. Maberly, 1992, "Odd-lot transactions around the turn of the year and the January effect," *Journal of Financial and Quantitative Analysis*, **27**, 592-604.

Eakins, S. and S. Sewell, 1993, "Tax-loss selling, institutional investors, and the January effect: A note," *Journal of Financial Research*, **16**, no. 4, 377-384.

Eakins, S. and S. Sewell, 1994, "Do institutions window dress? An empirical investigation," *Quarterly Journal of Business and Economics*, **33**, no. 2, 69-78.

Engle, R. F. and D. M. Lilien and R. P. Robins, 1987, "Estimating time varying risk premium in the term structure: The ARCH-M model," *Econometrica*, **55**, 987-1007.

Fama, E. F. and J. D. MacBeth, 1973, "Risk, return, and equilibrium: Empirical test," *Journal of Political Economy*, **81**, 607-636.

Fama, E. F. and K. French, 1992, "The cross section of expected stock returns," *Journal of Finance*, **47**, 427-465.

Fant, L. F. and D. R. Peterson, 1995, "The effect of size, book-to-market equity, prior returns, and beta on stock returns: January versus the remainder of the year," *Journal of Financial Research*, **18**, no. 2, 129-142.

Ferris, S. P., R. A. Haugen, and A. K. Makhija, 1988, "Predicting contemporary volume with historic volume at different price levels: Evidence supporting the disposition effect," *Journal of Finance*, **43**, no. 3, 677-697.

French, D. W. and T. D. Trapani, 1994, "Cash balances and the January effect in stock returns," *Quarterly Journal of Business and Economics*, **33**, no. 4, 3-12.

Givoly, D. and A. Ovadia, 1983, "Year-end tax-induced sales and stock market seasonality," *Journal of Finance*, **38**, no. 1, 171-186.

Gultekin, M. N. and N. B. Gultekin, 1983, "Stock market seasonality: International evidence," *Journal of Financial Economics*, **12**, 469-481.

Haugen, R. A., 1986, *Modern Investment Theory*, Englewood Cliffs, NJ: Prentice-Hall.

Haugen, R. A. and J. Lakonishok, 1988, *The Incredible January Effect: The Stock Market Unsolved Mystery*, Homewood, IL: Dow Jones-Irwin.

Haugen, R. A. and P. Jorion, 1996, "The January effect: Still there after all these years," *Financial Analysts Journal*, January-February, 27-31.

Jannson, S., 1983, "The fine art of window dressing," *Institutional Investor*, **27**, 139-140.

Jegadeesh, N. and S. Titman, 1993, "Returns to buying winners and selling losers: Implications for stock market efficiency," *Journal of Finance*, **48**, no. 1, 65-91.

Jones, C. P., D. K. Pearce and J. W. Wilson, 1987, "Can tax-loss selling explain the January effect? A note," *Journal of Finance*, **42**, no. 2, 453-461.

Jones, C. P. and J. W. Wilson, 1989, "An analysis of the January effect in stocks and interest rates under varying monetary regimes," *Journal of Financial Research*, **12**, no. 4, 341-354.

Jones, S. L., W. Lee, and R. Apenbrink, 1991, "New evidence on the January effect before personal income taxes," *Journal of Finance*, **46**, 1909-1924.

Kato, K. and J. S. Schallheim, 1985, "Seasonal and size anomalies in the Japanese stock market," *Journal of Financial and Quantitative Analysis*, **20**, no. 2, 243-260.

Keim, D. B., 1983, "Size-related anomalies and stock market seasonality: Further empirical evidence," *Journal of Financial Economics*, **12**, 12-32.

Keim, D. B., 1985, "Dividend yields and stock returns: Implications of abnormal January returns," *Journal of Financial Economics*, **14**, 473-489.

Keim, D. B. and R. F. Stambaugh, 1986, "Predicting returns in the stock and bond markets," *Journal of Financial Economics*, **17**, 357-390.

Ketcham, D. C., 1988, *Institutional trading practices and security price behavior: The case of window dressing*, Unpublished Doctoral Dissertation, The Pennsylvania State University (August 1988).

Lakonishok, J. and S. Smidt, 1984, "Volume and turn-of-the-year behavior," *Journal of Financial Economics*, **13**, 435-455.

Lakonishok, J. and A. C. Shapiro, 1986, "Systematic risk, total risk and size as determinants of stock market returns," *Journal of Banking and Finance*, **10**, 115-132.

Lakonishok, J. and S. Smidt, 1986, "Volume for winners and losers: taxation and other motives for stock trading," *Journal of Finance*, **41**, no. 4, 951-974.

Lakonishok, J. and S. Smidt, 1988, "Are seasonal anomalies real? A ninety-year perspective," *Review of Financial Studies*, **1**, 403-425.

Lakonishok, J., A. Shleifer, R. Thaler, and R. Vishny, 1991, "Window dressing by pension fund managers," *AER Papers and Proceedings*, **81**, 227-231.

Laurent, R. D., 1988, "An interest-rate-based indicator of monetary policy," *Economic Perspectives, Federal Reserve Bank of Chicago*, **12**, 3-14.

Lee, I., 1992, "Stock market seasonality: Some evidence from the Pacific-Basin countries," *Journal of Business Finance and Accounting*, **19**, no. 2, 199-210.

Lee, K. Y. and C.-S. Chang, 1988, "Anomalies in the stock returns over nontrading and trading periods: Further evidence in the Korean stock market," *Quarterly Journal of Business and Economics*, **27**, no. 2, 139-161.

Maberly, E. D. and B. A. Maris, 1991, "The January effect, arbitrage opportunities, and derivative securities: Has anything changed?" *Journal of Futures Markets*, **11**, no. 2, 253-257.

McConnell, J. J. and H. Servaes, 1990, "Additional evidence on equity ownership and corporate value," *Journal of Financial Economics*, **27**, 595-612.

Merrill, A. A., 1965, *Behavior of Prices on Wall Street*, Chappaqua, NY: The Analysis Press.

Mikkelson, W. and M. Partch, 1985, "Stock price effects and cost of secondary distributions," *Journal of Financial Economics*, **14**, 165-194.

Miller, E., 1990, "Explaining the January small firm effect by the interaction of procedurally rational investors and seasonal traders," *Quarterly Journal of Business and Economics*, **29**, no. 3, 36-51.

Ogden, J. P., 1990, "Turn-of-month evaluations of liquid profits and stock returns: A common explanation for the month and January effects," *Journal of Finance*, **45**, no. 4, 1259-1272.

Pettengill, G. N., 1986, "A non-tax cause for the January effect? Evidence from early January," *Quarterly Journal of Business and Economics*, **25**, no. 3, 15-33.

Pettengill, G. N., 1989, "Holiday closing and security returns," *Journal of Financial Research*, **12**, 57-67.

Porter, D. C., G. E. Powell, and D. G. Weaver, 1996, "Portfolio rebalancing, institutional ownership, and the small firm-January effect," *Review of Financial Economics*, **5**, 19-29.

Reinganum, M. R., 1981, "Misspecification of capital asset pricing: Empirical anomalies based on earnings yields and market values," *Journal of Financial Economics*, **9**, 19-46.

Reinganum, M. R., 1983, "The anomalous stock market behavior of small firms in January," *Journal of Financial Economics*, **12**, no. 1, 89-104.

Reinganum, M. R. and A. Shapiro, 1987, "Taxes and stock return seasonality: Evidence from the London stock exchange," *Journal of Business*, **60**, 281-295.

Ritter, J. R., 1988, "The buying and selling behavior of individual investors at the turn of the year," *Journal of Finance*, **43**, no. 3, 701-717.

Ritter, J. R., and Navin Chopra, 1989, "Portfolio rebalancing and the turn-of-the-year effect," *Journal of Finance*, **44**, no. 1, 149-166.

Rogalski, R. J. and S. M. Tinic, 1986, "The January size effect: Anomaly or risk mismeasurement?" *Financial Analysts Journal*, **42**, 63-70.

Roll, R., 1983, "Vas ist das?" *Journal of Portfolio Management*, **9**, 18-28.

Rozeff, M. S. and W. R. Kinney, Jr., 1976, "Capital market seasonality: The case of stock returns," *Journal of Financial Economics*, **3**, 379-402.

Rozeff, M. S., 1986, "Tax loss selling: Evidence from December stock returns and share shifts," *Proceedings of the CRSP Seminar on the Analysis of Security Prices*, May, 9-45.

Schultz, P., 1985, "Personal income taxes and the January effect: Small firm stock returns before the War Revenue Act of 1917: A note," *Journal of Finance*, **40**, 333-343.

Seyhun, H. N., 1986, "Insiders' profits, costs of trading, and market efficiency," *Journal of Financial Economics*, **16**, 189-212.

Seyhun, H. N., 1988, "The January effect and aggregate insider trading," *Journal of Finance*, **43**, 129-141.

Seyhun, H. N., 1993, "Can omitted risk factors explain the January effect? A stochastic dominance approach," *Journal of Financial and Quantitative Analysis*, **28**, 195-212.

Shefrin, H. and M. Statman, 1985, "The disposition to sell winners too early and ride losers too long: Theory and evidence," *Journal of Finance*, **40**, no. 3, 777-792.

Slemrod, J., 1982, "The effect of capital gains taxation on year-end stock market behavior," *National Tax Journal*, **35**, no. 1, 69-77.

Slovin, M. B., M. E. Sushka, and J. A. Polonchek, 1991, "The information content of multiple seasoned common stock offerings by bank holding companies," *Journal of Banking and Finance*, **15**, 633-646.

Slovin, M. B., M. E. Sushka, and J. A. Polonchek, 1992, "Informational externalities of seasoned equity issues: Differences between banks and industrial firms," *Journal of Financial Economics*, **32**, 87-101.

Sorenson, E., 1982, "Rational expectations and the impact of money upon stock prices," *Journal of Financial and Quantitative Analysis*, **17**, 649-662.

Tinic, S. M. and R. R. West, 1984, "Risk and return: January vs. the rest of the year," *Journal of Financial Economics*, **13**, 561-574.

Tinic, S., M., G. Barone-Adesi, and R. R. West, 1987, "Seasonality in Canadian evidence stock prices: A test of the tax-loss selling hypothesis," *Journal of Finance and Quantitative Analysis*, **22**, no. 1, 51-64.

Tong, W. H. S., 1992, "An analysis of the January effect of United States, Taiwan and South Korean stock returns," *Asia Pacific Journal of Management*, **9**, no. 2, 189-207.

Visscher, S., 1986, *Institutional ownership, market efficiency and the behavior of security prices*, Unpublished Doctoral Dissertation, Indiana University (March 1986).

Wachtel, S. B., 1942, "Certain observations on seasonal movements in stock prices," *Journal of Business*, **15**, 184-193.

APPENDICES

Appendix 1. Potential Tax-Loss Selling (PTS) Measures Or Proxies Used In Testing The Tax-Loss Selling Hypothesis In The Literature

[1] Stocks experiencing high PTS are proxied by **Stocks reaching yearly lows at year end.**

The PTS stocks' percentage price changes from year end to the first four weeks in the following January are compared with the NYSE Composite Index's.

<u>Disadvantages:</u> If only the stocks reaching a low at year end are chosen, it may impose a selection bias in the analysis. Besides, this rough standard for selecting stocks facing PTS pressure is incapable of determining the relative magnitude of PTS pressure across stocks. In short, this method ignores much information and can not quantify PTS.

Branch, Ben, 1977, "A tax loss trading rule," *Journal of Business*, **50**, no. 2, 198-207.
Givoly, Dan, and Arie Ovadia, 1983, "Year-end tax-induced sales and stock market seasonality," *Journal of Finance*, **38**, no. 1, 171-186.

[2] PTS = $(\mathbf{P}_t\mathbf{P}_{it})$ **- 1**, $t = 1, 2, \ldots, 11$

where P_{it} is the monthly price relative of security i in month t without dividends reinvested.

The unrealized gain or loss is proxied by the percentage appreciation of the stock in the first 11 months of the year. The data are divided into 3 categories, according to PTS levels.

<u>Disadvantages:</u> This measure is a variant of the geometric average mean of stock returns. However, according to the tax-loss selling hypothesis, what really matters is the capital loss incurred during the past period that the IRS considers short-term,

rather than percentage price appreciation or negative mean return. Using the geometric (or arithmetic) mean return as a PTS measure could dramatically underestimate the PTS values for those stocks which have higher volatility than less-risky stocks of comparable average returns, since higher returns due to positive shocks tend to be averaged out by lower returns due to negative shocks. This shows that inadequate selection of a PTS proxy could incur bias.

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

[3] PTS = **Mean preceding year rate of return**

Disadvantages: Similar to the geometric mean in item [2].

Roll, Richard, 1983, "Vas ist das?" *Journal of Portfolio Management*, **9**, 18-28. (Regressing stocks' returns at the turn of the year against their mean returns over the preceding year.)

Brauer, G. A. and E. C. Chang, 1990, "Return seasonality in stocks and their underlying assets: Tax-loss selling versus information explanations," *Review of Financial Studies*, **3**, 255-280. (Regressing stocks' returns at the turn of the year against their mean returns and standard deviations over the preceding year.)

[4] PTS = $\mathbf{P_{end}/P_{max}}$

where P_{end} is the stock price on the second to last trading day of the year; P_{max} is the maximum stock price during the prior period which would be classified by the IRS as short-term (6-month to 12-month, depending on which period of time).

Disadvantages: P_{max} is only a single observation and may be an outlier of the stock price distribution. This measure neglects all potential capital losses happening on the remaining days in the short-term period during the year.

Reinganum, Marc R., 1983, "The anomalous stock market behavior of small firms in January," *Journal of Financial Economics*, **12**, no. 1, 89-104. (The data are divided into 4 categories, according to PTS levels.)

Berges, Angel, John J. McConnell, and Gary G. Schlarbaum, 1984, "The turn of the year in Canada," *Journal of Finance*, **39,** no. 1, 185-192. (The data are divided into 2 categories, according to PTS levels.)

Chan, K. C., 1986, "Can tax-loss selling explain the January seasonal in stock returns," *Journal of Finance*, **41**, no. 5, 1115-1128. (The data are divided into 4 categories, according to PTS levels.)

[5] PTS_i = **(Aggregate realized gross losses in month *i*)/(Aggregate value of total sales in month *i*)**

$PTS_i = a_0 + a_1{*}DEC_i + a_2{*}JAN_i + a_3{*}S_i + a_4{*}DS_i + a_5{*}DS_{i-1} + u_i$

where DEC_i and JAN_i are dummy variables for December and January, respectively; S_i is the average level of stock prices in month *i*; DS_i and DS_{i-1} are the percentage change in stock prices during month *i* and *i*-1, respectively; u_i is the error term.

<u>Disadvantages:</u> This measure uses aggregate data and hence can not be applied to testing the tax-loss selling hypothesis using cross-sectional data. It is also subject to problems with defining the "average" stock price. Besides, the transaction data from this study are no longer accessible.

Slemrod, Joel, 1982, "The effect of capital gains taxation on year-end stock market behavior," *National Tax Journal*, **35**, no. 1, 69-77. (The data are divided into 2 categories, the capital gain transactions and the capital loss transactions.)

Appendix 2. Derivation of the Potential Tax-Loss Selling (PTS) Proxy

As pointed out by Constantinides (1984), "the tax law confers upon the investor a timing option — to realize capital losses and defer capital gains. With the tax rate on long term gains and losses being about half the short term rate,[136] the law provides a second timing option — to realize losses short term and gains long term, if at all." Chan (1986) further adds that, given the higher tax rates on short-term capital gains (losses) than long-term, if tax-loss selling is the underlying explanation of the January effect, then there will be little relation between long-term capital losses and January returns, because there is no tax benefit gained by realizing long-term losses before the turn-of-the-year, at the depressed year-end price.[137] Since the short-term tax rate is higher than the long-term rate for individuals in the higher tax brackets during most of our 1988-1995 data period (please see Appendix 3), we focus on short-term capital losses only in deriving the PTS proxy.

Suppose the IRS-defined short-term period is one year[138] and investor A bought V shares of stock i at the price P on January 1 in the year. For the sake of argument, we also assume that the stock price drops to P_{end} by the year-end. Under this scenario, investor A suffers a capital loss of $(P - P_{end})^* V$ on the investment of stock i. Suppose

[136] This is true for the time period of 1942-1986 only. Please refer to Appendix 3 for the brief history of the tax code changes.

[137] Realizing long-term capital losses does have tax and non-tax benefits, if the year-end tax-loss selling does not depress the stock price. Realizing capital losses in the current tax year, rather than in the next year, will have the higher present value on expected cash flows due to the time value of money. Year-end selling for liquidity needs is also more likely to occur in absence of the depressed December stock price.

there exist transaction costs for stock trading and a distinction between the short-term and long-term tax rates. Then according to Constantinides (1984), given the assumptions of the equal short-term and long-term tax rates and presence of transaction costs, at the beginning of the year, investor A will be reluctant to incur the transaction costs and realize the capital loss (for illustration, suppose the price drops to P_{end} on the next day after the purchase).

Toward the year-end, however, investor A's reluctance "is overcome by his preference for a tax rebate this year rather than the next." The optimal trading policy for investor A is selling stock i at the end of December. Consequently, tax-loss selling pressure gradually increases from January to December and is suddenly released on the first few days of the next January. When the long-term tax rate is lower than the short-term rate, the benefit from the year-end tax-loss selling is even larger.[139] However, Constantinides also mentions that the tax-loss selling pressure may or may not affect the stock price. If the selling pressure does have an effect of depressing stock price, then "rational tax-loss sellers should repurchase different stock sold by other tax-loss sellers at about the same time." Therefore, he concludes that the year-end stock price depressed by tax-loss selling and the following January rebounded price would occur only if "the tax-loss sellers are irrational or, at least, ignorant of the stock price seasonality."

---

[138] The IRS-defined short-term period is one year during the data period in this dissertation. Please refer to Appendix 3 for a brief report on the relevant tax code changes.

[139] Constantinides (1984) acknowledges that "without the distinction between the short-term and long-term tax rates, transaction costs may dissipate the benefit of tax trading and the optimal policy may be to refrain from tax-loss selling." But he also demonstrates that transaction costs do not significantly reduce the benefit of tax-loss selling, when the long-term tax rate is favorably lower than the short-term rate. He also argues that taxable investors should realize long-term gains in high variance stocks in order to reestablish the favorable short-term status for realizing future capital losses at the short-term rate.

Though tax-loss selling may be irrational, in order to test the tax-loss selling/parking-the-proceeds hypothesis, deriving an adequate proxy for tax-loss selling pressure remains crucial. On the other hand, selling losers at the year-end depressed price may be partially, if not fully, rationalized by other considerations such as year-end liquidity needs. Therefore, we proceed to derive the PTS proxy in the following.

In addition to the above-mentioned factors such as capital loss and transaction costs (*TC*), investor *A*'s tax-loss selling behavior may also be affected by other factors, such as the following variables.[140]

[1] Size of realized short-term capital gains from other investments (*RSCG*):
Since capital losses offset capital gains one to one, we expect that, the larger the realized short-term capital gains, the stronger the tax motivation for investor *A* to sell stock *i* by the year-end.

[2] Size of realized long-term capital gains from other investments (*RLCG*):
Similarly, since short-term capital losses offset long-term capital gains one to one, and according to Constantinides (1984), if investor *A* "has already realized large long-term gains earlier in the year, he wishes to defer the short-term losses to the following year, if possible." Therefore, we expect that, the larger the realized long-term capital gains, the stronger the tax motivation for investor *A* to sell stock *i* by the year-end.[141]

[3] Difference between investor *A*'s marginal short-term and long-term tax rates (*DTAX*):
Clearly, the larger the difference in the marginal short-term and long-term tax rates,

[140] In deriving the expected relationship between tax-loss selling pressure and any one of the following variables, we hold other variables, including the expected capital loss and transaction costs, to be constant.

the stronger is the tax motivation for investor A to sell stock i by the year-end. If *DTAX* is zero and year-end tax-loss selling would depress the stock price, then there will be little benefits for the tax-loss selling concentrated at year-end, since the stock can be sold in January at a higher rebounded price.

[4] Limit of capital-loss deductible from ordinary income (*LD*):

It is also obvious that, if this deductible limit is binding, then the lower the deductible, the weaker the tax motivation for investor A to sell stock i by the year-end.

[5] Accumulated unused capital-losses (*AUCL*):

Given the tax code that unused capital-losses can be carried forward indefinitely,[142] if the *LD* is binding, then the larger the *AUCL*, the weaker the tax motivation for investor A to sell stock i by the year-end.[143]

[6] Expected variance of stock i return (*EV*):

Since tax-loss selling before the year-end is a timing option for investor A, and because a call option is more valuable when the stock variance is higher, the higher the expected volatility of stock i return, the stronger the tax motivation for investor A to sell stock i by the year-end. Specifically, as pointed out by Constantinides (1984), "the higher the stock variance the stronger the incentive to reestablish the short-term status…"

---

[141] Though the short-term and long-term realized capital gains have the opposite effects on year-end tax-loss selling, short-term capital losses realized to offset the long-term capital gains is more economically important since investors are motivated to defer (short-term) capital gains.

[142] This has become effective since 1942, and therefore cover our sample period of 1988-1995. Please refer to Appendix 3 for details.

[143] Even if the *LD* is not binding, this statement may still be valid, since investor A could be not able to use the *AUCL* in the current tax year for the reasons such as insufficient ordinary taxable income and be forced to carry them forward to the next tax year, so that present value of total tax benefits decrease due to the time value of money.

[7] Interest rate (*IR*):

Constantinides further mentions that, the lower the interest rate the higher the present value of the future tax benefit of the tax option. Therefore, the lower the interest rate, the stronger is the tax motivation for investor A to reestablish the short-term status through selling stock i by the year-end.[144]

To include total shares of stock i purchased by all investors on different trading days during the year, we extend our previous assumptions as follows. Suppose investors aggregately purchased V_1 shares of stock i at price P_1 on the first trading day in the year, V_2 shares of stock i at price P_2 on the second trading day in the year, and so on until the third-to-last trading day in the year. That is, total trading volumes and closing price for stock i on the tth trading day in the year are V_t and P_t, respectively. For the second-to-last trading day in the year, the closing price for stock i is P_{end}.

