Distinguished Lecture Series
School of Accountancy
W. P. Carey School of Business
Arizona State University

Eric Weisbrod
of
School of Accountancy
W.P. Carey School of Business
Arizona State University

will discuss

"The Disposition Effect as a Determinant of the Abnormal Volume and Return Reactions to Earnings Announcements"

on

April 13, 2012

10:00am in BA258

The Disposition Effect as a Determinant of the Abnormal Volume and Return Reactions to Earnings Announcements

by

Eric Weisbrod

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved April 2012 by the
Graduate Supervisory Committee:

Stephen Hillegeist, Co-Chair
Dan Dhaliwal, Co-Chair
Steven Kaplan
Michael Mikhail

ARIZONA STATE UNIVERSITY

May 2012

ABSTRACT

I examine the degree to which stockholders’ aggregate gain/loss frame of reference in the equity of a given firm affects their response to the firm’s quarterly earnings announcements. Contrary to predictions from rational expectations models of trade (Shackelford and Verrecchia 2002), I find that abnormal trading volume around earnings announcements is larger (smaller) when stockholders are in an aggregate unrealized capital gain (loss) position. This relation is stronger among seller-initiated trades and weaker in December, consistent with the cognitive bias referred to as the disposition effect (Shefrin and Statman 1985). Sensitivity analysis reveals that the relation is also stronger among less sophisticated investors and for firms with weaker information environments, consistent with the behavioral explanation. I also present evidence on announcement-window consequences of the disposition effect. First, stockholders' aggregate unrealized capital gain position moderates the degree to which information-related determinants of trade (e.g. unexpected earnings, firm size, and forecast dispersion) generate abnormal announcement-window trading volume. Second, stockholders' aggregate unrealized capital gains position is associated with announcement-window abnormal returns, consistent with the disposition effect reducing the market's ability to efficiently incorporate earnings news into price.

ACKNOWLEDGMENTS

I am grateful for the guidance provided by my dissertation co-chairs Steve Hillegeist and Dan Dhaliwal, and committee members Steve Kaplan and Mike Mikhail. I am also grateful for helpful comments from Katharine Drake, Miguel Minutti-Meza, Artur Hugon, Larry Brown, and seminar participants at Arizona State University, UT Dallas, London Business School, The University of Miami, Singapore Management University, Georgia State University, The NYU Stern School of Business, and The University of Missouri.

TABLE OF CONTENTS

APPENDIX

LIST OF TABLES

Table Page