If we further assume these investors hold the shares until the second-to-last trading day of the year, then before the last trading day at the year-end, investors of stock i will suffer a total amount of capital losses of $\sum_t \text{MAX}\,[P_t - P_{end}, 0]^* V_t$. Facing the capital losses, investors of stock i would be motivated to sell stock i on the last trading

[144] As mentioned in footnote 140, we hold the expected capital loss constant in determining the expected relationship between interest rates and tax-loss selling pressure. However, when interest rates change, the expected capital loss may no longer be constant. This is because a low-interest-rate period seems often to be a period of bear stock markets as well. Therefore, when interest rates are lower, the expected capital loss would probably be greater. However, both low interest rates and large capital losses result in heavier year-end capital loss selling. This multiplier effect of capital loss and interest rate on tax-loss selling does not change our assertion that there exists a negative relation between interest rates and tax-loss selling. In fact, the result of our test (not shown here) indicates that the correlation between the one-month T-bill rate and the CRSP value-weighted market return (including dividends) is 0.02 and insignificant at the 0.10 level during the March 1988-December 1995 period, which covers 98% of the length of our sample period, January 1988-December 1995. Replacing the T-bill rate with the Federal funds rate or using the market return excluding dividends gives a similar result.

day in the year for tax purposes. Noteworthily, this amount of capital losses is actually the maximum value that investors of stock i could experience as of market-closing on the second-to-last trading day, since part of the investors may sell their shares before that day. Alternatively, we may assume that the percentage of the shares sold before the second-to-last trading day by the investors is roughly constant across stocks which have the same total capital losses, so that our PTS proxy can be used to explain cross-sectional variation in stock returns or trading volumes. If either one of these assumptions are invalid, then the PTS will be not accurate.

To build a proxy for tax-loss selling pressure, we recognize that the effect of tax-loss selling on stock returns can be decomposed into the three following components:

[1] the capital-loss on the stock, of $\sum_t \text{MAX}\,[P_t - P_{end}, 0]^* V_t$,

[2] the motivation coefficient of tax-loss selling, $F(TC,RSCG,RLCG,DTAX,LD,AUCL,EV,IR)$, where $F(\cdot)$ is a function, and

[3] the sensitivity of stock price toward the tax-loss selling, which is proxied by the function of yearly trading volumes of stock i at the year-end, $G(YV_{end})$.

The reason for adding $G(YV_{end})$ is described as follows. Suppose the above-mentioned two components are the same across stocks. But even in this scenario, the obtained tax-loss selling measure may still have different impacts on stock price between firms with a large average daily trading volume and firms with a small average daily trading volume. To illustrate, we assume that the number of total shares suffering from the capital losses is a constant 100 across the stocks. Then at the year-end when these 100 shares are sold for tax purposes, the stock price of the firms with an average daily trading volume of 2000 should be less adversely affected than the firms with an average daily trading volume of 200, because the percentage of liquidity trading in total volumes traded is different. This reasoning is logically consistent with the fact that block stock trading has larger impact on the transaction price for any specific stock than odd-lot trading. To examine whether tax-loss selling can explain cross-sectional stock returns, it seems necessary to take into account this price-trading volume relationship in deriving our PTS proxy.

Therefore, an ideal proxy for potential tax-loss selling (PTS) should be expressed as:

$$\text{PTS} = \sum_t \text{MAX}\,[P_t\text{-}P_{end}, 0]^* V_t^*[F(TC,RSCG,RLCG,DTAX,LD,AUCL,EV,IR)]^*[G(YV_{end})] \quad \text{(A0)}$$

However, in practice, some arguments of the function F are unobservable and we also do not know the exact functional form of F. On the other hand, we argue that the second component of the above equation, $F(\cdot)$, is less significant in measuring the potential tax-loss selling than the other two components. This is because most argument variables in the function F are quite stable across both years and representative investors of different stocks. In addition, some arguments may have opposite effects on F. These effects offset each other, hence further stabilizing F.

For example, in a year of a bull stock market, both short-term and long-term realized capital gains would increase. The increased realized long-term gains discourage tax-loss selling on loser stocks. However, the increased realized short-term losses motivate it. Consequently, the net change in F may be minimal. In contrast, the first component, the total capital losses, is the fundamental reason for tax-loss selling and could vary drastically across both years and stocks. To simplify our PTS proxy, therefore, we assume that the $F(\cdot)$ term is a constant and then drop it from equation (A0).[145] After the rearrangement, we obtain:

$$\text{PTS} = \sum_{t} \text{MAX}\,[P_t - P_{end}, 0]^* V_t{}^* G(YV_{end}) \tag{A1}$$

We will use this PTS proxy for potential tax-loss selling throughout this study.[146]

Noteworthily, this PTS proxy does not include all potential variables for tax-loss selling pressure. For example, since only individual investors are motivated for tax-loss selling activities, institutional ownership of loser stocks should be negatively related to the effective tax-loss selling pressure. However, since we use the institutional-ownership interaction term for nearly all independent variables in the regressions and also because we do not know the exact functional form of institutional ownership in the real PTS

---

[145] Actually, in our regression study, we use ln(PTS), instead of PTS, as one of the independent variables. Hence, from equation (A0), $\ln(\text{PTS}) = \ln\{\sum_{t} \text{MAX}\,[P_t - P_{end}, 0]^* V_t{}^* G(YV_{end})\} + \ln\{F(\cdot)\}$. That is, the actual ln(PTS) is decomposed in two parts: the ln(PTS) in equation (A1), which is employed as the independent variable in our regressions, and $\ln\{F(\cdot)\}$. The second part, $\ln\{F(\cdot)\}$, is not only a constant but also the intercept term in equation (3). The reason is explained as follows. As shown in equation (A0), the argument of $\ln\{F(\cdot)\}$, $F(\cdot)$, should be positive, since we define it as a function measuring motivation for tax-loss selling when the capital losses on stock i are constant. The larger the motivation, the more shares will be sold to realize the capital losses before the year-end. When it equals zero, there will be no tax-loss selling even if the capital losses on stock i are huge. This scenario is very unlikely. It cannot be negative, either. This is because both $\sum_{t} \text{MAX}\,[P_t - P_{end}, 0]^* V_t$ and $G(YV_{end})$ are non-negative. The reason for non-negative $\sum_{t} \text{MAX}\,[P_t - P_{end}, 0]^* V_t$ is obvious. $G(YV_{end})$ in equation (A0) is non-negative by definition, since larger capital losses tend to induce more tax-loss sale transactions, which should then create larger selling pressure on the stock price. $G(YV_{end})$ measures the sensitivity of price pressure toward the tax-loss sales. Therefore, when $\sum_{t} \text{MAX}\,[P_t - P_{end}, 0]^* V_t{}^* G(YV_{end})\}$ is positive, if $F(\cdot)$ is negative, then we would get a negative PTS value. This implies that the stock would experience *buying* pressure when it suffers from previous capital losses. Therefore, $F(\cdot)$ should be positive and $\ln\{F(\cdot)\}$ is a well-defined logarithmic function and hence can be regarded as the intercept term in the regression. This intercept is a constant, which may be zero.

formula, institutional ownership is excluded from equation (A1). Another possible candidate is the number of individual shareholders. If the limit of capital-losses deductible from ordinary income (*LD*) is binding for most of the shareholders, then the loser stock would probably experience less or little tax-loss selling pressure.

Though as indicated above, institutional ownership is an important variable for tax-loss selling pressure, in practice the institutional ownership data filed to the SEC includes a variety of categories of institutions. Some institutions such as IRAs are tax-free. As mentioned by Constantinides (1984), tax-exempt institutions pay no attention to the realization of capital gains and losses in pursuing their optimal investment policy, i.e., they have no motivation for tax-loss selling. For other institutions, the motivation for tax-loss selling is probably also low, since net capital losses cannot be deducted from their ordinary income. More importantly, net capital gains are taxed as ordinary income for corporations and therefore there is no distinction between short-term and long-term tax rates. Though capital losses can be used to offset capital gains, there is no tax motivation for institutions to sell losers before *year-end*. Therefore, functions of institutional ownership can be used as a proxy for ownership of individuals who are involved in tax-loss selling.[147]

However, the institutional ownership data also cover some institutions such as mutual funds. Since mutual funds are mostly held by individuals, mutual fund managers may have the incentive for tax-loss selling in the best interest of their clients. This may

---

[146] Though the exact functional form for $G(YV_{end})$ is unknown, we use $\frac{1}{YV_{end}}$ for $G(YV_{end})$ in the empirical tests of this dissertation, since a larger YV_{end} would induce the lower tax-loss selling pressure.
[147] That is, individual ownership (in percent) = 100 - institutional ownership (in percent).

be very important since mutual fund assets invested in corporate equities rapidly increased from $187.6 billion in 1988 to $737.7 billion in 1994 (Federal Reserve Board data, March 1995). If this is true, unless we assume that mutual funds account for a fixed portion of institutional equity holdings across stocks, then the regressions will be biased toward not finding a significant relation between tax-loss selling pressure and institutional ownership. Therefore, the institutional ownership data from the SEC filings are used only as proxies, with potential measurement error, in examining the relation between individual ownership and tax-loss selling pressure.

On the other hand, the extent of the tax-loss selling by fund managers may be not as severe as thought. Although mutual fund assets invested in corporate equities rapidly increased to $737.7 billions in 1994, the amount accounts for only 12.2% of the corporate equity market in 1994 (*The 1995 Mutual Fund Fact Book*).[148] Further, during this period, institutional assets in mutual funds also quickly accumulated. For example, the percentage of institutional holdings in the equity, bond, and income funds of mutual funds increased from 28.5% in 1990 to 39.2% in 1994.[149] Since institutional ownership accounts for a significant portion of mutual fund assets, given the transaction costs, the motivation of year-end tax-loss selling for mutual fund managers, if present, is probably not too high.

---

[148] In contrast, average institutional ownership for the NYSE/AMEX stocks increased from 27.78% at the end of 1988 to 38.51% at the end of 1994.

[149] The percentages were obtained from the following: Total institutional assets in equity, bond, and income funds of mutual funds are $162.3 billions in 1990 and $607.1 billions in 1994. Total mutual fund assets invested in equity, bond, and income funds are $568.5 billions in 1990 and $1,550.5 billions in 1994 (*The 1995 Mutual Fund Fact Book*).

As shown in footnote 23 on p. 24, only investment managers with discretion over more than $100 million in equity assets are required to file Form 13-F quarterly to provide information about the securities held, and equity holdings below 10,000 shares and less than $200,000 in principal amount and market value are exempted. This reporting requirement, in fact, results in underestimating the real institutional ownership on stocks. Consequently, it tends to offset the tax-loss selling effect of mutual fund managers that biases toward not finding a significant relation between tax-loss selling pressure and institutional ownership.

Appendix 3. A Brief History Of The Relevant Tax Codes for Personal Capital Gains

[1] The Revenue Act of 1917: introduction of national income taxes for individuals and corporations; no definition of capital gain (loss).

[2] The Revenue Act of 1921: capital gains rates established; *defining capital gain (loss) and capital net gain*; *capital assets* are assets held more than two years; *capital net gain* is taxed at a rate of 12.5%.

[3] The Revenue Act of 1924: capital assets are assets held more than two years; *capital net loss* (*gain*) is taxed (deductible) at a rate of 12.5%.

[4] The Revenue Act of 1936: tax rates for capital net loss (gain) — *100% if holding period (HP) ≤ 1 year; 80% if 1 year $< HP \leq 2$ years; 60% if 2 years $< HP \leq 5$ years; 40% if 5 years $< HP \leq 10$ years; 30% if $HP > 10$ years.*

[5] The Revenue Act of 1938: *defining short-term and long-term capital gain (loss) — short-term if $HP \leq 18$ months (long-term if $HP > 18$ months);* tax rates for capital net loss (gain) — *100% if $HP \leq 18$ month; $66\frac{2}{3}$ % if 18 months $< HP \leq 24$ months; 50% if $HP > 24$ months.*

[6] According to Berges, McConnell, and Schlarbaum (1984), Constantinides (1984), and Chan (1986): short-term holding period was 6 months in 1942-1976, 9 months in 1977, and one year since 1978. Short-term gains or losses are taxed as ordinary unearned income, while long-term gains and losses are taxed at 40% (until October 1979, 50%) 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.[150] Unused capital losses may be carried forward indefinitely. Upon the investor's death the assets' basis is adjusted to market and capital gains and losses remain untaxed.

[7] The Tax Reform Act of 1986: Both short-term and long-term net capital gains (losses) are taxed as (deducted from) ordinary income, but the maximum tax rate for net long-term capital gains is 28% and deduction from capital losses (either short-term or long-term) is still limited at the level of $3,000. Since there are only two rates on personal ordinary income, 15% and 28%, and the top tax rates on capital gains and ordinary income are the same, actually there is no distinction between short-term and long-term capital gains (losses) during 1986-1989.

[8] Tax code changes effective in 1990: tax rates on personal ordinary income are 15%, 28%, and 31%; tax rates on short-term and long-term capital gains (losses) are different for top-tax-bracket individuals only.

[9] Tax code changes effective in 1993: tax rates on personal ordinary income are 15%, 28%, 31%, 36%, and 39.6%; tax rates on short-term and long-term capital gains (losses) are the same for individuals in the lower tax brackets of 15% and 28% only.

[150] According to Constantinides (1984), the deduction limit was $1,000 until 1976, $2,000 in 1977 and $3,000 thereafter. In addition, prior to 1969 the maximum rate on long-term capital gains was 25%. In 1969-1976 (1976-1979) the marginal tax rate on capital gains above the first $50,000 was as high as 42.5% (49%).

Appendix 4. Window Dressing Strategies

Jannson (1983) describes five types of window dressing allegedly used by portfolio managers. They are:

[1] MARKING UP THE MERCHANDISE: In this form of window dressing, a manager maintaining a position in a thinly traded security will submit purchase orders just prior to the close of trading on the last day of the quarter. The manager's hope is that the increase in buy orders for this security will drive the price up, increasing the market value of his or her holding as of the reporting date.

[2] TRICKING THE TECHNICIANS: This strategy is related to the above. Technical analysts often talk of "breakout points," a price that, if attained, indicates future upward movement. The technique followed here is for the manager to continue to purchase the security until it rises above its breakout point and let the technicians take over from there.

[3] PLAYING CATCH-UP (BUYING THE WINNERS): This strategy is more obviously related to the manager self-preservation motive. Under this scenario, the manager purchases superior performers not already in the portfolio just prior to the end of the quarter to avoid the embarrassment of appearing to have "missed the boat."

[4] DUMPING THE LOSERS: This strategy is the opposite of the above. If there are securities in the portfolio that are obviously underperforming, the manager dumps them just prior to reporting his or her holdings. The report then makes it appear as if the manager avoided holding clear losers.

[5] MAKING IT EASIER NEXT YEAR: This strategy is seldom used. In this scenario, the manager who has experienced good success will engage in trades to lower his or her overall performance. The rationale for this is that since the manager is unlikely to be as successful in subsequent quarters, a strategy such as this will allow the managerial performance to appear consistent through time.

Appendix 5. Risk-Preference Switching: Risk-Seeking vs. Risk-Avoiding

According to the risk-preference switching hypothesis, institutional managers may want to lock in their performance by switching to low-risk stocks before year-end. This explanation of institutional trading raises a different question: will institutional managers who are having bad quarters try to gamble their way back into the plus column? That is, do they switch to riskier stocks before year-end? Or do they try to shift back to safe stocks to improve the apparent performance at the very end of the year, so that their risk-seeking behavior is hidden?

If any one of the above scenarios is true, then it may change the expected results in testing the hypothesis. To explore the possible effect, we conduct an analysis as follows. For the purpose of illustration, we first assume that the risk-seeking managers simultaneously purchase the high-risk stocks sold by those wanting to lock in their performance. This scenario is mostly likely to be true, since they can buy high-risk stocks at possibly lower prices depressed by the selling pressure from the risk-avoiding managers. If this is the case, then we may observe no, or weak, return seasonality in December for high-risk stocks.

But if we find that riskier stocks actually have lower (higher) December returns than less-risky stocks, then it implies that the window dressing activities of the risk-avoiding managers are more (less) active and economically important than those of the risk-seeking managers. In any case, high-risk stocks should always have high December trading volumes because of increased trading. Further, we may still observe high January returns for risky stocks unless we further assume that the risk-seeking managers resell those risky stocks in January, since the risk-avoiding managers will switch back to high-risk stocks in January. High-risk stocks would also have large January trading volumes if either the risk-avoiding or the risk-seeking managers trade those stocks in January.

Instead of in December, if the risk-seeking managers gamble in early November or even earlier, then the December/January seasonality in return and trading volume will probably be unaffected. But if they do it in late November and we assume that stock prices of high-risk stocks are thus bid up in late November but move back to their equilibrium fundamental levels in early December, then we will observe depressed (early) December returns for high-risk stocks. Together with the selling behavior of the risk-avoiding managers, the high-risk stocks will then have depressed returns in December.

Nevertheless, if the risk-avoiding managers advance their selling decision to late November to enjoy the possibly higher prices of high-risk stocks as they are bid up by the risk-seeking managers, then we will observe neither high November returns nor low December returns for high-risk stocks. The seasonality in December returns and trading volumes will disappear. Only high November and January trading volumes and high January returns are expected for high-risk stocks.

Next, let us address the second question, i.e., do the risk-seeking managers, in an attempt to hide their risk-seeking behavior, switch back to safe stocks at the very end of the year? If they really switch back to safe stocks on, or immediately before, the last trading day in the year, then in addition to the above expected results for the different scenarios, we will observe lower returns and higher trading volumes for high-risk stocks in December. In summary, no matter which scenario is true, we may still be able to observe the corresponding seasonality in returns and trading volumes. The behavior of the risk-seeking managers is not likely to fully offset the behavior of the risk-avoiding managers.

Appendix 6. Data Sources

The data used in this study are limited to the firms with stocks traded on the NYSE or AMEX only, unless specified otherwise. The specific data items used in previous sections are displayed in the following.

A6.1 Simultaneous Testing Of The Four Hypotheses In Sections 3.2-3.3

A6.1.1 Cross-Sectional Analysis For Rate Of Return In Section 3.2

Item No.	Data	Source
1	Daily stock returns in December and January	1988-1995 CRSP daily stock file
2	Monthly stock returns	1988-1995 CRSP monthly stock file
3	Daily stock prices and trading volumes (for obtaining PTS value)	1988-1995 CRSP daily stock file
4	Fiscal-year-end book value of common equity plus balance-sheet deferred taxes	1987-1994 COMPUSTAT annual industrial file
5	Market value of common equity (price times shares outstanding) at the end of June and December	1987-1995 CRSP daily stock file
6	Institutional ownership (in percentage)	September 1988-September 1995 CD/SEC file of Disclosure, Inc. (annual data)
7	Federal funds rate in November and December	1988-1995 daily federal funds rate from the Federal Reserve Bank of St. Louis
8	Interest rate of T-bill maturing within one month in November and December	1988-1990 data are from the *Wall Street Journal* and 1991-1995 data are from the Federal Reserve Bank of Atlanta
9	The CRSP NYSE/AMEX value-weighted index returns	1988-1995 CRSP monthly stock file

A6.1.2 Cross-Sectional Analysis For Trading Volume Ratio In Section 3.3

Item No.	Data	Source
10	Daily and Monthly trading volume data in December and January	1988-1995 CRSP daily and monthly stock files
(3-9)	Same as Section A6.1.1	Same as Section A6.1.1

A6.2 Relation Of Stock Ownership With Stock Price And Firm Size In Section 3.4

Item No.	Data	Source
11	Monthly stock prices and number of total common shares outstanding	1988-1995 CRSP monthly stock file
12	Institutional ownership (in percentage)	March 1988-December 1995 CD/SEC file of Disclosure, Inc. (quarterly data)

A6.3 Reactions Of Stockholders And Agency Problems In Section 3.5

A6.3.1 Management In Section 3.5.1

Item No.	Data	Source
13	Stock repurchases and new share issuances during October-March	1963-1995 CRSP monthly stock file
14	Daily stock prices and trading volumes (for obtaining PTS value)	1962-1994 CRSP daily stock file

A6.3.2 Inside holders In Section 3.5.2

Item No.	Data	Source
15	Insider holdings (in number of shares held) and insider ownership (in percentage of total outstanding shares)	Number of shares and percentage of total outstanding shares held by insiders at the end of November (or October, if not available) and December (or January, if not available) during 1992-1995 from the CD/SEC file of Disclosure, Inc.
16	Monthly stock prices, returns, and number of total common shares outstanding	1992-1995 CRSP monthly stock file
17	Institutional holdings (in number of shares held) and institutional ownership (in percentage of total outstanding shares)	September 1992-September 1995 CD/SEC file of Disclosure, Inc. (annual data)

A6.3.3 Institutional holders In Section 3.5.3

Item No.	Data	Source
18	Institutional holdings (in number of shares held)	Number of shares held by institutions at the end of each quarter during 1988-1995 from the CD/SEC file of Disclosure, Inc.
19	Monthly stock prices, returns, and number of total common shares outstanding	1988-1995 CRSP monthly stock file

Appendix 7. Preliminary Results Of Pooled Time-Series Cross-Sectional Regressions And Cross-Sectional Regressions With Up & Down Market Dummy Variables

A7.1 Results For The Pooled Time-Series Cross-Sectional Regressions

The results of the pooled time-series cross-sectional regressions are displayed in Table A7-1. The *t*-statistics are presented in parentheses in Table A7-1 and other tables throughout this dissertation. There are five regressions for returns in the early December period, the year-end period, December, the turn-of-the-year period, and January, respectively. Similarly, there are five regressions for trading volumes during the above time periods, respectively. These results, however, have the following serious econometric problems.

First, the SAS output (not shown here) indicates that the absolute value of the estimated autoregression coefficient, ρ, is greater than 1.0 for two to nine firms in every regression, which account for about 0.32%-1.44% of the total observations.

Second, the correlation matrix is singular in every regression and the SAS message warns that these results have possible multicollinearity and/or estimability problems. The same warning repeats in the regressions of returns and trading volumes for the TOTY period and January, since the transformed regression does not have full rank.

Third, the pooled time-series cross-sectional regressions require that all variables in the regression model must be non-missing in each time-series. That is, in order to

Table A7-1. Estimated Coefficients for Pooled Time-Series Cross-Sectional Regressions of Returns and Trading Volumes[a]

	Early December	Year-End	December	Turn-of-the-Year	January
Panel A: Holding Period Return (in Percent)					
Intercept	0.01 (1.00)	-0.01 (-0.43)	-0.04 (-1.26)	-0.01 (-0.74)	-0.08 (-1.40)[b]
ln(ME)	0.00 (2.78***)	-0.00 (-1.35)	-0.00 (-0.82)	0.00 (0.47)	0.00 (1.32)
ln(BE/ME)	0.01 (0.33**)	0.01 (0.96)	0.02 (1.53)	-0.01 (-0.94)	0.04 (1.19)
INST	0.01 (0.71)	0.05 (1.17)	0.08 (1.64)	0.01 (0.19)	0.04 (0.48)
ln(PTS)	0.00 (2.87***)	0.00 (0.04)	0.00 (1.86*)	-0.00 (-0.53)	0.00 (0.43)
σ	-0.06 (-1.15)	0.07 (0.76)	0.49 (2.25**)	0.22 (1.78*)	0.64 (2.05**)
D_{LTW}	0.13 (0.85)	-0.41 (-1.23)	0.04 (0.09)	0.00 ( )	0.00 ( )
INST*D_{LTW}	-0.22 (-0.86)	0.73 (1.22)	-0.07 (-0.09)	-0.00 ( )	0.00 ( )
D_{LTL}	-0.05 (-1.19)	-0.07 (-0.73)	-0.15 (-1.59)	0.31 (2.39**)	0.54 (1.49)
INST*D_{LTL}	0.09 (1.33)	0.07 (0.46)	0.25 (1.47)	-0.74 (-2.48**)	-1.69 (-1.60)
D_{STW}*$D_{up\ mkt}$	-0.01 (-0.60)	-0.01 (-0.51)	0.04 (1.14)	0.00 (0.13)	0.22 (1.14)
D_{STL}*$D_{up\ mkt}$	-0.01 (-1.94*)	0.01 (1.63)	0.00 (0.04)	0.00 (0.01)	-0.02 (-0.69)
FFS*$D_{up\ mkt}$	-0.00 (-1.14)	-0.01 (-2.62***)	-0.01 (-5.34***)	0.01 (3.03***)	-0.01 (-2.02**)
D_{STW}*$D_{down\ mkt}$	-0.02 (-1.34)	0.03 (2.69***)	-0.03 (-1.84*)	-0.03 (-1.30)	-0.03 (-1.70*)
D_{STL}*$D_{down\ mkt}$	0.02 (2.40**)	0.01 (0.48)	0.02 (0.93)	0.01 (0.57)	-0.00 (-0.09)
FFS*$D_{down\ mkt}$	-0.01 (-2.99***)	-0.02 (-4.25***)	-0.02 (-5.43***)	-0.00 (-0.52)	-0.01 (-0.98)
No. of Obs.	5,024	5,016	5,016	4,620	4,620

Table A7-1 (Continued)

	Early December	Year-End	December	Turn-of-the-Year	January
Panel B: Trading Volume Ratio (in Percent)					
Intercept	0.05 (8.55***)	0.06 (12.25***)	0.12 (24.48***)	0.03 (4.53***)	0.12 (5.07***)
ln(ME)	-0.00 (-0.75)	-0.00 (-1.25)	-0.00 (-2.37**)	0.00 (0.63)	0.00 (0.03)
ln(BE/ME)	-0.00 (-0.16)	-0.00 (-0.06)	0.00 (1.32)	0.00 (0.91)	0.01 (0.35)
INST	-0.00 (-0.41)	-0.01 (-2.17**)	-0.03 (-2.52**)	-0.01 (-1.17)	-0.04 (-1.14)
ln(PTS)	0.00 (1.77*)	0.00 (0.59)	0.00 (0.91)	0.00 (0.82)	0.00 (1.00)
σ	0.03 (1.02)	-0.05 (-1.42)	-0.08 (-1.19)	0.01 (0.35)	0.14 (1.02)
D_{LTW}	-0.12 (-1.67*)	0.02 (0.16)	-0.08 (-0.51)	0.00 ( )	0.00 ( )
INST*D_{LTW}	0.20 (1.63)	-0.04 (-0.18)	0.13 (0.47)	0.00 ( )	0.00 ( )
D_{LTL}	0.07 (3.21***)	0.00 (0.09)	0.07 (1.94*)	-0.00 (-0.14)	0.10 (0.96)
INST*D_{LTL}	-0.11 (-3.02***)	0.01 (0.22)	-0.12 (-2.08**)	-0.02 (-0.45)	-0.21 (-0.72)
D_{STW}*$D_{up\ mkt}$	0.01 (1.13)	-0.00 (-0.09)	0.02 (0.98)	-0.01 (-0.93)	0.01 (0.47)
D_{STL}*$D_{up\ mkt}$	0.00 (1.37)	0.00 (0.90)	0.01 (2.62***)	0.00 (0.95)	-0.00 (-0.06)
FFS*$D_{up\ mkt}$	-0.00 (-7.31***)	-0.00 (-3.72***)	-0.01 (-5.19***)	-0.00 (-6.02***)	-0.01 (-6.57***)
D_{STW}*$D_{down\ mkt}$	0.02 (4.09***)	0.01 (0.20**)	0.02 (2.62***)	0.00 (0.36)	0.03 (2.24**)
D_{STL}*$D_{down\ mkt}$	0.01 (3.08***)	0.01 (3.33***)	0.01 (4.36***)	0.00 (2.05**)	0.02 (2.14**)
FFS*$D_{down\ mkt}$	-0.01 (-6.56***)	-0.01 (-4.74***)	-0.02 (-8.43***)	-0.01 (-9.53***)	-0.02 (-6.63***)
No. of Obs.	5,016	5,000	5,024	4,620	4,620

[a] The early-December period is defined as remaining December trading days which are prior to the year-end period; the year-end period is defined as the 10-trading-day period prior to the last trading day in the year; the turn-of-the-year period is defined as the five-trading-day period beginning from the last trading day in the previous year.
[b] *t*-statistics are presented in parentheses in this or any other tables of this study which display estimated coefficients.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

enter the regression, the stocks must have complete information on all independent and dependent variables every year during the 1988-1995 data period. This restrictive requirement greatly limits the number of observations used in the regressions. As shown in Table A7-1, the sample size varies from 4,607 to 5,009.

In contrast, when the cross-sectional regression model is applied to our sample, there are 9,036-10,685 observations entering the regressions (Table A7-2). That is, the pooled time-series cross-sectional regression approach employs only about a half of the observations in traditional cross-sectional regression approach. This greatly-reduced sample size may introduce a serious selection or survivor bias into our analysis and makes our results not representative.

Fourth, most of the obtained estimated coefficients are statistically insignificant at the 0.10 level. In contrast, Table A7-2 shows that, about two thirds of the obtained estimated coefficients are statistically significant at the 0.10 level. This larger number of insignificant coefficients is probably due to using an inadequate statistical model, rather than reflecting the true relations between dependent variable and independent variables, and thus increasing the difficulty in examining the validity of the four tested hypotheses.

Based on the above four reasons, the pooled time-series cross-sectional approach, though more econometrically powerful in theory, is probably not the best methodology for analyzing our sample. Therefore, we apply the traditional cross-sectional approach in regression analysis. This approach does not incorporate the time-series relation for annual observations of the same stock. It only requires non-missing values for variables during

Table A7-2. Estimated Coefficients for Cross-Sectional Regressions of Returns and Trading Volumes with Market Dummy Variables[a]

	Early December	Year-End	December	Turn-of-the-Year	January
Panel A: Holding Period Return (in Percent)					
Intercept	0.99 (1.95*)	0.88 (1.92*)	3.23 (4.99***)	1.79 (4.26***)	2.34 (2.55***)[b]
ln(ME)	0.10 (1.71*)	0.08 (1.40)	0.01 (0.14)	-0.40 (-7.54***)	-0.16 (-1.41)
ln(BE/ME)	0.51 (3.88***)	0.45 (3.83***)	0.85 (5.12***)	0.41 (3.83***)	3.11 (13.23***)
INST	-0.04 (-0.09)	2.31 (5.09***)	2.67 (4.16***)	-1.11 (-2.60***)	-1.92 (-2.07**)
ln(PTS)	0.45 (2.32**)	0.42 (2.38**)	1.13 (4.56***)	0.53 (3.30***)	0.38 (1.08)
σ	-9.36 (-4.36***)	2.36 (1.22)	-6.26 (-2.29**)	23.68 (13.19***)	48.29 (12.35***)
D_{LTW}	1.32 (2.29**)	-0.07 (-0.13)	0.82 (1.12)	-1.18 (-2.45**)	-1.88 (-1.80*)
INST*D_{LTW}	-2.74 (-2.22**)	1.07 (0.96)	-0.44 (-0.28)	0.34 (0.32)	3.11 (1.36)
D_{LTL}	-1.59 (-2.74***)	0.23 (0.45)	-0.45 (-0.61)	5.94 (12.21***)	8.49 (8.02***)
INST*D_{LTL}	2.61 (1.58)	-0.96 (-0.65)	0.03 (0.01)	-8.41 (-5.63***)	-11.68 (-3.59***)
D_{STW}*$D_{up\ mkt}$	1.19 (3.35***)	0.35 (1.08)	1.42 (3.12***)	-0.36 (-1.14)	0.82 (1.20)
D_{STL}*$D_{up\ mkt}$	-1.26 (-2.94***)	-0.56 (-1.45)	-2.13 (-3.92***)	-0.37 (-1.03)	-0.55 (-0.69)
FFS*$D_{up\ mkt}$	-0.07 (-0.53)	-0.95 (-7.70***)	-0.96 (-5.50***)	0.22 (2.60***)	-2.64 (-14.49***)
D_{STW}*$D_{down\ mkt}$	-0.39 (-0.72)	2.13 (4.31***)	1.68 (2.40**)	-1.89 (-4.48***)	-2.39 (-2.60***)
D_{STL}*$D_{down\ mkt}$	1.11 (1.95*)	0.07 (0.14)	0.63 (0.87)	-0.12 (-0.27)	1.28 (1.33)
FFS*$D_{down\ mkt}$	-0.49 (-2.72***)	-1.41 (-8.76***)	-2.03 (-8.91***)	-0.77 (-6.95***)	0.19 (0.78)
No. of Obs.	10,682	10,680	10,680	9,039	9,036
Adj-R^2	0.009	0.016	0.016	0.126	0.104

Table A7-2 (Continued)

	Early December	Year-End	December	Turn-of-the-Year	January
Panel B: Trading Volume Ratio (in Percent)					
Intercept	6.32 (20.96***)	6.75 (29.07***)	14.13 (31.80***)	3.91 (13.27***)	12.72 (19.61***)
ln(ME)	-0.23 (-6.16***)	-0.27 (-9.33***)	-0.58 (-10.54***)	-0.12 (-3.12***)	-0.11 (-1.39)
ln(BE/ME)	0.03 (0.37)	0.11 (1.78*)	0.13 (1.15)	-0.06 (-0.78)	0.16 (0.97)
INST	-0.01 (-0.02)	-0.59 (-2.59***)	-0.88 (-2.01**)	-0.56 (-1.87*)	-0.90 (-1.37)
ln(PTS)	0.03 (0.25)	0.23 (2.60***)	0.31 (1.80*)	-0.02 (-0.19)	-0.27 (-1.09)
σ	-0.47 (-0.37)	-2.33 (-2.38**)	-2.22 (-1.19)	-3.08 (-2.45***)	-1.45 (-0.52)
D_{LTW}	-0.36 (-1.05)	-0.44 (-1.67*)	-1.11 (-2.21**)	-0.35 (-1.05)	-0.99 (-1.35)
INST*D_{LTW}	0.75 (1.03)	1.25 (2.21**)	2.53 (2.35**)	1.01 (1.37)	2.93 (1.81*)
D_{LTL}	2.00 (5.84***)	2.46 (9.32***)	4.84 (9.60***)	2.07 (6.09***)	4.03 (5.37***)
INST*D_{LTL}	-3.84 (-3.92***)	-2.19 (-2.90***)	-6.36 (-4.41***)	-4.84 (-4.63***)	-7.87 (-3.42***)
D_{STW}*$D_{up\ mkt}$	0.83 (3.93***)	0.53 (3.27***)	1.31 (4.23***)	0.78 (3.53***)	3.55 (7.31***)
D_{STL}*$D_{up\ mkt}$	0.86 (3.40***)	0.54 (2.76***)	1.44 (3.87***)	0.27 (1.06)	0.90 (1.61)
FFS*$D_{up\ mkt}$	-0.58 (-7.13***)	-0.37 (-5.98***)	-0.96 (-8.07***)	-0.25 (-4.20***)	-1.04 (-8.06***)
D_{STW}*$D_{down\ mkt}$	0.40 (1.24)	-0.12 (-0.46)	0.14 (0.29)	0.34 (1.16)	2.52 (3.88***)
D_{STL}*$D_{down\ mkt}$	1.10 (3.28***)	0.36 (1.38)	1.41 (2.85***)	0.36 (1.18)	2.35 (3.45***)
FFS*$D_{down\ mkt}$	-0.74 (-7.02***)	-0.51 (-6.29***)	-1.25 (-7.97***)	-0.45 (-5.84***)	-1.74 (-10.24***)
No. of Obs. Adj-R^2	10,675 0.023	10,675 0.049	10,685 0.056	9,037 0.015	9,039 0.031

[a] The early-December period is defined as remaining December trading days which are prior to the year-end period; the year-end period is defined as the 10-trading-day period prior to the last trading day in the year; the turn-of-the-year period is defined as the five-trading-day period beginning from the last trading day in the previous year. [b] *t*-statistics are presented in parentheses in this or any other tables of this study which display estimated coefficients. * Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Table A7-3. Up and Down Market Years: Equally-Weighted and Value-Weighted NYSE/AMEX Market Index Returns

	1988	*1989*	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*
Market Index Returns (in Percent)								
Equally-Weighted	19.61	11.85	-21.25	51.17	26.79	26.20	-4.72	29.89
Value-Weighted	17.61	28.45	-6.03	33.58	9.02	11.48	-0.62	35.74

the same time period. As mentioned earlier, the results of this approach are shown in Table A7-2.

A7.2 Results For The Cross-Sectional Regressions

Table A7-2 indicates that institutional ownership has an important role in explaining both returns and trading volumes in the December-January period. Many coefficients on INST, INST*D_{LTW}, or INST*D_{LTL} are statistically significant. This implies that institutional and individual investors may have very different trading behavior in that period. For example, institutional investors may buy winners in December, while individual investors may keep holding them to postpone realizing capital gains. And institutional investors may sell risky stocks in December but individual investors may not. Therefore, though the coefficient of INST is significant, we are not clear whether this significance comes from, say, winners, or not. To differentiate the effects from all other independent variables, it seems appropriate to add an interaction term of institutional ownership for each major variable.

However, these additional interaction terms will make our already-bulky regression equation unmanageable. On the other hand, as shown in Table A7-3, during the eight-year sample period of 1988-1995, there are only two down-market years. And in one of the down-market years, 1994, the return on the value-weighted market index is only slightly below zero.[151] Therefore, it is likely that the introduction of up- and down-market dummy variables in the regression has very limited power in explaining returns or trading volumes.

Based on the above-mentioned reasons, we drop those up- and down-market dummy variables and INST, meanwhile adding the institutional-ownership interaction term for each independent variable in the regression equations, except for ln(ME) and ln(BE/ME).

[151] We define a down-market year if the value-weighted market return is negative. The equally-weighted market returns are presented only for the purpose of reference.

Appendix 8. Estimated Coefficients Predicted By Each Hypothesis For Cross-Sectional Regressions On Returns And Trading Volumes

In Appendix 8 or elsewhere in this dissertation, the symbol "→" means "implies that" or "implies a."

A8.1 Returns During December, The Year-End Period, Or The Early-December Period

A8.1.1 The Tax-Loss Selling Hypothesis

[1] Coefficient of ln(PTS): $b_1 < 0$.

Higher tax-loss selling pressure experienced by shareholders of the stock before year-end → more seller-initiated transactions and heavier selling pressure before year-end → lower rate of return in December → $b_1 < 0$.

[2] Coefficient of INST*ln(PTS): $b_2 > 0$.

Given the constant PTS on stocks, the higher institutional ownership (lower individual-investor holdings) of the firm → the less tax-loss selling pressure from its individual shareholders in December → higher rate of return in December for the stock with the same PTS value but with higher institutional ownership → $b_2 > 0$.

[3] Coefficient of D_{STW}: $c_1 \geq 0$.

If tax-motivated trading is the underlying explanation of the January effect, in addition to selling short-term losers, it also implies deferring realizing short-term capital gains until the capital gains become long-term (or at least until the beginning of the next tax year) → if the stock is a short-term winner and its price appreciates during the past January-November period, then the more likely that its stockholders have larger unrealized short-term and long-term capital gains[152] → higher rate of return for the prior winners in the current period due to lower stock supply → $c_1 \geq 0$.[153]

[4] Coefficient of INST*D_{STW}: $c_2 \leq 0$.

For a short-term winner, the higher its institutional ownership (lower individual-investor holdings) → the less its stocks will be deferred from selling in December until the following January due to tax motivation → relatively more seller-initiated transactions and heavier selling pressure in December for the short-term winner with a higher institutional ownership → lower rate of return in December for the short-term winner with higher institutional ownership → $c_2 \leq 0$.[154]

[5] Coefficient of D_{STL}: $d_1 \leq 0$.

Individual investors tend to incur capital losses on the extreme loser stocks experiencing depressed returns → higher tax-loss selling pressure experienced by

---

[152] For investors who purchased the stock before the prior December, the unrealized capital gains have all become long-term in the current December, but individual investors are still motivated to defer capital gains taxes into the next year by selling the stocks in the following January, instead of selling in the current December. For those who purchased the stock in the prior December, the motivation of deferring the selling until the next year would be the strongest, since the capital gains will become long-term in the next January and the gains will be taxed in the next year. And for those who purchased the stocks in the current year and need to sell for whatever reasons such as the need for cash, deferring sale of the stocks until the beginning of the next year can postpone the capital-gain tax payment from the current year into the next year.

[153] Just as the reason that the prior period return is probably not an adequate proxy for capital losses and the year-end tax-loss selling, it may also be a weak proxy for capital gains and the year-end deferred selling. Therefore, we allow the possibility of finding a statistically insignificant result.

[154] For the same reason stated in footnote 153, we allow the possibility of $c_2 = 0$.

shareholders of the stock → more seller-initiated transactions for the stock before year-end → lower rate of return in December → $d_1 \leq 0$.[155]

[6] Coefficient of INST*D_{STL}: $d_2 \geq 0$.

For the short-term losers, the higher institutional ownership (lower individual-investor holdings) of the firm → the less tax-loss selling pressure from its individual shareholders in December → higher rate of return in December for the loser stock with higher institutional ownership → $d_2 \geq 0$.[156]

A8.1.2 The Window Dressing Hypothesis

[1] Coefficient of D_{STW}: $c_1 > 0$; Coefficient of D_{LTW}: $f_1 > 0$.

Institutional investors buy, before year-end, prior winners (with high, positive rate of return) → higher rate of return for the prior winners in the current period → $c_1 > 0$ for short-term winners and $f_1 > 0$ for long-term winners.

[2] Coefficient of D_{STL}: $d_1 < 0$; Coefficient of D_{LTL}: $g_1 < 0$.

Institutional investors dump, before year-end, prior losers (with low, negative rate of return) → lower rate of return for prior losers in the current period → $d_1 < 0$ for short-term losers and $g_1 < 0$ for long-term losers.

[3] Coefficient of σ: $e_1 < 0$.

"Winning" institutional managers want to lock up their performance by switching

---

[155] As mentioned previously, prior-period return may be not an adequate proxy for capital losses. Therefore, we allow the possibility of finding $d_1 = 0$.
[156] Similar to the reason stated in footnote 155, we allow $d_2 = 0$.

from high-risk stocks to low-risk stocks before year-end → the higher σ is, the lower December rate of return → $e_1 < 0$.

[4] Coefficient of INST*D_{STL}: $d_2 < 0$; Coefficient of INST*σ: $e_2 < 0$; Coefficient of INST*D_{LTL}: $g_2 < 0$.

Higher institutional ownership of previous losers (or high-risk stocks) → higher probability of window dressing activities of selling losers (or high-risk stocks)[157] → lower rate of return for losers (or high-risk stocks) with higher-institutional-ownership → $d_2 < 0$ for short-term losers, $e_2 < 0$ for high-risk stocks, and $g_2 < 0$ for long-term losers.

Note that: institutional ownership of stocks purchased by institutional investors, such as previous winners and low-risk stocks, may play no role in explaining their rates of return in December, since institutional investors can buy previous winners and low-risk stocks of either high-institutional-ownership or low-institutional-ownership. The ownership data used in this study are measured in September, which is before the return period, and therefore can not reflect any increase in institutional ownership during the return period.[158]

---

[157] Institutional managers may dump losers to dress up the portfolio or lock up their performance by switching from high-risk securities to low-risk ones by the year-end. Therefore, the higher is the institutional ownership of a firm, the stronger the window dressing activity on its stock will be.

[158] September institutional ownership of previous winners and low-risk stocks will matter, however, if we assume the institutional managers tend to window dress at year-end by purchasing those winners and low-risk stocks which have higher institutional ownership. That is, the institutional managers have a common "preferred habitat" to invest in stocks with special characteristics, such as firms of large size, high-prestige, and so on. Consequently, average December returns for the winners and low-risk stocks of higher-institutional-ownership firms become, *ceteris paribus*, higher than the average returns for the corresponding lower-institutional-ownership firms. If this scenario is true, then c_2 (for short-term winners) and f_2 (for long-term winners) will be greater than zero and e_2 (for σ) will be less negative or become positive. Noteworthily, no matter whether it can explain December stock returns or not, institutional

A8.1.3 The Liquidity Hypothesis[159]

[1] Coefficient of ln(ME): $a_1 < 0$.

Individual investors prefer to invest their wealth in small-firm stocks → stronger demand for small-firm stocks → higher (early) December returns on smaller firms → $a_1 < 0$.

[2] Coefficient of FFS: $h_1 < 0$.

Higher federal funds spread → more stringency of Fed monetary policy → lower aggregate liquid profits → lower rate of return in (early) December → $h_1 < 0$.

Note that: Similar to institutional ownership of stocks purchased by institutional investors, institutional ownership of stocks purchased by individual investors may play no role in explaining their rates of return in December, since individual investors can buy stocks of either high-institutional-ownership or low-institutional-ownership. The ownership data used in this study are measured in September, which is before the return period, and therefore can not reflect any increase in institutional ownership during the return period, unless we make additional assumptions such as individual investors have a 'preferred habitat' to invest in the stocks of high-individual-ownership (i.e.,

---

ownership of previous winners and low-risk stocks will increase in December, if window dressing activities take place.

[159] According to the liquidity hypothesis, monetary policy has an effect only on the turn-of-the-month returns, therefore the following prediction does not apply to the year-end-period return, but only to the early-December and perhaps the whole December returns as well. This is because individual investors receive nearly all liquid profits at the month-end and then immediately invest in stocks during the turn-of-the month period. In the remaining days of the month, monetary policy does not matter, since individual investors have little to invest in stocks.

low-institutional-ownership) or they tend to increase the investment in the stocks that they currently own, rather than investing in new stocks.[160]

A8.2 Returns During January Or The Turn-Of-The-Year Period

A8.2.1 The Tax-Loss Selling Hypothesis

[1] Coefficient of ln(PTS): $b_1 > 0$.

Higher tax-loss selling pressure experienced by shareholders of the stock → more seller-initiated transactions for the stock before year-end → the stock price is more depressed in December → stronger price rebound in January (TOTY) → $b_1 > 0$.

[2] Coefficient of INST*ln(PTS): ($b_2 < 0$).

Given constant PTS on stocks, higher institutional ownership (lower individual-investor holdings) of the firm → the less tax-loss selling pressure from its individual shareholders in December → less depressed stock price in December for the stock with the same PTS value but with higher institutional ownership → if we assume that in January the depressed price moves back to its fundamental level, then the stocks with higher institutional ownership will have less price rebound in January (TOTY)[161] → ($b_2 < 0$).

[160] If individual investors have a 'preferred habitat' to invest in the high-individual-ownership (low-institutional-ownership) firms which have common characteristics desired by most individual investors or they tend to increase the investment in the firms that they currently own, rather than investing in new firms, then demand for low-institutional-ownership stocks will be stronger when the Fed has an easy monetary policy. Therefore, when the Fed has a stringent monetary policy, stock demand for high-institutional-ownership firms will be less unfavorably affected than demand for low-institutional-ownership firms. Consequently, high-institutional-ownership stocks will have higher (early) December returns than low-institutional-ownership stocks. That is, we expect $h_2 > 0$.

[161] The January rebound may be a pure price adjustment from the depressed December price. That is, the price moves back to its fundamental level in January once the year-end selling pressure is relieved, without

[3] Coefficient of D_{STW}: $c_1 \leq 0$.

If tax-motivated trading is the underlying explanation of the January effect, in addition to selling short-term losers, it also implies deferring realizing short-term capital gains until the capital gains become long-term (or at least until the beginning of next year) → if the stock is a short-term winner and its price appreciates during the past January-November period, then it is more likely that its stockholders have larger unrealized short-term and long-term capital gains[162] → lower rate of return for the prior winners in January (TOTY) due to capital-gain realization of individual investors and accompanying more seller-initiated transactions for the stocks → $c_1 \leq 0$.[163]

[4] Coefficient of INST*D_{STW}: $c_2 \geq 0$.

For a short-term winner, the higher its institutional ownership (lower individual-investor holdings) → the less its stocks will be deferred from selling in December until the following January due to tax motivation → relatively less seller-initiated transactions and lower selling pressure in January (TOTY) for the short-term winner

abnormal January purchases. However, the parking-the-proceeds hypothesis states that in January individual investors reinvest their proceeds from the December tax-loss sales and in this study we are testing a joint hypothesis of the tax-loss selling and the parking-the-proceeds. In fact, in order to avoid the wash sale prohibition, in January individual investors could purchase the stocks sold by other individuals in December. On the other hand, the January price may be further bid up, i.e., overvalued, due to additional stock demand. This is very likely since the results from previous studies such as Reinganum (1983) show that those stocks experiencing large January returns reveal little evidence of depressed December returns. This abnormal stock demand may also come from the high liquidity position of individual investors at the year-end, or from institutional managers who are involved in year-end window dressing activities and rebalance their portfolios in January.

[162] Please refer to footnote 152 on p. 228 for detailed explanations.

[163] Please refer to footnote 153 on p. 228 for detailed explanations.

with a higher institutional ownership → higher rate of return in January (TOTY) for the short-term winner with higher institutional ownership → $c_2 \geq 0$.[164]

[5] Coefficient of D_{STL}: $d_1 \geq 0$.

Individual investors tend to incur capital losses on the extreme short-term losers experiencing depressed returns → higher tax-loss selling pressure experienced by shareholders of the loser stock → the stock price is more depressed in December for short-term losers → stronger price rebound in January (TOTY) → $d_1 \geq 0$.[165]

[6] Coefficient of INST*D_{STL}: ($d_2 \leq 0$).

For the short-term losers, the higher institutional ownership (lower individual-investor holdings) of the firm → the less tax-loss selling pressure from its individual shareholders in December → less depressed stock price in December for the loser stock with higher institutional ownership → if we assume that in January the depressed price moves back to its fundamental level[166] → the less price rebound and lower return in January (TOTY) for the loser stock with higher institutional ownership → ($d_2 \leq 0$).[167]

---

[164] As mentioned in footnote 153 on p. 228, prior-period return may be not an adequate proxy for capital losses. Therefore, we allow the possibility of $c_2 = 0$.

[165] Similar to footnote 164, we allow the possibility of finding $d_1 = 0$.

[166] Please refer to footnote 161 for detailed discussion.

[167] Similar to footnote 164, we allow $d_2 = 0$.

A8.2.2 The Window Dressing Hypothesis

[1] Coefficient of D_{STW}: $c_1 \leq 0$; Coefficient of D_{LTW}: $f_1 \leq 0$.

Institutional investors buy, before year-end, prior winners (with high, positive rate of return) → Reselling the prior winners in January (TOTY) or later → no higher rate of return for the prior winners in current period → $c_1 \leq 0$ for short-term winners and $f_1 \leq 0$ for long-term winners.

[2] Coefficient of D_{STL}: $d_1 > 0$; Coefficient of D_{LTL}: $g_1 > 0$.

Institutional investors dump, before year-end, prior losers (with low, negative rate of return) → institutional investors become net buyers of these losers in January (TOTY) → higher rate of return for prior losers in January (TOTY) → $d_1 > 0$ for short-term losers and $g_1 > 0$ for long-term losers.

[3] Coefficient of σ: $e_1 > 0$.

"Winning" institutional managers want to lock up their performance by switching from high-risk stocks to low-risk stocks before year-end and then switch them back at the turn-of-the-year in the following year → the higher σ is, the lower December rate of return and the higher January (TOTY) return → $e_1 > 0$.

[4] Coefficient of INST*D_{STL}: ($d_2 \geq 0$); Coefficient of INST*σ: ($e_2 \geq 0$); Coefficient of INST*D_{LTL}: ($g_2 \geq 0$).

Higher institutional ownership of previous losers (or high-risk stocks) → higher probability of window dressing activities of selling losers (or high-risk stocks) in December → lower December return for losers (or high-risk stocks) with higher-institutional-ownership → if we assume that in January the depressed price moves back to its fundamental level, then the stocks with higher institutional ownership will have less price rebound in January (TOTY), then the losers (or high-risk stocks) with higher-institutional-ownership earn a higher January (TOTY) return[168] → ($d_2 \geq 0$ for short-term losers, $e_2 \geq 0$ for high-risk stocks, and $g_2 \geq 0$ for long-term losers).

Note that: Similar to the case of December returns shown previously, institutional ownership of stocks purchased by institutional investors in January (TOTY) may play no role in explaining their rates of return in January (TOTY) unless we make additional assumptions such as that institutional investors have a preferred habitat of investing in high-institutional-ownership firms,[169] or that institutional investors just buy back, in the aggregate, the depressed-price stocks sold by themselves in December, as mentioned earlier.

---

[168] Alternatively, as mentioned in footnote 161, the January price may be further bid up, i.e., overvalued, due to additional stock demand by, e.g., individual investors who have large year-end liquid profits. Since individual investors could have the preferred habitat of investing in low-institutional-ownership firms which have common characteristics such as smaller firms size desired by most individual investors, January returns of the low-institutional-ownership firms may thus be bid up. If this scenario is true, then the observed coefficients of d_2, e_2, and g_2 will be less positive or become statistically insignificant.

[169] As in the explanation shown in footnote 158 on p. 230, under the preferred habitat assumption, institutional investors will purchase winners with higher institutional ownership in December. If the stock price moves back towards its equilibrium fundamental level in January as argued in footnote 168, then these winners should have lower January (TOTY) return than the winners with lower institutional ownership. That is, we should obtain $c_2 < 0$ for short-term winners and $f_2 < 0$ for long-term winners. Similarly, after year-end dumping of losers and high-risk stocks, institutional investors become net buyers of these stocks in January (TOTY) and they invest more in higher-institutional-ownership stocks. Under this scenario, losers and high-risk stocks with higher-institutional-ownership will earn a higher January (TOTY) return than those with lower-institutional-ownership, i.e., $d_2 > 0$ for short-term losers, $e_2 > 0$ for σ, and $g_2 > 0$ for long-term losers. Consequently, d_2, e_2, and g_2 will become more positive.

A8.2.3 The Overreaction Hypothesis

[1] Coefficient of D_{LTW}: $f_1 < 0$.

The current stock price is likely to be overvalued due to previous overreaction of investors on long-term winners → investing in long-term winners is unattractive in the current period → lower rate of return in the current period due to weaker demand for the stocks → $f_1 < 0$.

[2] Coefficient of INST*D_{LTW}: $f_2 > 0$.

Higher institutional ownership of long-term winners → lower individual-investor holdings for long-term winners → the current stock price is less likely to be overvalued due to previous overreaction of individual investors on long-term winners → investing in long-term winners is less unattractive in the current period → higher rate of return in the current period due to less depressed demand for the stocks → $f_2 > 0$.

[3] Coefficient of D_{LTL}: $g_1 > 0$.

The current stock price is likely to be undervalued due to previous overreaction of investors on long-term losers → investing in long-term losers is attractive in the current period → higher rate of return in the current period due to stronger demand for the stocks → $g_1 > 0$.

[4] Coefficient of INST*D_{LTL}: $g_2 < 0$.

Higher institutional ownership of long-term losers → lower individual-investor holdings for long-term losers → the current stock price is less likely to be undervalued due to previous overreaction of individual investors on long-term losers $\rightarrow$ investing in long-term losers is less attractive in the current period $\rightarrow$ lower rate of return in the current period due to less strong demand for the stocks $\rightarrow g_2 < 0$.

A8.2.4 The Liquidity Hypothesis

[1] Coefficient of ln(ME): $a_1 < 0$.

Individual investors prefer to invest their wealth in small-firm stocks $\rightarrow$ stronger demand for small-firm stocks $\rightarrow$ higher January (TOTY) returns on smaller firms $\rightarrow$ $a_1 < 0$.

[2] Coefficient of FFS: $h_1 < 0$.

Higher federal funds spread $\rightarrow$ more stringency of Fed monetary policy $\rightarrow$ lower aggregate liquid profits $\rightarrow$ lower rate of return in January (TOTY) $\rightarrow h_1 < 0$.

Note that: Similar to the case of December returns shown previously, institutional ownership of stocks purchased by individual investors may play no role in explaining their rates of return in December, since individual investors can buy stocks of either high-institutional-ownership or low-institutional-ownership. The ownership data of the purchased stocks will matter only if we make additional assumptions such as individual investors have a 'preferred habitat' to invest in the stocks of high-individual-ownership (i.e., low-institutional-ownership) or they tend to increase the investment in the stocks that they currently own, rather than investing in new stocks.[170]

A8.3 Trading Volume Ratios During December, The Year-End Period, Or The Early-December Period

A8.3.1 The Tax-Loss Selling Hypothesis

[1] Coefficient of ln(PTS): $b_1 > 0$.

Higher tax-loss selling pressure experienced by shareholders of the stock → more seller-initiated transactions for the stock before year-end → higher trading volume ratio in December → $b_1 > 0$.

[2] Coefficient of INST*ln(PTS): $b_2 < 0$.

Given the constant PTS on stocks, the higher institutional ownership (lower individual-investor holdings) of the firm → the less tax-loss selling pressure from its individual shareholders in December → lower trading volume ratio in December for the stock with the same PTS value but with higher institutional ownership → $b_2 < 0$.

[3] Coefficient of D_{STW}: $c_1 \leq 0$.

If tax-motivated trading is the underlying explanation of the January effect, in addition to selling short-term losers, it also implies deferring realizing short-term capital gains until the capital gains become long-term (or at least until the beginning of next year) → if the stock is a short-term winner and its price appreciates during the past January-November period, then it is more likely that its stockholders have larger

[170] Please refer to footnote 160 on p. 232 for detailed explanations. If we make either one of the

unrealized short-term and long-term capital gains[171] → a lower trading volume ratio for the prior winners in the current period due to lower stock supply → $c_1 \leq 0$.[172]

[4] Coefficient of INST*D_{STW}: $c_2 \geq 0$.

For a short-term winner, the higher its institutional ownership (lower individual-investor holdings) → the less its stocks will be deferred from selling in December until the following January due to tax motivation → relatively more seller-initiated transactions in December for the short-term winner with higher institutional ownership → higher trading volume ratio in December for the short-term winner with higher institutional ownership → $c_2 \geq 0$.[173]

[5] Coefficient of D_{STL}: $d_1 \geq 0$.

Individual investors tend to incur capital losses on the extreme loser stocks experiencing depressed returns → higher tax-loss selling pressure experienced by shareholders of the stock → more seller-initiated transactions for the stock before year-end → higher trading volume in December → $d_1 \geq 0$.[174]

[6] Coefficient of INST*D_{STL}: $d_2 \leq 0$.

For the short-term losers, the higher the institutional ownership (lower individual-investor holdings) of the firm → the less tax-loss selling pressure from its individual

---

assumptions, then we expect $h_2 > 0$.

[171] Please refer footnote 152 on p. 228 for detailed explanation.

[172] For the same reason stated in footnote 153 on p. 228, we allow the possibility of $c_1 = 0$.

[173] For the same reason stated in footnote 153, we allow the possibility of $c_2 = 0$.

[174] As mentioned in footnote 155 on p. 229, prior-period return may be not an adequate proxy for capital losses. Therefore, we allow the possibility of finding $d_1 = 0$.

shareholders in December → the lower trading volume ratio in December for the loser stock with higher institutional ownership → $d_2 \leq 0$.[175]

A8.3.2 The Window Dressing Hypothesis

[1] Coefficient of D_{STW}: $c_1 > 0$; Coefficient of D_{LTW}: $f_1 > 0$.

Institutional investors buy, before year-end, prior winners (with high, positive rate of return) → higher trading volume ratio for the prior winners in the current period → $c_1 > 0$ for short-term winners and $f_1 > 0$ for long-term winners.

[2] Coefficient of D_{STL}: $d_1 > 0$; Coefficient of D_{LTL}: $g_1 > 0$.

Institutional investors dump, before year-end, prior losers (with low, negative rate of return) → higher trading volume ratio for prior losers in the current period → $d_1 > 0$ for short-term losers and $g_1 > 0$ for long-term losers.

[3] Coefficient of INST*D_{STL}: $d_2 > 0$; Coefficient of INST*D_{LTL}: $g_2 > 0$.

Higher institutional ownership of previous losers → higher probability of window dressing activities of selling loser stocks[176] → higher trading volume ratio for losers with higher-institutional-ownership → $d_2 > 0$ for short-term losers, and $g_2 > 0$ for long-term losers.

[4] Coefficient of σ: ($e_1 \geq 0$).

"Winning" institutional managers want to lock up their performance by switching from high-risk stocks to low-risk stocks before year-end → higher trading volume

---

[175] Similar to footnote 155, we allow $d_2 = 0$.
[176] Please refer to footnote 157 on p. 230 for further explanation.

ratio for stocks with very high σ or very low σ, and the sign of e_1 cannot be determined. However, if institutional managers reinvest the proceeds from selling high-risk stocks in other low-risk financial instruments such as bonds, T-bills, market-money funds, or cash,[177] then the trading volume ratio for high-risk stocks will tend to be higher than that for low-risk stocks. Consequently, the trading volume ratio in December will tend to be an increasing function of stock riskiness $\rightarrow e_1 \geq 0$.

[5] Coefficient of INST*σ: $e_2 \geq 0$.

Given the constant σ for either high-risk or low-risk stocks, the higher the institutional ownership of the stocks $\rightarrow$ the more active window dressing activities (selling high-risk and buying low-risk stocks) on the stocks will be $\rightarrow$ higher trading volume ratio for both high-risk and low-risk stocks with higher institutional ownership $\rightarrow$ on average, given the constant σ for stocks with any risk level, higher-institutional-ownership stocks will have no lower trading volume ratio than lower-institutional-ownership stocks $\rightarrow e_2 \geq 0$.

Note that: Similar to the argument for rate of returns, institutional ownership of stocks purchased by institutional investors, such as previous winners and low-risk stocks, may play no role in explaining their trading volume ratios in December, unless other assumptions are made.[178]

---

[177] Athanassakos and Schnabel (1994) provide evidence of the systematic shift in portfolio rebalancing for institutional managers. They find that portfolio allocations of pension and mutual funds early in the calendar are more heavily weighted towards the stock market and less heavily weighted towards cash and cash equivalents than later in the calendar year in Canada.

[178] As discussed in footnote 158 on p. 230, if we assume the institutional managers have a preferred habitat in investment decisions and hence purchase those previous winners and low-risk stocks with higher institutional ownership during year-end window dressing activities, then average December trading volume ratios for the winners and low-risk stocks of higher-institutional-ownership firms become, *ceteris paribus*,

A8.3.3 The Liquidity Hypothesis[179]

[1] Coefficient of ln(ME): $a_1 < 0$.

Individual investors prefer to invest their wealth in small-firm stocks → stronger demand for small-firm stocks → higher trading volume ratio in (early) December for smaller firms → $a_1 < 0$.

[2] Coefficient of FFS: $h_1 < 0$.

Higher federal funds spread → more stringency of Fed monetary policy → lower aggregate liquid profits → lower trading volume ratio in (early) December → $h_1 < 0$.

Note that: Similar to the argument for rates of return, institutional ownership of stocks purchased by individual investors may play no role in explaining their trading volume ratio in December, since individual investors can buy stocks of either high-institutional-ownership or low-institutional-ownership. However, institutional ownership of the purchased stocks will matter if we make additional assumptions such as individual investors have a 'preferred habitat' to invest in the stocks of high-individual-ownership (i.e., low-institutional-

higher than the average December trading volume ratios for the corresponding lower-institutional-ownership firms. If this scenario is true, then c_2 (for short-term winners) and f_2 (for long-term winners) will be greater than zero and e_2 will be more positive.

[179] According to the liquidity hypothesis, monetary policy has an effect only on the turn-of-the-month returns, therefore the following prediction does not apply to the year-end-period return, but only to the early-December and perhaps the whole December returns as well. This is because individual investors receive nearly all liquid profits at the month-end and then immediately invest in stocks during the turn-of-the month period. In the remaining days of the month, monetary policy does not matter, since individual investors have little to invest in stocks.

ownership) or they tend to increase the investment in the stocks that they currently own, rather than investing in new stocks.[180]

A8.4 Trading Volume Ratios During January Or The Turn-Of-The-Year Period

A8.4.1 The Tax-Loss Selling Hypothesis

[1] Coefficient of ln(PTS): $b_1 > 0$.

Higher tax-loss selling pressure in December $\rightarrow$ stronger price rebound in January (TOTY) $\rightarrow$ individual investors in the aggregate buy back the stocks they sold in December,[181] then higher-PTS stocks would have higher trading volume ratio in January (TOTY) $\rightarrow b_1 > 0$.

[2] Coefficient of INST*ln(PTS): ($b_2 < 0$).

Given the constant PTS on stocks, the higher institutional ownership (lower individual-investor holdings) of the firm $\rightarrow$ the December stock price will be less

---

[180] Similar to footnote 160 on p. 232 for explaining rates of return, if individual investors have a 'preferred habitat' to invest in the high-individual-ownership (low-institutional-ownership) firms which have common characteristics desired by most individual investors or they tend to increase the investment in the firms that they currently own, rather than investing in new firms, then demand for low-institutional-ownership stocks will be stronger when the Fed has an easy monetary policy. Therefore, when the Fed has a stringent monetary policy, stock demand for high-institutional-ownership firms will be less unfavorably affected than demand for low-institutional-ownership firms. Consequently, high-institutional-ownership stocks will have higher (early) December trading volume ratios than low-institutional-ownership stocks. That is, we expect $h_2 > 0$.

[181] If the January price rebound is a pure price adjustment from the depressed December price, i.e., the price moves back to its fundamental level in January once the year-end selling pressure is relieved and there is no abnormal January purchases, then there should be no effect on trading volume ratio. However, the parking-the-proceeds hypothesis states that in January individual investors reinvest their proceeds from the December tax-loss sales. In fact, Reinganum (1983) shows that those stocks experiencing large January returns reveal little evidence of depressed December returns and Ritter (1988) finds that the buy/sell ratio for individual investors is below its normal level in December and above in January, the large price appreciation in January could, at least partially, result from individual investors' strong buying activities in January. Practically, to avoid the wash sale prohibition, in January individual investors can purchase the stocks sold by other individuals in December. Further, the January price may be further bid up due to additional stock demand from the high liquidity position of individual investors at the year-end,

depressed due to year-end tax-loss selling activity of its individual shareholders → if the January demand is stronger for the lower-institutional-ownership stocks, which have lower December returns, than for the higher-institutional-ownership stocks, then the trading volume ratio for higher-institutional-ownership stocks will be smaller than that for lower-institutional-ownership stocks → ($b_2 < 0$).

[3] Coefficient of D_{STW}: $c_1 \geq 0$.

If tax-motivated trading is the underlying explanation of the January effect, in addition to selling short-term losers, it also implies deferring realizing short-term capital gains until the capital gains become long-term (or at least until the beginning of next year) → if the stock is a short-term winner (its price appreciates during the past January-November period), then the more likely that its stockholders have accumulated large unrealized short-term or long-term capital gains[182] → higher trading volume ratio for the prior winners in January (TOTY) period due to stronger stock supply → $c_1 \geq 0$.[183]

[4] Coefficient of INST*D_{STW}: $c_2 \leq 0$.

For a short-term winner, the higher its institutional ownership (lower individual-investor holdings) → the less its stocks will be deferred from selling in December until the following January due to tax motivation → relatively fewer seller-initiated

---

or from institutional managers who involves in year-end window dressing activities and rebalance their portfolios in January.

[182] Please refer footnote 152 on p. 228 for detailed explanation.

[183] As mentioned in footnote 153 on p. 228, the prior period return is probably not an adequate proxy for capital losses and the year-end tax-loss selling, it may also be a weak proxy for capital gains and the year-end deferred selling. Therefore, we allow the possibility of finding a statistically insignificant result, i.e., c_1 = 0.

transactions in January (TOTY) for the short-term winner with higher institutional ownership → lower trading volume ratio in January for the short-term winner with higher institutional ownership → $c_2 \leq 0$.[184]

[5] Coefficient of D_{STL}: $d_1 \geq 0$.

Individual investors tend to incur capital losses on the extreme short-term losers experiencing depressed returns → higher tax-loss selling pressure experienced by shareholders of the loser stock → the stock price is more depressed in December for short-term losers → stronger price rebound in January (TOTY) → individual investors in the aggregate buy back the stocks they sold in December,[185] then short-term losers would have higher trading volume ratio in January (TOTY) → $d_1 \geq 0$.[186]

[6] Coefficient of INST*D_{STL}: ($d_2 \leq 0$).

For the short-term losers, the higher institutional ownership (lower individual-investor holdings) of the firm → the less tax-loss selling pressure from its individual shareholders in December → the December stock price will be less depressed due to year-end tax-loss selling activity of its individual shareholders → if the January demand is stronger for the lower-institutional-ownership stocks, which have lower December returns, than for the higher-institutional-ownership stocks, then the trading volume ratio for higher-institutional-ownership stocks will be smaller than that for lower-institutional-ownership stocks → ($d_2 \leq 0$).[187]

---

[184] Similar to footnote 183, we allow the possibility of $c_2 = 0$.
[185] Please refer to footnote 181 for detailed discussion.
[186] Similar to footnote 183, we allow the possibility of $d_1 = 0$.
[187] Similar to footnote 183, we allow the possibility of $d_2 = 0$.

A8.4.2 The Window Dressing Hypothesis

[1] Coefficient of D_{STW}: $c_1 \geq 0$; Coefficient of D_{LTW}: $f_1 \geq 0$.

Institutional investors buy, before year-end, prior winners (with high, positive rate of return) → reselling the prior winners in January (TOTY) or later → no lower trading volume ratio for the prior winners in January (TOTY) → $c_1 \geq 0$ for short-term winners and $f_1 \geq 0$ for long-term winners.

[2] Coefficient of D_{STL}: $d_1 > 0$; Coefficient of D_{LTL}: $g_1 > 0$.

Institutional investors dump, before year-end, prior losers (with low, negative rate of return) → institutional investors become net buyers of these losers in January (TOTY) → higher trading volume ratio for prior losers in January (TOTY) → $d_1 > 0$ for short-term losers and $g_1 > 0$ for long-term losers.

[3] Coefficient of INST*D_{STL}: ($d_2 \geq 0$); Coefficient of INST*D_{LTL}: ($g_2 \geq 0$).

Higher institutional ownership of previous losers → higher probability of window dressing activities of selling losers in December → lower December return for losers with higher-institutional-ownership → if we assume that institutional managers have the preferred habitat of investing in high-institutional-ownership stocks when they purchase these losers in January[188] → ($d_2 \geq 0$ for short-term losers, and $g_2 \geq 0$ for long-term losers).

[188] In addition to the December window dressing activities for reporting purposes and the following January transactions, institutional managers may rebalance their portfolios according to past performance of the stocks. That is, institutional managers would trade for the purposes of both reporting rebalancing and performance rebalancing. As pointed out by Porter, Powell, and Weaver (1996), the hypothesis proposed by Haugen and Lakonishok (1988) "does not predict the precise timing of the performance

[4] Coefficient of σ: ($e_1 \geq 0$).

"Winning" institutional managers want to lock up their performance by switching from high-risk stocks to low-risk stocks before year-end and reversing the switch in January (TOTY) $\rightarrow$ higher trading volume ratio for stocks with very high σ or very low σ and the sign of e_1 cannot be determined. However, if institutional managers reinvest the proceeds from selling high-risk stocks in other low-risk financial instruments such as bonds, T-bills, market-money funds, or cash,[189] then the trading volume ratio for high-risk stocks will tend to be higher than that for low-risk stocks. Consequently, the trading volume ratio in December will tend to be an increasing function of stock riskiness $\rightarrow$ ($e_1 \geq 0$).

[5] Coefficient of INST*σ: ($e_2 \geq 0$).

Institutional managers switch from high-risk stocks to low-risk stocks before year-end and reverse the switch in January (TOTY) $\rightarrow$ higher trading volume ratio for stocks with very high σ or very low $\sigma \rightarrow$ given a constant σ for high-risk stocks, the higher the institutional ownership of the stocks, the more active window dressing activities of selling high-risk stocks in December will be $\rightarrow$ if we assume that institutional managers have the preferred habitat of investing in high-institutional-ownership stocks when they purchase high-risk stocks in January[190] $\rightarrow$ higher January trading volume ratio for high-risk stocks with higher institutional ownership $\rightarrow$ on average,

---

rebalancing, only that it will occur in the latter part of the year. In both reporting and performance rebalancing, repurchase ... will occur in January."

[189] Please refer to footnote 177 on p. 242 for supporting empirical evidence.

[190] Please refer to footnote 188 for detailed discussion.

given the constant σ for stocks with any risk level, higher-institutional-ownership stocks will have no lower January trading volume ratio than lower-institutional-ownership stocks $\rightarrow$ ($e_2 \geq 0$).

Note that: Similar to the argument for rate of returns, institutional ownership of stocks purchased by institutional investors, such as previous winners and low-risk stocks, may play no role in explaining their trading volume ratios in January, unless other assumptions are made.[191]

A8.4.3 The Overreaction Hypothesis

[1] Coefficient of D_{LTW}: $f_1 < 0$.

The current stock price is likely to be overvalued due to previous overreaction of investors on long-term winners $\rightarrow$ investing in long-term winners is unattractive in the current period $\rightarrow$ lower stock demand and lower trading volume ratio in the current period $\rightarrow f_1 < 0$.

[2] Coefficient of INST*D_{LTW}: $f_2 > 0$.

Higher institutional ownership of long-term winners $\rightarrow$ lower individual-investor holdings for long-term winners $\rightarrow$ the current stock price is less likely to be

[191] As the explanation shown in footnotes 158 and 169 (on pp. 230 and 236), under the preferred habitat assumption, institutional investors will purchase winners with higher institutional ownership in December and then resell these stocks in January or later. Consequently, the January trading volume ratio for winners with higher institutional ownership will be no lower than that for winners with lower institutional ownership. That is, $c_2 \geq 0$ for short-term winners and $f_2 \geq 0$ for long-term winners. Similarly, after year-end dumping losers and high-risk stocks, institutional investors become net buyers of these stocks in January (TOTY) and they invest more in higher-institutional-ownership stocks. Under this scenario, losers and high-risk stocks with higher-institutional-ownership will have higher January (TOTY) trading volume ratio than those with lower-institutional-ownership, i.e., $d_2 > 0$ for short-term losers, $e_2 > 0$ for σ, and $g_2 > 0$ for long-term losers. Consequently, d_2, e_2, and g_2 will become more positive.

overvalued due to previous overreaction of individual investors on long-term winners → investing in long-term winners is less unattractive in the current period → higher trading volume ratio in the current period due to less depressed demand for the stocks → $f_2 > 0$.

[3] Coefficient of D_{LTL}: $g_1 > 0$.

The current stock price is likely to be undervalued due to previous overreaction of investors on long-term losers → investing in long-term losers is attractive in the current period → higher trading volume ratio in the current period due to stronger demand for the stocks → $g_1 > 0$.

[4] Coefficient of INST*D_{LTL}: $g_2 < 0$.

Higher institutional ownership of long-term losers → lower individual-investor holdings for long-term losers → the current stock price is less likely to be undervalued due to previous overreaction of individual investors on long-term losers → investing in long-term losers is less attractive in the current period → lower trading volume ratio in the current period due to less strong demand for the stocks → $g_2 < 0$.

A8.4.4 The Liquidity Hypothesis

[1] Coefficient of ln(ME): $a_1 < 0$.

Individual investors prefer to invest their wealth in small-firm stocks → stronger demand for small-firm stocks → higher trading volume ratio in January (TOTY) for smaller firms → $a_1 < 0$.

[2] Coefficient of FFS: $h_1 < 0$.

Higher federal funds spread → more stringency of the Fed's monetary policy → lower aggregate liquid profits → lower trading volume ratio in January (TOTY) December → $h_1 < 0$.

Note that: Similar to the argument for rate of returns, institutional ownership of stocks purchased by individual investors may play no role in explaining their trading volume ratio in January (TOTY), since individual investors can buy stocks of either high-institutional-ownership or low-institutional-ownership. However, if we assume that either individual investors have a 'preferred habitat' to invest in the stocks of high-individual-ownership (i.e., low-institutional-ownership) or they tend to increase the investment in the stocks that they currently own, rather than investing in new stocks, then we have $h_2 > 0$.[192]

[192] Similar to footnote 160 on p. 232 for explaining rates of return, if individual investors have the 'preferred habitat' to invest in the high-individual-ownership (low-institutional-ownership) firms which have common characteristics desired by most individual investors or they tend to increase the investment in the firms that they currently own, rather than investing in new firms, then demand for low-institutional-ownership stocks will be stronger when the Fed has an easy monetary policy. Therefore, when the Fed has a stringent monetary policy, stock demand for high-institutional-ownership firms will be less unfavorably affected than demand for low-institutional-ownership firms. Consequently, high-institutional-ownership stocks will have higher January (TOTY) trading volume ratios than low-institutional-ownership stocks. That is, we expect $h_2 > 0$.

Appendix 9. Expected Coefficient Signs For Ownership Changes Of Insiders & Institutional Holders

A9.1 December Insider Ownership Change

[1] Coefficient of σ: $a_1 > 0$.[193]

The riskier (less risky) the stock is → stock price is more likely to be temporarily depressed (raised) in December and to rebound (decline) in January due to the risk-preference switching window dressing activities → insiders would benefit by buying high-risk stock at the undervalued price (selling low-risk stock at the overvalued price) during December → insiders of high-risk (low-risk) firms would increase (decrease) their ownership during December → the riskier the firms are, the larger their December change in insider ownership would be → $a_1 > 0$.

[2] Coefficient of D_{LTW}: $a_2 < 0$.

Long-term winners tend to earn negative excess returns in January → insiders would benefit by deferring planned purchase transactions, if any, until the following January at a lower price, or accelerating and completing planned sale transactions in December → insiders would decrease their ownership during December → $a_2 < 0$.

---

[193] Here, we assume that the depressed December price of high-risk stocks rebounds back to its fundamental value in January or it is further bid up due to the stronger demand by the institutional managers who switch back to high-risk stock at turn-of-the-year or the individual investors who receive huge year-end liquid profits. If the consequent January price is still below its fundamental value, then the insiders may either purchase additional shares in December and keep holding the shares in January, in anticipation that the stock price will finally rebound back to the fundamental value, or not increase their holdings in December. On the contrary, if the January price rebounds beyond its fundamental value due to other reasons such as stronger stock demand induced by great year-end liquid profits of individual investors, then the insiders who did not purchase their firms' stocks during the past six months would be motivated to sell their holdings at the overvalued January price.

[3] Coefficient of D_{LTL}: $a_3 > 0$.

Long-term losers tend to earn positive excess returns in January → insiders would benefit by buying the stock in December[194] or delaying planned sale transactions until the following January or early February at a higher stock price → insiders would increase their ownership during December → $a_3 > 0$.

[4] Coefficient of FFS: $a_4 > 0$.

When the Fed's monetary policy is easy, i.e., FFS < 0, the stock markets prosper[195] and stock prices tend to be bid up in early December due to investment of liquid profits by individual investors → insiders could benefit by selling the stock at the overvalued early-December price and buying back after six months when the monetary policy is more stringent or the stock is fairly priced → December insider ownership should decrease when the Fed's monetary policy is easy → $a_4 > 0$.[196]

---

[194] The stock purchases in December may be the results of accelerating the planned purchase transactions (passive trading) or active arbitrage trading.

[195] Ogden (1990), examining both value-weighted and equally-weighted market index returns on the NYSE stocks during 1969-1986, reports that the *turn-of-the-month* returns during the easy-money months are significantly positive but are statistically insignificant during the stringent-money months. In addition, the difference in returns is significant at the 0.01 level. In contrast, the difference in the *value-weighted* market index returns during the *remaining trading days of the month* for the easy- and the stringent-money months are statistically insignificant and the returns for both periods are insignificantly different from zero. However, the *equally-weighted* index returns for the easy-money months are significantly positive and greater than those for the stringent-money months. As does Ariel (1987), Ogden defines the turn-of-the-month period as " the ten consecutive trading days of the calendar month, beginning with the last trading day of the month and extending through the first nine trading days of the following month." The easy- (stringent-) money months are those in which FFS in the prior week is less than (greater than or equal to) 2.0 percent. As pointed out in footnote 18 of Ogden (1990), " the value of 2.0 is chosen arbitrarily under the assumption that the Fed is likely to pursue an easy monetary policy more often than a stringent monetary policy." Totally, there are 170 easy-money months and 46 stringent-money months in Ogden's study.

[196] If insiders believe that monetary policy will remain easy in the following January, then they would not decrease their ownership in early December. Instead, they should increase their ownership right before the year-end if monetary policy remains easy at that time, since the monetary policy has greater effect on stock returns in January. If this scenario is true, then a_4 for December will be less positive or even become

[5] Coefficient of $D_{low\text{-}ME}$: $a_5 > 0$.

Small firms tend to earn huge returns in January due to individual investors' investment preference $\rightarrow$ insiders of small firms would benefit by accelerating and completing the planned purchase transactions in December or delaying the planned sale transactions until the following January[197] $\rightarrow$ change in insider ownership of small firms would be positive during December $\rightarrow$ $a_5 > 0$.

[6] Coefficient of $D_{low\text{-}PRC}$: $a_6 > 0$.

Given the finding that low-price stocks have high January returns and the assumption that the high January returns are not exploitable for typical investors due to high transaction costs and large bid-ask spreads for low-price firms (Bhardwaj and Brooks (1992)), we expect $a_6 = 0$. But if the low-price January effect is exploitable by insiders, then $\rightarrow$ insiders of low-price firms would benefit by accelerating and completing the planned purchase transactions in December or delaying the planned sale transactions until the following January $\rightarrow$ change in insider ownership of low-price stocks would be positive during December $\rightarrow$ $a_6 > 0$.

[7] Coefficient of $D_{low\text{-}INST}$: $a_7 > 0$.

If individual investors have the preferred habitat to invest in low-institutional-ownership stocks, which may have common characteristics desired by most individual investors, or the individuals tend to enlarge their investment in already-owned stocks rather than investing in new stocks, then low-institutional-ownership

---

negative. Similarly, in January if the monetary policy is easy and stock prices rise, then insiders should sell their shares and buy them back six months later for abnormal profits. That is, we expect $a_4 > 0$ for January.

stocks would earn huge returns in January due to higher January liquid profits of individual investors → insiders of low-institutional-ownership firms would benefit by accelerating and completing the planned purchase transactions in December or delaying the planned sale transactions until the following January → change in insider ownership of low-institutional-ownership stocks would be positive during December → $a_7 > 0$.

A9.2 January Insider Ownership Change

[1] Coefficient of σ: $a_1 < 0$.[198]

The riskier (less risky) the stock is → stock price is more likely to be temporarily depressed (raised) in December and to rebound (decline) in January due to the risk-preference switching window dressing activities → insiders would benefit by selling high-risk stock at the overvalued price (buying low-risk stock at the undervalued price) during January → insiders of high-risk (low-risk) firms would decrease

---

[197] If the December stock purchase bids up the price because small-firm stocks are usually illiquid and thinly traded, then the insiders may not do so.

[198] As mentioned in footnote 193 on p. 252, we assume that the depressed December price of high-risk stocks rebounds back to its fundamental value in January, or that it is further bid up due to the stronger demand by the institutional managers who switch back to high-risk stock at turn-of-the-year or the individual investors who receive huge year-end liquid profits. If the consequent January price is still below its fundamental value, then the insiders may either purchase additional shares in December and keep holding the shares in January, in an anticipation that the stock price will finally rebound back to the fundamental value, or not increase their holdings in December. In this case, January insider ownership change could be minimal. But this scenario is less likely, since stock price should reflect its fundamental value in the absence of price pressure. On the contrary, if the January price rebounds beyond its fundamental value due to other reasons such as stronger stock demand induced by great year-end liquid profits of individual investors, then the insiders who did not purchase their firms' stocks during the past six months would be motivated to sell their holdings at the overvalued January price. This is because the Securities and Exchange Act of 1934, as mentioned in footnote 70 on p. 69, requires that any profit obtained from a sale and a purchase transaction within six months of each other be returned to the corporation. Lastly, if the price moves back to its fundamental value in January, then those insiders who

(increase) their ownership during January → the riskier the firms are, the more negative their December change in insider ownership would be → $a_1 < 0$.

[2] Coefficient of D_{LTW}: $a_2 > 0$.

Long-term winners tend to earn negative excess returns in January → insiders would benefit by deferring the planned purchase transactions, if any, until the following January at a lower price, or accelerating and completing the planned January sale transactions in December → insider ownership of long-term winners will increase during January → $a_2 > 0$.

[3] Coefficient of D_{LTL}: $a_3 < 0$.

Long-term losers tend to earn positive excess returns in January → insiders would benefit by selling the stock in January[199] → insiders would decrease their ownership during January → $a_3 < 0$.

[4] Coefficient of FFS: $a_4 > 0$.

When the Fed's monetary policy is easy, i.e., FFS < 0, the stock markets prosper[200] and stock prices tend to be bid up in early January due to investment of liquid profits by individual investors → insiders could benefit by selling the stock at the overvalued early-January price and buying back after six months when the monetary policy is more stringent or the stock is fairly priced → January insider ownership should decrease when the Fed's monetary policy is easy → $a_4 > 0$.

---

have planned December sales may be motivated to delay the transactions until the following January to avoid the depressed December price.

[199] The stock sales in January may be the result of insider trading from the accelerated or delayed sale transactions planned previously (passive trading) or active arbitrage trading.

[200] Please refer to footnote 195 for supporting evidence.

[5] Coefficient of $D_{low\text{-}ME}$: $a_5 < 0$.

Small firms tend to earn huge returns in January due to individual investors' investment preference → insiders of small firms would benefit by accelerating and completing the planned sale transactions in January or delaying the planned sale transactions until January[201] → change in insider ownership of small firms would be negative in January → $a_5 < 0$.

[6] Coefficient of $D_{low\text{-}PRC}$: $a_6 < 0$.

Given the finding that low-price stocks have high January returns and the assumption that the high January returns are not exploitable for typical investors due to high transaction costs and large bid-ask spreads for low-price firms (Bhardwaj and Brooks (1992)), we expect $a_6 = 0$. But if the low-price January effect is exploitable by insiders, then → insiders of low-price firms would benefit by accelerating and completing the planned sale transactions in January or delaying the planned sale transactions until January → change in insider ownership of low-price stocks would be negative during January → $a_6 < 0$.

[7] Coefficient of $D_{low\text{-}INST}$: $a_7 < 0$.

If individual investors have the preferred habitat to invest in low-institutional-ownership stocks which may have common characteristics desired by most individual investors, or the individuals tend to enlarge their investment in already-owned stocks rather than investing in new stocks, then low-institutional-ownership stocks would earn huge returns in January due to higher January liquid profits of individual

---

[201] Similar to footnote 197, if the January stock sale would depress the price because small-firm stocks are

investors → insiders of low-institutional-ownership firms would benefit by accelerating and completing the planned sale transactions in January or delaying the planned sale transactions until January → change in insider ownership of low-institutional-ownership stocks would be negative during January → $a_7 < 0$.

A9.3 December Institutional Ownership Change

[1] Coefficient of σ: indeterminate.[202]

The riskier (less risky) the stock is → stock price is more likely to be temporarily depressed (raised) in December and to rebound (decline) in January due to the risk-preference switching window dressing activities by those institutional managers who want to lock in their performance → other institutional owners would benefit by buying high-risk stock at the undervalued price (selling low-risk stock at the overvalued price) during December → other institutional owners of high-risk (low-risk) firms would increase (decrease) their ownership during December and hence the net change in December institutional ownership for high-risk (low-risk) firms will be minimal → sign of a_1 cannot be determined.[203]

---

usually illiquid and thinly traded, then the insiders may not do so.

[202] Similar to Section 3.5.2, if the price of high-risk stock is expected to drop in December, then we assume that the depressed December price rebounds back to its fundamental value in January, or that the price is further bid up due to the increased stock demand in January. Please refer to footnote 193 on p. 252 for detailed discussion.

[203] The window dressing activity of selling high-risk stocks is probably not completely offset by arbitrage trading of other institutional investors and the sign of a_1 may remain negative. This is because individual investors, in addition to other institutional investors, may also purchase (sell) the high-risk (low-risk) stocks sold (purchased) by those institutional managers who want to lock in their performance. Therefore, the net change in December institutional ownership for high-risk (low-risk) firms could still be negative (positive). However, since only quarterly, rather than monthly, institutional ownership data are available, institutional trading in other months of the fourth quarter may obscure the negative ownership change in

[2] Coefficient of D_{LTW}: $a_2 < 0$.

Long-term winners tend to earn negative excess returns during the next five years, especially in the following January → institutional owners would benefit by selling the stock and realizing the capital gains before the stock price significantly drops in the following January → institutional owners would decrease their ownership during December (the fourth quarter) → negative change in institutional ownership during the fourth quarter → $a_2 < 0$.

[3] Coefficient of D_{LTL}: $a_3 > 0$.

Long-term losers tend to earn positive excess returns during the next five years, especially in the following January → institutional owners would benefit by buying the stock in December and reselling after the following January at a higher stock price for short-term arbitrage profits[204] → institutional owners would increase their ownership during December (the fourth quarter) → change in institutional ownership in the fourth quarter should be positive → $a_3 > 0$.

[4] Coefficient of FFS: $a_4 > 0$.

When the Fed's monetary policy is easy, i.e., FFS < 0, the stock markets prosper[205]

December. Specifically, window dressing activities of selling high-risk stocks at the end of the third quarter may induce net purchases of high-risk stocks by institutional investors at the beginning of October. Though window dressing transactions are much more active around the year-end than other quarter-ends and the December window dressing activity of selling high-risk stocks would probably dominate the October activity of switching back to high-risk stocks from low-risk stocks, the October purchases will definitely offset the December sales on high-risk stocks. Further, in their regular stock transactions, i.e., those not for the window dressing purposes, institutional investors may tend to invest in high-risk stocks at the beginning of each quarter for high expected returns. Therefore, the net ownership change during the fourth quarter is unknown and the sign of a_1.for the fourth quarter is indeterminate.

[204] Alternatively, since long-term losers tend to earn positive excess returns during the following five years, institutional investors could hold the investment for a couple of years before the expected gains vanish.

[205] Please refer to footnote 195 on p. 253 for supporting evidence.

and stock prices tend to be bid up in early December due to investment of liquid profits by individual investors → institutional owners could earn arbitrage profits if they sell those overvalued stocks in early-December and buy them back later when monetary policy is more stringent or the stocks are fairly priced → institutional owners would decrease their stock ownership during December when the Fed's monetary policy is easy → negative change in institutional ownership for the fourth quarter when the Fed's monetary policy is easy (FFS < 0) → $a_4 > 0$.

[5] Coefficient of $D_{low\text{-}ME}$: $a_5 > 0$.

Small firms tend to earn huge returns in January due to individual investors' investment preference → institutional investors would benefit by buying small-firm stocks in December and reselling after the following January at higher stock prices[206] → institutional owners of small firms would increase their ownership during December → positive change in institutional ownership in the fourth quarter → $a_5 >$ 0.

[6] Coefficient of $D_{low\text{-}PRC}$: $a_6 > 0$.

Given the finding that low-price stocks have high January returns and the assumption that the high January returns are not exploitable due to high transaction costs and large bid-ask spreads for low-price firms (Bhardwaj and Brooks (1992)), we expect $a_6 = 0$. But if the low-price January effect is exploitable by institutional investors, then → institutional investors would benefit by buying the stocks in December and

[206] As mentioned in footnote 197 on p. 255, if the December stock purchase would bid up the price because small-firm stocks are usually illiquid and thinly traded, then institutional investors may not do so.

reselling after the following January at higher stock prices → change in institutional ownership would be positive in the fourth quarter → $a_6 > 0$.

[7] Coefficient of $D_{low\text{-}INST}$: $a_7 > 0$.

If individual investors have the preferred habitat to invest in low-institutional-ownership stocks which may have common characteristics desired by most individual investors, or the individuals tend to enlarge their investment in already-owned stocks rather than investing in new stocks, then low-institutional-ownership stocks would earn huge returns in January due to higher January liquid profits of individual investors → institutional investors would benefit by buying the stocks in December and reselling after the following January at higher stock prices → institutional ownership of low-institutional-ownership firms would increase during December → change in institutional ownership for low-institutional-ownership firms in the fourth quarter should be positive → $a_7 > 0$.

A9.4 January Institutional Ownership Change

[1] Coefficient of σ: indeterminate.[207]

The riskier (less risky) the stock is → stock price is more likely to be temporarily depressed (raised) in December and to rebound (drop back) in January due to the risk-preference switching window dressing activities by those institutional managers who want to lock in their performance → If January price of high-risk stock rebounds and

[207] Similar to Section 3.5.2 and as mentioned in footnote 202, if the price of high-risk stock is expected to drop in December, then we assume that the depressed December price rebounds back to its fundamental

is overvalued due to strong demand, then other institutional owners would benefit by selling the high-risk stock at the overvalued price (buying low-risk stock at the undervalued price) during January → the net change in January institutional ownership for high-risk (low-risk) firms will be minimal → sign of a_1 cannot be determined.[208]

[2] Coefficient of D_{LTW}: $a_2 \leq 0$.

Long-term winners tend to earn negative excess returns during the next five years, especially in the following January → institutional investors should sell the stocks in the prior quarter and institutional ownership of long-term winners would not increase during the five-year period, particularly in the following January → $a_2 \leq 0$.

[3] Coefficient of D_{LTL}: a_3 is indeterminate.

Long-term losers tend to earn positive excess returns during the next five years,

---

value in January, or that the price is further bid up due to the increased stock demand in January. Please refer to footnote 198 on p. 255 for detailed discussion.

[208] If institutional investors exploit the January effect by purchasing (selling) the high-risk (low-risk) stocks whose prices are depressed (bid up) in the prior December and reselling (buying back) in the following January for short-term arbitrage profits, then January institutional ownership would be more negative, even though the stock prices all move back to their fundamental levels in January. Of course, if prices of high-risk (low-risk) stocks are further bid up (depressed) and overvalued (undervalued) in January, then more institutional investors would be motivated to sell (buy) those high-risk (low-risk) stocks. However, the January arbitrage activity of institutional investors are very likely to be obscured and undetectable. First, similar to the explanations in footnote 203 on p. 258, the window dressing activity of switching back to high-risk stocks in January is probably not completely offset by arbitrage trading of other institutional investors and the sign of a_1 may remain positive. This is because individual investors, in addition to other institutional investors, may also sell (purchase) the high-risk (low-risk) stocks in January to (from) those institutional managers who switch between high-risk and low-risk stocks around year-end. Second, in their regular stock transactions, i.e., those not for the window dressing purposes, institutional investors may tend to invest in high-risk stocks at the beginning of each quarter for high expected returns, which results in a more positive a_1 for the first quarter. On the other hand, some factors may play an opposite role in affecting institutional ownership change in the first quarter. For example, window dressing activities of selling (buying) high-risk (low-risk) stocks at the end of the first quarter may make a_1 more negative, though we expect that the January window dressing activity of switching back to (away from) high-risk (low-risk) stocks would probably dominate the March activity of switching from high-risk stocks to low-risk stocks. Therefore, the net ownership change during the first quarter is unknown and the sign of a_1.for the first quarter is indeterminate.

especially in the following January → current institutional owners should not decrease their holding during the five-year period, particularly in the following January. That is, we expect $a_3 \geq 0$. However, if other institutional investors buy the stocks in December and resell at the end of January or early February in the following year at higher stock prices for short-term arbitrage profits, then a_3 would be more negative → change in institutional ownership in the first quarter is indeterminate → a_3 is indeterminate.[209]

[4] Coefficient of FFS: $a_4 > 0$.

When the Fed's monetary policy is easy, i.e., FFS < 0, the stock markets prosper[210] and stock prices tend to be bid up in early January due to investment of liquid profits by individual investors → institutional owners could earn arbitrage profits by selling those overvalued stocks in early-January and repurchase them later when monetary policy is more stringent or the stocks are fairly priced → institutional owners would decrease their stock ownership during January when the Fed's monetary policy is easy → negative change in institutional ownership for the first quarter when the Fed's monetary policy is easy (FFS < 0) → $a_4 > 0$.

[5] Coefficient of $D_{low\text{-}ME}$: $a_5 < 0$.

Small firms tend to earn huge returns in January due to individual investors' investment preference → institutional investors would benefit by buying small-firm

---

[209] Alternatively, if institutional investors buy the long-term losers in December but hold the investment for a couple of years before the expected gains vanish, rather than selling in the following January for short-term profits, then they will not affect the January institutional ownership. Consequently, we may observe $a_3 \geq 0$.

[210] Please refer to footnote 195 on p. 253 for supporting evidence.

stocks in December and reselling at the end of January (or in the early February) in the following year at higher stock prices for short-term arbitrage profits[211] → institutional ownership of small firms would decrease in the first quarter → $a_5 < 0$.

[6] Coefficient of $D_{low\text{-}PRC}$: $a_6 < 0$.

Given the finding that low-price stocks have high January returns and the assumption that the high January returns are not exploitable due to high transaction costs and large bid-ask spreads for low-price firms (Bhardwaj and Brooks (1992)), we expect $a_6 = 0$. But if the low-price January effect is exploitable by institutional investors, then → institutional investors would benefit by buying the stocks in December and reselling at the end of January (or in early February) in the following year at higher stock prices for short-term arbitrage profits → change in institutional ownership would be negative in the first quarter → $a_6 < 0$.

[7] Coefficient of $D_{low\text{-}INST}$: $a_7 < 0$.

If individual investors have the preferred habitat to invest in low-institutional-ownership stocks which may have common characteristics desired by most individual investors, or the individuals tend to enlarge their investment in already-owned stocks rather than investing in new stocks, then low-institutional-ownership stocks would earn huge returns in January due to higher January liquid profits of individual investors → institutional investors would benefit by buying the stocks in December and reselling at the end of January (or in the early February) in the following year at higher stock prices for short-term arbitrage profits → change in institutional

[211] As mentioned in footnote 197 on p. 255, if the January or February stock sale would depress the price

ownership for low-institutional-ownership firms in the first quarter should be negative

$\rightarrow a_7 < 0$.

---

because small-firm stocks are usually illiquid and thinly traded, then institutional investors may not do so.

Appendix 10. Results Of Diagnostic And Sensitivity Tests For Return Regressions

A10.1 The Diagnostic Test On Multicollinearity

There are several ways to detect the existence and the extent of multicollinearity in a multiple regression. One of them is to examine the variance inflation factor for each independent variable in the regression. For the purpose of illustration, we assume that there exists the following regression equation:

$$y_i = \alpha_0 + \alpha_1 x_{i1} + \cdots + \alpha_j x_{ij} + \cdots + \alpha_p x_{ip} + \varepsilon_i \qquad \text{(A2)}$$

where y_i is the dependent variable for observation i; α_0 is the intercept term; x_{ij} and α_j are the ith independent variable for observation i and the corresponding regression coefficient, respectively; p is the number of independent variables in the regression; and ε_i is the random error for observation i.

First, to test whether x_j is correlated with other independent variables in equation (A2), the multiple coefficient of determination, R_j^2, is calculated by running the regression

$$x_{ij} = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_{j-1} x_{i,j-1} + \beta_{j+1} x_{i,j+1} + \cdots + \beta_p x_{ip} + \varepsilon_i \qquad \text{(A3)}$$

Finally, the variance inflation factor is used to test the existence of multicollinearity. It is obtained from the equation

$$VIF_j = \frac{1}{1 - R_j^2} \qquad \text{(A4)}$$

If x_j is related to the other independent variable in equation (A2), then we will have $R_j^2 > 0$, which makes $VIF_j > 1$. If the largest variance inflation factor is greater than

10, which is equivalent to $R_j^2 > 0.9$, then multicollinearity may be seriously influencing the least squares point estimates.[212] The *VIF* for each independent variable in our regressions are presented in Table A10-1. The largest variance inflation factor is 6.85, which is equivalent to $R_j^2 = 0.85$. Since the multicollinearity test measures the correlation between one independent variable and others, the dependent variable is irrelevant. Hence the result in this section is valid for the cross-sectional regressions of both returns and trading volumes.

A10.2 The Sensitivity Tests On Independent Variables For Return Regressions

A10.2.1 Maximum-To-End Price Ratio As The PTS Proxy

The results of regressions using the maximum-to-end price ratio as the tax-loss selling proxy is presented in Table A10-2. In contrast to Table 5, the return patterns for the tax-loss selling proxy in Table A10-2 are strongly consistent with the tax-loss selling/parking-the-proceeds hypothesis, since the coefficients of P_{max}/P_{end} and INST*P_{max}/P_{end} are significantly negative and positive, respectively, for December, and then become significantly positive and negative for January, respectively. This result is distinctly different from the previous one using our PTS proxy. The reason for the distinctive difference resulting from using Reinganum's proxy is unclear. One possible explanation is that this proxy is correlated with the dummy variable for long-term losers

[212] Bowerman, B. L. and R. T. O'Connell, 1990, *Linear Statistical Methods: An applied approach*, 2nd ed., p. 447, Boston, MA: PWS-Kent.

Table A10-1. Variance Inflation Factors for Regressions of Returns and Trading Volumes[a]

	Early December	Year-End	December	Turn-of-the-Year	January
ln(ME)	2.18	2.18	2.18	2.22	2.22
ln(BE/ME)	1.27	1.27	1.27	1.28	1.28
ln(PTS)	5.49	5.49	5.49	5.41	5.42
INST*ln(PTS)	6.81	6.81	6.81	6.85	6.85
D_{STW}	3.63	3.64	3.64	3.58	3.58
INST*D_{STW}	3.62	3.62	3.62	3.55	3.55
D_{STL}	3.51	3.51	3.51	3.44	3.44
INST*D_{STL}	3.27	3.27	3.27	3.21	3.21
σ	2.43	2.43	2.43	2.39	2.39
INST*σ	3.07	3.07	3.07	3.20	3.20
D_{LTW}	3.95	3.95	3.95	3.87	3.87
INST*D_{LTW}	3.82	3.82	3.82	3.74	3.74
D_{LTL}	3.25	3.24	3.24	3.18	3.18
INST*D_{LTL}	3.02	3.02	3.02	2.95	2.95
FFS	3.42	3.42	3.42	3.26	3.26
INST*FFS	4.81	4.81	4.81	4.90	4.90
No. of Obs.	10,682	10,680	10,680	9,021	9,018
Adj-R^2	0.009	0.017	0.015	0.122	0.089

[a] The early-December period is defined as remaining December trading days which are prior to the year-end period; the year-end period is defined as the 10-trading-day period prior to the last trading day in the year; the turn-of-the-year period is defined as the five-trading-day period beginning from the last trading day in the previous year.

Table A10-2. Estimated Coefficients for Return Regressions with P_{max}/P_{end}

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	0.45 (0.83)	1.85 (3.72***)	3.74 (5.45***)	-0.23 (-0.52)	-2.90 (-2.84***)
ln(ME)	0.10 (1.61)	0.06 (1.05)	0.03 (0.38)	-0.25 (-4.77***)	0.01 (0.05)
ln(BE/ME)	0.61 (4.72***)	0.42 (3.46***)	0.90 (5.44***)	0.70 (6.51***)	2.83 (11.49***)
P_{max}/P_{end}	0.21 (1.11)	-0.42 (-2.43**)	-0.45 (-1.88*)	2.37 (13.88***)	5.11 (13.14***)
INST*P_{max}/P_{end}	2.18 (4.12***)	0.59 (1.21)	2.31 (3.43***)	-3.88 (-8.75***)	-5.75 (-5.69***)
D_{STW}	1.78 (3.31***)	1.21 (2.42**)	2.94 (4.28***)	-0.21 (-0.47)	1.21 (1.17)
INST*D_{STW}	-3.13 (-2.52**)	-1.52 (-1.33)	-4.91 (-3.10***)	-1.33 (-1.22)	-2.58 (-1.04)
D_{STL}	-0.43 (-0.71)	0.38 (0.69)	0.35 (0.46)	1.42 (2.81***)	-3.50 (-3.04***)
INST*D_{STL}	-2.54 (-1.61)	-0.46 (-0.32)	-2.72 (-1.36)	-2.32 (-1.70*)	0.03 (0.01)
σ	-2.90 (-1.12)	-3.55 (-1.49)	-7.89 (-2.41**)	13.73 (6.33***)	48.36 (9.80***)
INST*σ	-30.89 (-4.33***)	27.63 (4.20***)	12.10 (1.33)	22.84 (3.84***)	7.35 (0.54)
D_{LTW}	0.82 (1.40)	0.34 (0.63)	1.09 (1.45)	-0.70 (-1.43)	-1.40 (-1.25)
INST*D_{LTW}	-1.00 (-0.77)	-0.13 (-0.11)	-0.84 (-0.50)	-0.00 (-0.00)	1.72 (0.68)
D_{LTL}	-1.97 (-3.29***)	0.49 (0.89)	-0.28 (-0.37)	3.90 (7.73***)	6.37 (5.55***)
INST*D_{LTL}	3.36 (1.98**)	-1.85 (-1.18*)	-0.66 (-0.31)	-4.64 (-3.02***)	-6.04 (-1.73*)
FFS	-0.62 (-2.71***)	-0.78 (-3.71***)	-1.16 (-3.97***)	-0.50 (-3.59***)	-3.31 (-10.44***)
INST*FFS	1.05 (2.01**)	-0.56 (-1.16)	-0.01 (-0.01)	0.77 (2.43**)	4.12 (5.71***)
No. of Obs. Adj-R^2	10,814 0.013	10,813 0.017	10,814 0.017	9,125 0.139	9,122 0.110

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

(the correlation coefficient is 0.18 and is significant at the 0.01 level).[213] That is, P_{max}/P_{end} is also a proxy for D_{LTL}.

As shown in Panel A of Table A10-2, P_{max}/P_{end} (INST*P_{max}/P_{end}) and D_{LTL} (INST*D_{LTL}) have the estimated coefficients with the same sign and equivalent magnitude in the regressions of January and TOTY returns. However, the evidence from the observed coefficients of P_{max}/P_{end} and INST*P_{max}/P_{end} in the trading volume regressions (Section A11.1) does not support the tax-loss selling hypothesis. Therefore, our final conclusions in Sections 4.3 and 5.1 will not change.

A10.2.2 Prior January-November Return As The PTS Proxy

As mentioned in Section 4.1.6.2, the prior return is supposed to be negatively related to year-end tax-loss selling pressure, i.e., lower prior return should induce higher tax-loss selling pressure before year-end. Therefore, the coefficients of $R_{Jan\text{-}Nov}$ and INST*$R_{Jan\text{-}Nov}$ expected by the tax-loss selling hypothesis are completely opposite to those shown in Table 6. The results of regressions using this tax-loss selling proxy are presented in Table A10-3.

Table A10-3 shows that the coefficients of $R_{Jan\text{-}Nov}$ and INST*$R_{Jan\text{-}Nov}$ are significantly positive for December returns. For stocks with positive returns (winners), it implies that their prices continue to appreciate in December and higher institutional-ownership firms have larger December price increases than lower ones. In contrast, for

[213] The correlation between our PTS proxy and Reinganum's is 0.36. However, in contrast to Reinganum's, our PTS proxy is negatively correlated with D_{LTL} with a correlation coefficient of -0.05. Both correlations are significant at the 0.01 level.

Table A10-3. Estimated Coefficients f or Return Regressions with $R_{Jan\text{-}Nov}$

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	1.07	1.56	3.73	1.43	1.19
	(2.05**)	(3.24***)	(5.63***)	(3.30***)	(1.20)
ln(ME)	0.13	0.02	0.01	-0.33	-0.04
	(2.08**)	(0.33)	(0.19)	(-6.34***)	(-0.30)
ln(BE/ME)	0.55	0.32	0.75	0.65	2.99
	(4.17***)	(2.67***)	(4.52***)	(5.93***)	(11.93***)
$R_{Jan\text{-}Nov}$	0.61	0.05	0.69	0.29	-0.05
	(2.33**)	(0.20)	(2.09**)	(1.40)	(-0.10)
INST*$R_{Jan\text{-}Nov}$	-0.79	4.78	3.57	1.04	-7.15
	(-0.85)	(5.59***)	(3.03***)	(1.36)	(-4.10***)
D_{STW}	1.00	0.91	1.90	-1.29	0.35
	(1.66*)	(1.62)	(2.47**)	(-2.54**)	(0.30)
INST*D_{STW}	-2.27	-4.07	-6.35	-0.24	3.43
	(-1.61)	(-3.14***)	(-3.55***)	(-0.20)	(1.23)
D_{STL}	0.15	-0.11	0.14	3.69	1.77
	(0.27)	(-0.21)	(0.18)	(7.52***)	(1.57)
INST*D_{STL}	-1.62	2.73	1.10	-5.14	-9.99
	(-1.01)	(1.85*)	(0.54)	(-3.74***)	(-3.17***)
σ	-5.29	-4.25	-11.09	24.28	66.54
	(-2.17**)	(-1.90*)	(-3.59***)	(12.03***)	(14.40***)
INST*σ	-12.54	25.76	25.54	-12.67	-34.93
	(-2.13**)	(4.75***)	(3.41***)	(-2.73***)	(-3.28***)
D_{LTW}	0.63	0.34	0.93	-1.21	-2.16
	(1.06)	(0.62)	(1.24)	(-2.45***)	(-1.92*)
INST*D_{LTW}	-0.82	-0.80	-1.36	0.93	4.66
	(-0.62)	(-0.66)	(-0.81)	(0.83)	(1.82*)
D_{LTL}	-1.72	0.37	-0.24	4.73	7.83
	(-2.89***)	(0.68)	(-0.32)	(9.36***)	(6.77***)
INST*D_{LTL}	3.36	-1.02	0.16	-5.87	-9.25
	(1.98**)	(-0.66)	(0.07)	(-3.82***)	(-2.62***)
FFS	-0.74	-0.81	-1.27	-0.10	-2.67
	(-3.30***)	(-3.93***)	(-4.48***)	(-0.69)	(-8.51***)
INST*FFS	1.64	0.06	1.01	0.03	2.41
	(3.21***)	(0.13)	(1.56)	(0.09)	(3.37***)
No. of Obs.	10,809	10,808	10,809	9,121	9,118
Adj-R^2	0.009	0.021	0.018	0.121	0.092

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

stocks with negative returns (losers), it indicates that prices continue to drop in December and higher institutional-ownership firms have worse stock returns. This is not quite consistent with tax-loss selling. According to the hypothesis, winners have higher returns in December because of postponed realization of capital gains, but the higher institutional-ownership stocks should be less affected by tax-loss selling behavior of their individual shareholders and hence earn lower December returns.

Similarly, losers should have lower December returns and the higher their institutional-ownership, the less severe are their depressed returns. Consequently, higher institutional-ownership losers should have higher December returns. Therefore, the observed sign of INST*$R_{Jan\text{-}Nov}$ for December return contradicts the predictions of the hypothesis. Moreover, the significantly negative coefficient of INST*$R_{Jan\text{-}Nov}$ for January return is also inconsistent with the expected returns. The observed negative sign incorrectly implies lower January returns for higher institutional-ownership winners, and higher January returns for higher institutional-ownership losers. The results of other coefficients are almost identical to Table 5. Roll's proxy has, therefore, very similar contradictory results as our PTS and the evidence is still against the tax-loss selling hypothesis.

A10.2.3 Five-Percent Ranking For Winners And Losers

The regression results for using 5% ranking, instead of decile ranking, for winners and losers (both short- and long-terms) are presented in Table A10-4. Table A10-4 shows that the coefficients of D_{LTL} and INST*D_{LTL} for the ED return become insignificant,

Table A10-4. Estimated Coefficients for Return Regressions with 5%-Ranking Winners and Losers

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	1.27 (2.38**)	1.16 (2.42**)	3.82 (5.63***)	1.95 (4.45***)	3.06 (3.18***)
ln(ME)	0.11 (1.77*)	0.11 (1.95*)	0.03 (0.40)	-0.37 (-7.18***)	-0.32 (-2.80***)
ln(BE/ME)	0.46 (3.58***)	0.44 (3.79***)	0.80 (4.83***)	0.76 (7.10***)	2.98 (12.69***)
ln(PTS)	0.17 (0.58)	-0.07 (-0.28)	0.30 (0.81)	-0.32 (-1.35)	0.54 (1.04)
INST*ln(PTS)	0.08 (0.15)	0.43 (0.87)	0.30 (0.43)	1.07 (2.41**)	1.23 (1.26)
D_{STW}	3.14 (4.43***)	0.94 (1.48)	3.90 (4.31***)	-2.20 (-3.78***)	-0.85 (-0.67)
INST*D_{STW}	-5.32 (-2.89***)	-0.82 (-0.50)	-6.60 (-2.82***)	2.18 (1.40)	5.28 (1.54)
D_{STL}	-0.34 (-0.42)	0.89 (1.24)	-0.56 (-0.55)	6.51 (9.69***)	6.06 (4.10***)
INST*D_{STL}	1.14 (0.46)	-1.73 (-0.79)	1.08 (0.35)	-10.76 (-5.11***)	-20.68 (-4.47***)
σ	-7.51 (-3.06***)	-2.70 (-1.23)	-11.00 (-3.53***)	24.81 (12.25***)	56.06 (12.59***)
INST*σ	-15.27 (-2.62***)	31.92 (6.11***)	28.24 (3.81***)	-17.25 (-3.71***)	-39.37 (-3.85***)
D_{LTW}	0.89 (1.19)	-0.01 (-0.01)	0.56 (0.59)	-0.50 (-0.81)	-3.22 (-2.35**)
INST*D_{LTW}	-0.68 (-0.38)	0.08 (0.05)	-0.33 (-0.15)	-0.61 (-0.41)	4.36 (1.32)
D_{LTL}	-0.77 (-0.94)	1.11 (1.51)	1.59 (1.51)	6.27 (8.89***)	10.40 (6.71***)
INST*D_{LTL}	3.05 (1.12)	-5.53 (-2.27**)	-5.11 (-1.48)	-8.47 (-3.54***)	-8.87 (-1.69*)
FFS	-0.71 (-3.10***)	-0.80 (-3.87***)	-1.30 (-4.45***)	-0.06 (-0.43)	-2.28 (-7.48***)
INST*FFS	1.61 (3.05***)	-0.75 (-1.59)	0.28 (0.42)	-0.25 (-0.80)	1.71 (2.47**)
No. of Obs. Adj-R^2	10,480 0.008	10,478 0.018	10,478 0.014	8,954 0.125	8,951 0.091

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

and the coefficient of INST*D_{LTL} for the YE return becomes significantly negative. This gives mixed evidence for the window dressing hypothesis (Table 6). However, the really puzzling changes are that the coefficient of D_{LTW} for the TOTY return, the coefficient of INST*D_{LTW} for January return, and the coefficients of D_{LTL} and INST*D_{LTL} for both the TOTY and January trading volumes become insignificant. These changes would greatly weaken the overreaction hypothesis.

The reasons for the changed, insignificant estimated coefficients are unknown. But for cross-sectional regressions with a very low adjusted R^2 like ours, using a dummy variable denoting fewer observations, that is, changing from the decile to 5% stocks, may have a higher probability to obtain insignificant results due to overwhelmingly large noise and lower explanatory power of the model. This could partially explain why we get more insignificant estimated coefficients in the January (TOTY) regressions of trading volumes, where R^2 is 0.026 (0.010), than returns, where R^2 is 0.091 (0.125). The other results in Table A10-4 are very similar to those in Table 5 and have no effect on the drawn conclusions.

A10.2.4 Four-Year Estimation Period For Long-Term Winners And Losers

The results for the regressions using the four-year estimation period, which ends on the prior year-end, are displayed in Table A10-5. Again, the outcomes are very similar to those in Table 5. We will reflect the findings in Table A10-5 and other results in the sensitivity test for our final conclusions in Sections 4.3 and 5.1, and omit the detailed discussions here.

Table A10-5. Estimated Coefficients for Return Regressions with Four-Year Long-Term Winners and Losers

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	1.09 (2.06**)	1.36 (2.86***)	3.88 (5.73***)	1.88 (4.30***)	3.12 (3.24***)
ln(ME)	0.11 (1.72*)	0.09 (1.56)	0.02 (0.21)	-0.36 (-6.91***)	-0.32 (-2.83***)
ln(BE/ME)	0.44 (3.30***)	0.51 (4.26***)	0.87 (5.12***)	0.66 (6.00***)	2.88 (11.94***)
ln(PTS)	0.28 (0.94)	-0.09 (-0.35)	0.29 (0.78)	-0.32 (-1.32)	0.65 (1.23)
INST*ln(PTS)	0.00 (0.01)	0.44 (0.89)	0.37 (0.53)	1.00 (2.20**)	1.11 (1.11)
D_{STW}	1.84 (3.39***)	1.40 (2.89***)	2.91 (4.22***)	-1.79 (-3.94***)	-1.28 (-1.28)
INST*D_{STW}	-3.40 (-2.70***)	-1.54 (-1.37)	-4.55 (-2.85***)	1.60 (1.47)	2.55 (1.06)
D_{STL}	-0.87 (-1.51)	0.55 (1.07)	-0.01 (-0.02)	4.85 (10.15***)	4.64 (4.42***)
INST*D_{STL}	-0.00 (-0.00)	-1.02 (-0.73)	-1.37 (-0.69)	-7.81 (-5.97***)	-12.43 (-4.32***)
σ	-5.58 (-2.22**)	-3.56 (-1.58)	-9.94 (-3.11***)	23.16 (11.17***)	55.26 (12.12***)
INST*σ	-14.95 (-2.43**)	34.23 (6.22***)	29.12 (3.72***)	-14.00 (-2.84***)	-39.27 (-3.62***)
D_{LTW}	0.36 (0.61)	0.26 (0.49)	0.12 (0.16)	-1.39 (-2.81***)	-3.95 (-3.63***)
INST*D_{LTW}	-0.38 (-0.29)	-0.64 (-0.55)	-0.03 (-0.02)	1.39 (1.27)	7.40 (3.08***)
D_{LTL}	-0.40 (-0.67)	-0.54 (-1.02)	-0.82 (-1.09)	4.41 (8.85***)	5.53 (5.04***)
INST*D_{LTL}	2.02 (1.18)	-3.49 (-2.27**)	-1.78 (-0.81)	-6.60 (-4.21***)	-4.41 (-1.28)
FFS	-0.73 (-3.18***)	-0.78 (-3.78***)	-1.30 (-4.43***)	-0.05 (-0.34)	-2.26 (-7.41***)
INST*FFS	1.61 (3.06***)	-0.81 (-1.71*)	0.22 (0.34)	-0.29 (-0.93)	1.63 (2.35**)
No. of Obs. Adj-R^2	10,480 0.008	10,478 0.021	10,478 0.015	8,954 0.122	8,951 0.088

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

A10.2.5 Non-Systematic Risk To Replace Own Standard Deviation

The results of this modification are shown in Table A10-6. In contrast to Table 5, the coefficient of INST*σ for the YE and December returns become insignificant. As indicated by Table 6, these changes will not make any difference in our preliminary conclusions. Other results are very similar to those in Table 5 and we will reflect all findings of Table A10-6 in our final conclusions (Sections 4.3 and 5.1).

A10.2.6 Beta And Non-Systematic Risk To Replace Own Standard Deviation

The results are displayed in Table A10-7. The observed coefficients of σ and INST*σ are the same as found in Table 5 or Table A10-6. Interestingly, we find that β and INST*β have no explanatory power in explaining returns in December or any subperiod, except that the coefficients of β are significantly negative for return in the ED period. The negative coefficient of β for the ED return seems consistent with our prior finding that investors avoid high-risk stocks in the ED period. However, the evidence of the negative coefficient of β from trading volumes (Section A11.6) does not support risk-preference switching. In contrast, the coefficients of β and INST*β are significantly positive and negative, respectively, for returns in January, which are very similar to the patterns for coefficients of σ and INST*σ. Other results in Table A10-7 are very similar to those previously found. We will reflect all findings in Table A10-7 in our final conclusions (Sections 4.3 and 5.1).

Table A10-6. Estimated Coefficients for Return Regressions with Own Standard Deviation Replaced by Non-Systematic Risk

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	1.64 (3.29***)	2.81 (6.28***)	6.45 (10.20***)	3.35 (8.19***)	8.20 (9.13***)
ln(ME)	0.05 (0.83)	0.01 (0.16)	-0.16 (-1.98**)	-0.44 (-8.51***)	-0.68 (-5.94***)
ln(BE/ME)	0.48 (3.67***)	0.34 (2.86***)	0.70 (4.17***)	0.65 (5.90***)	2.67 (11.11***)
ln(PTS)	0.14 (0.49)	-0.41 (-1.60)	-0.23 (-0.62)	-0.35 (-1.51)	0.47 (0.92)
INST*ln(PTS)	0.16 (0.30)	1.26 (2.63***)	1.49 (2.20**)	1.14 (2.62***)	1.52 (1.59)
D_{STW}	1.54 (2.86***)	1.20 (2.48**)	2.63 (3.83***)	-0.62 (-1.37)	1.24 (1.24)
INST*D_{STW}	-2.52 (-2.02**)	-0.65 (-0.58)	-3.01 (-1.90*)	0.12 (0.11)	-0.55 (-0.23)
D_{STL}	-0.58 (-0.99)	0.49 (0.94)	0.04 (0.06)	4.16 (8.50***)	4.04 (3.75***)
INST*D_{STL}	-0.57 (-0.37)	-0.47 (-0.34)	-0.94 (-0.48)	-6.70 (-5.03***)	-11.51 (-3.94***)
σ^{NS}	-7.17 (-2.56**)	-9.17 (-3.64***)	-21.54 (-6.05***)	18.88 (8.07***)	33.27 (6.48***)
INST*σ^{NS}	-34.34 (-4.29***)	10.54 (1.46)	-13.87 (-1.36)	-19.37 (-2.81***)	-53.90 (-3.56***)
D_{LTW}	0.87 (1.48)	0.47 (0.90)	1.32 (1.77*)	-0.29 (-0.59)	-0.49 (-0.45)
INST*D_{LTW}	-1.20 (-0.92)	0.38 (0.32)	-0.35 (-0.21)	0.04 (0.04)	2.15 (0.89)
D_{LTL}	-1.52 (-2.54**)	0.21 (0.40)	-0.33 (-0.43)	4.66 (9.16***)	7.48 (6.70***)
INST*D_{LTL}	3.32 (1.95*)	-0.88 (-0.58)	0.52 (0.24)	-5.94 (-3.83***)	-7.45 (-2.19**)
FFS	-0.87 (-3.98***)	-1.26 (-6.39***)	-2.04 (-7.32***)	0.02 (0.17)	-2.23 (-7.51***)
INST*FFS	1.49 (3.11***)	0.50 (1.16)	1.70 (2.78***)	-0.32 (-1.08)	1.68 (2.56**)
No. of Obs. Adj-R^2	10,683 0.011	10,681 0.015	10,681 0.018	9,022 0.113	9,019 0.077

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Table A10-7. Estimated Coefficients for Return Regressions with Own Standard Deviation Replaced by Beta and Non-Systematic Risk

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	2.07 (3.81***)	2.12 (4.34***)	5.71 (8.26***)	1.85 (4.11***)	4.28 (4.33***)
ln(ME)	0.02 (0.40)	0.02 (0.37)	-0.15 (-1.82*)	-0.38 (-7.09***)	-0.49 (-4.19***)
ln(BE/ME)	0.46 (3.48***)	0.38 (3.21***)	0.74 (4.44***)	0.73 (6.65***)	2.89 (11.99***)
ln(PTS)	0.23 (0.78)	-0.30 (-1.10)	-0.06 (-0.16)	-0.42 (-1.71*)	0.13 (0.24)
INST*ln(PTS)	-0.02 (-0.03)	0.94 (1.86*)	1.06 (1.48)	1.16 (2.48**)	1.95 (1.90*)
D_{STW}	0.64 (3.03***)	1.20 (2.47**)	2.65 (3.84***)	-0.74 (-1.63)	0.85 (0.85)
INST*D_{STW}	-2.65 (-2.12**)	-0.86 (-0.77)	-3.30 (-2.08**)	0.14 (0.13)	-0.32 (-0.14)
D_{STL}	-0.53 (-0.90)	0.42 (0.80)	-0.04 (-0.05)	3.94 (8.05***)	3.43 (3.20***)
INST*D_{STL}	-0.57 (-0.37)	-0.57 (-0.41)	-1.06 (-0.54)	-6.72 (-5.06***)	-11.46 (-3.94***)
β	-0.53 (-2.14**)	0.32 (1.45)	0.28 (0.89)	1.34 (6.15***)	3.79 (7.94***)
INST*β	0.68 (1.25)	0.66 (1.35)	0.96 (1.39)	-0.71 (-1.51)	-2.83 (-2.75***)
σ^{NS}	-7.49 (-2.61***)	-7.03 (-2.72***)	-18.99 (-5.20***)	21.25 (8.83***)	38.41 (7.28***)
INST*σ^{NS}	-36.75 (-4.38***)	6.25 (0.83)	-19.65 (-1.84*)	-19.65 (-2.68***)	-49.33 (-3.08***)
D_{LTW}	1.04 (1.76*)	0.34 (0.65)	1.20 (1.60)	-0.66 (-1.33)	-1.51 (-1.40)
INST*D_{LTW}	-1.43 (-1.09)	0.25 (0.21)	-0.55 (-0.33)	0.28 (0.25)	3.01 (1.24)
D_{LTL}	-1.50 (-2.51**)	0.24 (0.45)	-0.29 (-0.38)	4.68 (9.23***)	7.50 (6.75***)
INST*D_{LTL}	3.29 (1.93*)	-0.92 (-0.60)	0.47 (0.22)	-6.00 (-3.88***)	-7.59 (-2.24**)
FFS	-0.81 (-3.53***)	-1.14 (-5.53***)	-1.88 (-6.45***)	0.01 (0.07)	-2.34 (-7.65***)
INST*FFS	1.34 (2.63***)	0.19 (0.42)	1.29 (1.98**)	-0.29 (-0.93)	1.95 (2.87***)
No. of Obs. Adj-R^2	10,683 0.011	10,681 0.017	10,681 0.019	9,022 0.119	9,019 0.086

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Appendix 11. Results Of Sensitivity Tests For Trading Volume Regressions

A11.1 Maximum-To-End Price Ratio As The PTS Proxy

The results of regressions using the maximum-to-end price ratio as the tax-loss selling proxy is presented in Table A11-1. In contrast to Table 9, the results of trading volumes are less against tax-loss selling, since the negative coefficient of P_{max}/P_{end} for the ED period are no more significant. However, like INST*ln(PTS) in Table 9, the coefficient of INST*P_{max}/P_{end} is significantly positive for trading volumes in the ED and YE periods and December. This finding contradicts predictions of the tax-loss selling hypothesis as well. Therefore, use of Reinganum's proxy will get the same conclusion in testing the tax-loss selling hypothesis. The results of other coefficients are very similar to those in Table 5 and will be reflected in the final conclusions (Sections 4.3 and 5.1).

A11.2 Prior January-November Return As The PTS Proxy

As mentioned in Section A10.2.2, the prior return is supposed to be negatively related to year-end tax-loss selling pressure, i.e., lower prior return should induce higher tax-loss selling pressure before year-end. Therefore, the coefficients of $R_{Jan\text{-}Nov}$ and INST*$R_{Jan\text{-}Nov}$ expected by the tax-loss selling hypothesis are completely opposite to those shown in Table 10. The results of regressions using this tax-loss selling proxy are presented in Table A11-2.

Table A11-2 shows that the coefficient of INST*$R_{Jan\text{-}Nov}$ for trading volume is not

Table A11-1. Estimated Coefficients for Trading Volume Regressions with P_{max}/P_{end}

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	6.25 (19.07***)	6.34 (25.17***)	13.52 (28.04***)	3.96 (12.37***)	13.41 (19.04***)
ln(ME)	-0.20 (-5.51***)	-0.24 (-8.52***)	-0.52 (-9.60***)	-0.14 (-3.75***)	-0.20 (-2.48**)
ln(BE/ME)	0.09 (1.11)	0.17 (2.95***)	0.27 (2.37**)	-0.05 (-0.69)	0.14 (0.82)
P_{max}/P_{end}	-0.13 (-0.89)	0.05 (0.44)	-0.03 (-0.13)	0.02 (0.14)	-0.27 (-0.90)
INST*P_{max}/P_{end}	1.14 (3.30***)	1.14 (4.30***)	2.28 (4.48***)	0.02 (0.07)	0.51 (0.70)
D_{STW}	0.89 (2.77***)	0.22 (0.90)	0.99 (2.10**)	0.90 (2.81***)	3.92 (5.60***)
INST*D_{STW}	-0.19 (-0.26)	0.59 (1.04)	0.59 (0.55)	-1.02 (-1.34)	-3.03 (-1.81*)
D_{STL}	1.84 (5.00***)	0.99 (3.51***)	3.02 (5.58***)	-0.83 (-2.27**)	-2.58 (-3.23***)
INST*D_{STL}	-3.24 (-3.43***)	-0.84 (-1.15)	-4.20 (-3.02***)	1.94 (2.02**)	5.07 (2.40**)
σ	1.80 (1.12)	0.27 (0.22)	2.66 (1.13)	-1.09 (-0.68)	6.16 (1.76*)
INST*σ	-18.16 (-4.13***)	-19.46 (-5.75***)	-39.10 (-6.04***)	-10.13 (-2.35**)	-35.19 (-3.72***)
D_{LTW}	-0.45 (-1.28)	-0.44 (-1.63)	-1.18 (-2.29**)	-0.43 (-1.24)	-1.31 (-1.73*)
INST*D_{LTW}	1.47 (1.90*)	1.73 (2.90***)	3.73 (3.27***)	1.49 (1.91*)	4.57 (2.68***)
D_{LTL}	1.44 (4.06***)	1.99 (7.25***)	3.71 (7.08***)	2.29 (6.45***)	4.92 (6.29***)
INST*D_{LTL}	-2.88 (-2.87***)	-1.64 (-2.12**)	-4.70 (-3.17***)	-5.42 (-5.03***)	-9.92 (-4.19***)
FFS	-0.88 (-6.43***)	-0.44 (-4.21***)	-1.28 (-6.34***)	-0.55 (-5.59***)	-2.22 (-10.28***)
INST*FFS	0.64 (2.03**)	0.01 (0.06)	0.51 (1.11)	0.60 (2.68***)	2.52 (5.14***)
No. of Obs.	10,675	10,675	10,685	9,019	9,021
Adj-R^2	0.024	0.053	0.060	0.014	0.032

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Table A11-2. Estimated Coefficients f or Trading Volume Regressions with $R_{Jan\text{-}Nov}$

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	6.36 (20.41***)	6.64 (27.66***)	13.97 (30.44***)	4.00 (13.15***)	13.29 (19.89***)
ln(ME)	-0.19 (-5.18***)	-0.23 (-8.27***)	-0.50 (-9.25***)	-0.15 (-4.14***)	-0.24 (-3.03***)
ln(BE/ME)	0.06 (0.74)	0.14 (2.29**)	0.20 (1.76*)	-0.10 (-1.30)	-0.02 (-0.15)
$R_{Jan\text{-}Nov}$	0.27 (1.66*)	0.17 (1.38)	0.41 (1.71*)	0.51 (3.43***)	1.13 (3.44***)
INST*$R_{Jan\text{-}Nov}$	-0.18 (-0.33)	0.49 (1.14)	0.41 (0.50)	0.17 (0.32)	2.76 (2.34**)
D_{STW}	0.59 (1.64)	-0.04 (-0.13)	0.46 (0.86)	0.26 (0.74)	2.46 (3.16***)
INST*D_{STW}	0.01 (0.02)	0.39 (0.61)	0.53 (0.43)	-0.60 (-0.71)	-3.51 (-1.88*)
D_{STL}	1.89 (5.39***)	1.17 (4.34***)	3.29 (6.37***)	-0.55 (-1.59)	-2.33 (-3.08***)
INST*D_{STL}	-2.56 (-2.68***)	0.12 (0.16)	-2.54 (-1.81*)	1.99 (2.07**)	6.91 (3.28***)
σ	-0.09 (-0.06)	-1.06 (-0.93)	-0.38 (-0.17)	-1.59 (-1.10)	3.95 (1.25)
INST*σ	-8.62 (-2.46***)	-10.92 (-4.05***)	-21.26 (-4.12***)	-9.71 (-2.99***)	-32.86 (-4.61***)
D_{LTW}	-0.48 (-1.37)	-0.49 (-1.81*)	-1.27 (-2.45***)	-0.54 (-1.58)	-1.54 (-2.04**)
INST*D_{LTW}	1.43 (1.83*)	1.66 (2.78***)	3.62 (3.16***)	1.51 (1.94**)	4.20 (2.46***)
D_{LTL}	1.46 (4.12***)	2.06 (7.54***)	3.81 (7.30***)	2.38 (6.75***)	5.05 (6.51***)
INST*D_{LTL}	-2.71 (-2.70***)	-1.46 (-1.89*)	-4.36 (-2.95***)	-5.40 (-5.03***)	-9.41 (-3.99***)
FFS	-0.96 (-7.22***)	-0.51 (-5.04***)	-1.43 (-7.29***)	-0.49 (-5.11***)	-2.12 (-10.07***)
INST*FFS	0.95 (3.14***)	0.40 (1.71*)	1.22 (2.74***)	0.57 (2.63***)	2.70 (5.66***)
No. of Obs. Adj-R^2	10,675 0.023	10,675 0.049	10,685 0.057	9,019 0.017	9,021 0.037

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

significant during any period of December, while the coefficient of $R_{Jan\text{-}Nov}$ is significantly positive in December and the ED period. The positive coefficient of $R_{Jan\text{-}Nov}$ indicates more and less December trading for winners and losers, respectively, which is totally incompatible with the hypothesis. Further, the finding of a significantly positive coefficient of $R_{Jan\text{-}Nov}$ for January and the TOTY period does not support tax-loss selling either. It implies that winners are more actively traded than losers, which is opposite to the expected result. The results of other coefficients are almost identical to Table 9. Roll's proxy has, therefore, similar results as our PTS and the evidence is still against the tax-loss selling hypothesis.

A11.3 Five-Percent Ranking For Winners And Losers

The regression results for using 5% ranking, instead of decile ranking, for winners and losers (both short- and long-terms) are presented in Table A11-3. The table shows that the coefficient of INST*D_{STW} for January trading volume, and the coefficients of D_{STL} and INST*D_{STL} for TOTY trading volume become insignificant, but as indicated by Table 10, these changes do not affect our preliminary conclusions on the tax-loss selling or the window dressing hypotheses.[214] In contrast, the coefficient of INST*FFS becomes significantly positive, providing further evidence supporting the liquidity hypothesis. The other results in Table A11-3 are very similar to those in Table 9 and have no effect on the drawn conclusions.

[214] Similarly, changes in coefficient significance of D_{STW} for the YE trading volume and of INST*D_{STW} for the ED trading volume do not alter our conclusions.

Table A11-3. Estimated Coefficients for Trading Volume Regressions with 5%-Ranking Winners and Losers

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	6.67 (21.07***)	6.86 (28.14***)	14.54 (31.16***)	4.25 (13.80***)	13.87 (20.44***)
ln(ME)	-0.23 (-6.25***)	-0.27 (-9.41***)	-0.58 (-10.71***)	-0.16 (-4.30***)	-0.24 (-3.05***)
ln(BE/ME)	0.06 (0.81)	0.17 (2.93***)	0.25 (2.17**)	-0.00 (-0.07)	0.22 (1.32)
ln(PTS)	-0.29 (-1.72*)	-0.04 (-0.28)	-0.26 (-1.03)	-0.17 (-1.03)	-0.58 (-1.60)
INST*ln(PTS)	1.31 (4.05***)	0.86 (3.45***)	2.15 (4.51***)	0.39 (1.25)	1.23 (1.78*)
D_{STW}	1.54 (3.65***)	0.28 (0.88)	1.59 (2.55**)	0.74 (1.80*)	3.69 (4.09***)
INST*D_{STW}	-0.59 (-0.54)	0.94 (1.12)	0.72 (0.45)	-0.48 (-0.44)	-2.52 (-1.04)
D_{STL}	1.75 (3.68***)	1.39 (3.79***)	3.39 (4.85***)	-0.15 (-0.32)	-3.49 (-3.35***)
INST*D_{STL}	-3.88 (-2.67***)	-0.86 (-0.77)	-5.24 (-2.45**)	0.34 (0.23)	5.87 (1.80*)
σ	0.90 (0.62)	-0.76 (-0.68)	0.79 (0.37)	-0.85 (-0.60)	6.67 (2.12**)
INST*σ	-13.23 (-3.83***)	-12.19 (-4.58***)	-26.74 (-5.25***)	-12.31 (-3.76***)	-35.49 (-4.92***)
D_{LTW}	-0.69 (-1.55)	-0.63 (-1.85*)	-1.62 (-2.47**)	-0.49 (-1.12)	-1.51 (-1.57)
INST*D_{LTW}	2.15 (2.04**)	0.37 (2.92***)	5.05 (3.25***)	2.14 (2.03**)	5.26 (2.27**)
D_{LTL}	1.92 (3.92***)	0.94 (7.81***)	5.31 (7.36***)	0.62 (1.24)	1.56 (1.42)
INST*D_{LTL}	-4.61 (-2.86***)	-2.12 (-1.71*)	-6.61 (-2.78***)	-0.92 (-0.55)	-0.41 (-0.11)
FFS	-0.87 (-6.37***)	-0.46 (-4.35***)	-1.29 (-6.39***)	-0.52 (-5.35***)	-2.17 (-10.11***)
INST*FFS	0.53 (1.71*)	0.01 (0.05)	0.40 (0.86)	0.52 (2.36**)	2.38 (4.88***)
No. of Obs. Adj-R^2	10,474 0.025	10,473 0.051	10,483 0.058	8,952 0.010	8,954 0.026

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

A11.4 Four-Year Estimation Period For Long-Term Winners And Losers

The results for the regressions using the four-year estimation period, which ends on the prior year-end, are displayed in Table A11-4. Again, the outcomes are very similar to those in Table 9. We will reflect the findings in Table A11-4 and other results in the sensitivity test for our final conclusions in Sections 4.3 and 5.1, and omit the detailed discussions here. Noteworthily, the coefficient of D_{LTW} for January trading volume now becomes significantly negative.[215]

This change may be due to the reduced multicollinearity in the regression using the four-year formation period in defining long-term winners and losers. Since the four-year period ends before the measurement period of short-term winners and losers (the prior January-November), the correlation between the four-year winners (losers) and short-term winners (losers) should be lower than that between the five-year winners (losers) and short-term winners (losers).

A11.5 Non-Systematic Risk To Replace Own Standard Deviation

The results are shown in Table A11-5. In contrast to Table 9, Table A11-5 indicates that the coefficients of σ for the ED and December trading volumes become

[215] At a closer look, all insignificant coefficients of D_{LTW} and INST*D_{LTW} for December trading volume become significant, but at the expense of rendering some significant coefficients for December returns and trading volumes insignificant. However, since the overreaction hypothesis does not have predictions for December, it will not affect our hypothesis testing and conclusions. In contrast, observed returns and trading volumes for short-term winners and losers change little.

Table A11-4. Estimated Coefficients for Trading Volume Regressions with Four-Year Long-Term Winners and Losers

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	6.52 (20.68***)	6.85 (28.09***)	14.40 (30.94***)	4.16 (13.59***)	13.68 (20.28***)
ln(ME)	-0.21 (-5.64***)	-0.26 (-9.10***)	-0.55 (-10.13***)	-0.15 (-4.19***)	-0.23 (-2.89***)
ln(BE/ME)	0.08 (0.96)	0.19 (3.10***)	0.28 (2.42**)	-0.05 (-0.70)	0.14 (0.84)
ln(PTS)	-0.45 (-2.58***)	-0.13 (-0.96)	-0.54 (-2.10**)	-0.05 (-0.30)	-0.35 (-0.95)
INST*ln(PTS)	1.57 (4.76***)	0.99 (3.88***)	2.57 (5.30***)	0.17 (0.53)	0.97 (1.38)
D_{STW}	0.52 (1.62)	-0.13 (-0.54)	0.15 (0.34)	0.45 (1.41)	3.08 (4.39***)
INST*D_{STW}	0.74 (0.99)	1.32 (2.29**)	2.43 (2.21**)	-0.02 (-0.03)	-0.91 (-0.54)
D_{STL}	2.36 (6.90***)	1.62 (6.14***)	4.33 (8.59***)	-0.35 (-1.03)	-1.64 (-2.22**)
INST*D_{STL}	-4.03 (-4.37***)	-1.20 (-1.68*)	-5.59 (-4.11***)	0.88 (0.96)	2.89 (1.43)
σ	1.57 (1.05)	-0.16 (-0.14)	2.02 (0.92)	-1.77 (-1.22)	5.17 (1.61)
INST*σ	-15.30 (-4.20***)	-14.59 (-5.18***)	-31.55 (-5.86***)	-9.93 (-2.87***)	-35.31 (-4.64***)
D_{LTW}	-1.00 (-2.83***)	-0.84 (-3.10***)	-2.07 (-3.99***)	-0.30 (-0.87)	-1.44 (-1.88*)
INST*D_{LTW}	2.18 (2.83***)	2.05 (3.45***)	4.63 (4.07***)	1.00 (1.31)	3.81 (2.25**)
D_{LTL}	0.62 (1.77*)	0.81 (2.99***)	1.47 (2.84***)	1.97 (5.63***)	2.40 (3.11***)
INST*D_{LTL}	-1.40 (-1.38)	0.04 (0.05)	-1.12 (-0.75)	-4.77 (-4.33***)	-3.85 (-1.59)
FFS	-0.84 (-6.18***)	-0.45 (-4.27***)	-1.25 (-6.19***)	-0.54 (-5.52***)	-2.19 (-10.19***)
INST*FFS	0.48 (1.55)	-0.01 (-0.05)	0.32 (0.68)	0.56 (2.50**)	2.38 (4.88***)
No. of Obs. Adj-R^2	10,474 0.026	10,473 0.045	10,483 0.057	8,952 0.013	8,954 0.029

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.
* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Table A11-5. Estimated Coefficients for Trading Volume Regressions with Own Standard Deviation Replaced by Non-Systematic Risk

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	5.84 (19.88***)	6.46 (28.54***)	13.53 (30.84***)	3.92 (13.76***)	14.55 (23.29***)
ln(ME)	-0.16 (-4.48***)	-0.24 (-8.65***)	-0.49 (-9.15***)	-0.15 (-4.05***)	-0.33 (-4.18***)
ln(BE/ME)	0.12 (1.58)	0.18 (2.94***)	0.31 (2.68***)	-0.06 (-0.76)	0.05 (0.29)
ln(PTS)	-0.38 (-2.23**)	-0.07 (-0.55)	-0.39 (-1.57)	0.01 (0.05)	-0.24 (-0.68)
INST*ln(PTS)	1.38 (4.37***)	0.78 (3.22***)	2.15 (4.62***)	0.03 (0.09)	0.62 (0.93)
D_{STW}	0.69 (2.16**)	0.17 (0.68)	0.75 (1.60)	0.88 (2.77***)	4.21 (6.05***)
INST*D_{STW}	0.18 (0.24)	0.71 (1.26)	1.09 (1.01)	-0.93 (-1.22)	-3.00 (-1.79*)
D_{STL}	1.80 (5.23***)	1.15 (4.33***)	3.19 (6.30***)	-0.82 (-2.40**)	-2.57 (-3.44***)
INST*D_{STL}	-3.12 (-3.42***)	-0.83 (-1.18)	-4.16 (-3.09***)	1.87 (2.02**)	4.98 (2.45**)
σ^{NS}	4.84 (2.93***)	0.07 (0.05)	5.31 (2.19**)	-0.45 (-0.27)	-0.52 (-0.14)
INST*σ^{NS}	-15.85 (-3.35***)	-15.49 (-4.25***)	-33.51 (-4.81***)	-16.63 (-3.46***)	-56.63 (-5.37***)
D_{LTW}	-0.58 (-1.67*)	-0.45 (-1.68*)	-1.29 (-2.54**)	-0.45 (-1.31)	-0.75 (-1.00)
INST*D_{LTW}	1.38 (1.80*)	1.46 (2.46**)	3.34 (2.95***)	1.42 (1.84*)	3.61 (2.14**)
D_{LTL}	1.33 (3.77***)	2.02 (7.41***)	3.67 (7.03***)	2.29 (6.48***)	4.80 (6.18***)
INST*D_{LTL}	-2.44 (-2.43**)	-1.40 (-1.81*)	-4.04 (-2.73***)	-5.27 (-4.89***)	-9.18 (-3.88***)
FFS	-0.74 (-5.68***)	-0.38 (-3.81***)	-1.06 (-5.57***)	-0.52 (-5.55***)	-2.20 (-10.64***)
INST*FFS	0.21 (0.74)	-0.28 (-1.29)	-0.24 (-0.59)	0.45 (2.19**)	2.17 (4.76***)
No. of Obs. Adj-R^2	10,676 0.026	10,676 0.051	10,686 0.060	9,020 0.015	9,022 0.034

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.

* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

significantly positive, and the coefficient for January trading volume becomes insignificant. As indicated by Table 10, these changes will not make any difference in our preliminary conclusions. Other results are very similar to those in Table 9 and we will reflect all findings of Table A11-5 in our final conclusions (Sections 4.3 and 5.1).

A11.6 Beta And Non-Systematic Risk To Replace Own Standard Deviation

The results are displayed in Table A11-6. The observed coefficients of σ and INST*σ are the same as found in Table 9 or Table A11-5. Not surprisingly, we find that β and INST*β have no explanatory power in explaining trading volumes in December or any subperiod, except that the coefficient of β is significantly negative for trading volumes in the ED period. In contrast, the coefficients of β and INST*β are significantly positive and negative, respectively, for trading volumes in January, which are very similar to the patterns for coefficients of σ and INST*σ. Other results in Table A11-6 are very similar to those previously found. We will reflect all findings in Table A11-6 in our final conclusions (Sections 4.3 and 5.1).

Table A11-6. Estimated Coefficients for Trading Volume Regressions with Own Standard Deviation Replaced by Beta and Non-Systematic Risk

	Early December	Year-End	December	Turn-of-the-Year	January
Intercept	6.25 (19.49***)	6.73 (27.20***)	14.01 (29.64***)	4.15 (13.18***)	13.93 (20.16***)
ln(ME)	-0.18 (-4.71***)	-0.25 (-8.58***)	-0.51 (-9.22***)	-0.15 (-4.04***)	-0.27 (-3.37***)
ln(BE/ME)	0.10 (1.26)	0.16 (2.64***)	0.27 (2.31**)	-0.07 (-0.95)	0.08 (0.45)
ln(PTS)	-0.40 (-2.29**)	-0.13 (-0.99)	-0.49 (-1.89*)	-0.04 (-0.26)	-0.56 (-1.49)
INST*ln(PTS)	1.47 (4.41***)	0.95 (3.69***)	2.42 (4.92***)	0.17 (0.51)	1.29 (1.80*)
D_{STW}	0.71 (2.23**)	0.16 (0.64)	0.76 (1.61)	0.87 (2.73***)	4.03 (5.77***)
INST*D_{STW}	0.23 (0.31)	0.82 (1.45)	1.27 (1.17)	-0.86 (-1.13)	-2.67 (-1.60)
D_{STL}	1.84 (5.36***)	1.18 (4.44***)	3.26 (6.44***)	-0.79 (-2.31**)	-2.69 (-3.59***)
INST*D_{STL}	-3.07 (-3.37***)	-0.79 (-1.12)	-4.07 (-3.03***)	1.92 (2.07**)	5.18 (2.55**)
β	-0.28 (-1.91*)	-0.09 (-0.80)	-0.34 (-1.59)	-0.10 (-0.66)	1.04 (3.12***)
INST*β	-0.11 (-0.33)	-0.38 (-1.52)	-0.54 (-1.13)	-0.26 (-0.80)	-1.99 (-2.77***)
σ^{NS}	3.84 (2.26**)	-0.88 (-0.67)	3.36 (1.35)	-1.22 (-0.73)	-1.40 (-0.38)
INST*σ^{NS}	-14.64 (-2.96***)	-13.26 (-3.47***)	-29.88 (-4.10***)	-14.54 (-2.84***)	-47.50 (-4.24***)
D_{LTW}	-0.48 (-1.38)	-0.41 (-1.52)	-1.16 (-2.27**)	-0.41 (-1.21)	-1.00 (-1.33)
INST*D_{LTW}	1.38 (1.79*)	1.54 (2.59***)	3.43 (3.02***)	1.47 (1.90*)	4.11 (2.42**)
D_{LTL}	1.33 (3.75***)	2.01 (7.36***)	3.64 (6.99***)	2.28 (6.44***)	4.76 (6.13***)
INST*D_{LTL}	-2.43 (-2.42**)	-1.38 (-1.78*)	-4.01 (-2.71***)	-5.26 (-4.87***)	-9.16 (-3.87***)
FFS	-0.77 (-5.69***)	-0.44 (-4.23***)	-1.17 (-5.84***)	-0.55 (-5.64***)	-2.34 (-10.93***)
INST*FFS	0.30 (1.00)	-0.12 (-0.53)	0.02 (0.04)	0.52 (2.40**)	2.51 (*5.28**)
No. of Obs. Adj-R^2	10,676 0.026	10,676 0.051	10,686 0.061	9,020 0.015	9,022 0.035

† *t*-statistics are presented in parentheses. Please also refer to footnotes in Table A10-1 on p. 268.

* Significant at the 0.10 level. ** Significant at the 0.05 level. *** Significant at the 0.01 level.

Appendix 12. Relation Among Institutional Ownership, Stock Price, & Firm Size

This appendix presents the results of exploring the relationship among institutional ownership, stock price (Price), and market equity (ME), rather than among institutional ownership, ln(Price), and ln(ME). Table A12-1 presents the regression results. In Table A12-1, when institutional ownership is regressed on stock price alone (Regression 1A), the slope coefficient is positive (0.000999%) at the significance level of 0.01, which indicates that low-price stocks tend to have lower institutional ownership. This result seems to support our previous suspicion that individual investors may prefer low-price stocks.[216] But when we regress institutional ownership on firm size (market equity), the slope coefficient is significantly positive (0.000867%) at the 0.01 level as well (Regression 2A).

Therefore, the view that individual investors prefer small-firm stocks to large-firm stocks is also well supported. However, when we put both stock price and firm size on the right-hand-side of the equation (Regression 3A), the coefficient of stock price becomes statistically insignificant and the sign changes to negative. Meanwhile, the coefficient magnitude and *t*-statistic for intercept and firm size are almost the same as their values in Regression 2A. This seems to imply that the apparent positive relationship

[216] The positive relationship between institutional ownership and stock price implies that higher-institutional-ownership firms tend to have higher stock prices. The higher institutional ownership for the firms which have higher stock prices further imply that institutional investors prefer investing in the stocks with higher prices, since the current level of institutional ownership is just the cumulation of all past net institutional investments on the firm. Alternatively, since *institutional* ownership is a complement of *individual* ownership, we can also argue that *individual* investors prefer investing in the stocks with lower prices.

Table A12-1. Estimated Coefficients for Regressions of Institutional Ownership on Stock Price and Market Equity[a]

[1A] $INST_{i,t} = \alpha_1 + \beta_1 * Price_{i,t} + \varepsilon_{i,t}$

[2A] $INST_{i,t} = \alpha_2 + \beta_2 * ME_{i,t} + \mu_{i,t}$

[3A] $INST_{i,t} = \alpha_3 + \beta_3 * Price_{i,t} + \gamma_3 * ME_{i,t} + \nu_{i,t}$

	Regression 1A	Regression 2A	Regression 3A
Intercept	35.09 (357.10***)	33.70 (333.35***)	33.71 (332.93***)
Price[b]	0.000999 (3.29***)		-0.000310 (-1.03)
ME[c]		0.000867 (45.57***)	0.000869 (45.46***)
Observation No. Adj-R^2	59,025 0.0002	59,025 0.0340	59,025 0.0340

[a] *t*-statistics are displayed in parentheses below the estimated coefficients. INST is the institutional ownership (in percentage) at quarter-end.
[b] Price is the stock price at the end of calendar quarter.
[c] ME is the market equity obtained from the product of stock price and total common shares outstanding at the end of calendar quarter and is in million dollars.
* Significant at the 0.10 level.
** Significant at the 0.05 level.
*** Significant at the 0.01 level.

between institutional ownership and stock price is spurious. This spurious relation may be due to the high correlation between stock price and firm size, since the proxy for firm size, i.e., market equity, is a product of stock price times number of total shares outstanding. That is, stock price is just a proxy of firm size such that the significant relation between institutional ownership and stock price is observed when firm size is absent from the regression.

To confirm this possibility, we conduct a parametric correlation analysis (Pearson correlation) and a nonparametric correlation analysis (Spearman correlation). The reason to run the nonparametric test is because institutional ownership, stock price, or firm size may be not normally distributed. The results are presented in Table A12-2. Panel A of Table A12-2 shows that Pearson correlation between institutional ownership and firm size is greater than that between institutional ownership and stock price. The correlation between stock price and firm size is significantly positive at the 0.01 level, but is quite small in magnitude (0.0961).

However, Panel B of Table A12-2 shows that Spearman correlation coefficients are all large and significantly positive among institutional ownership, stock price, and firm size. The correlation between stock price and firm size is as high as 0.8203. The sample statistics in Panel C of Table A12-2 reveal that the distribution of firm size is skewed to the left, since its mean value, \$1,630.76 million, is far greater than its median value, \$261.27 million. Therefore, use of the nonparametric test, i.e., Spearman correlation coefficients, is more adequate for our analysis. The result of the Spearman correlation coefficients supports the view that the seemingly spurious relation between

Table A12-2. Correlation Analysis for Institutional Ownership, Stock Price, and Market Equity

	INST[a]	Price[b]	ME[c]
Panel A: Pearson Correlation Coefficients			
INST			
Price	0.0136***		
ME	0.1844***	0.0961***	
Panel B: Spearman Correlation Coefficients			
INST			
Price	0.6082***		
ME	0.6296***	0.8203***	

	Obs. No.	Mean	Std Dev	Median	Minimum	Maximum
Panel C: Sample Statistics						
INST	59,025	35.11	23.78	33.48	0.00	99.99
Price	59,025	28.02	322.70	17.25	0.03	32,100
ME	59,025	1,630.76	5,056.06	261.27	0.15	120,260

[a] INST is the institutional ownership (in percentage) at quarter-end.
[b] Price is the stock price at quarter-end.
[c] ME is the market equity obtained from the product of stock price and total common shares outstanding at quarter-end and is in millions of dollars.
*** Significant at the 0.01 level.

institutional ownership and stock price actually result from the high correlation between stock price and firm size.

On the other hand, if firm size (or stock price) is indeed not normally distributed, then the regression results in Table A12-1 are in doubt, since the normality assumption for independent variables is violated. Therefore, using ln(Price) and ln(ME) to smooth the regression is necessary.

VITA

Chu-San Edward Wang was born in Taoyuan, Taiwan on August 30, 1962. He graduated from Taipei Cheng-Kuo High School in June 1980. Edward attended National Tsing Hua University and received a Bachelor of Science degree in Chemistry in June 1984. After graduation, he was enrolled in the Taiwanese Army for the two-year military service. He was a sublieutenant and led a platoon at the front in Kinmen, which is a small island about two miles away from the mainland China.

In September 1986, Edward was employed as a research assistant at National Tsing Hua University. In the next August, he began his overseas study at the Case Western Reserve University, Cleveland, Ohio. He was awarded a Master of Science degree in macromolecular science in May 1991. About a year before graduation, he entered the business school at the Cleveland State University in Fall 1990. In March 1993, Edward received his Master of Business Administration degree.

During a hot summer, Ed moved to Knoxville to continue his study. He attended the Ph.D. program in Finance at the University of Tennessee in August 1993. In June 1997, Ed accepted an offer of a tenure-track assistant professor position from Chung Yuan Christian University, Chung-Li, Taiwan.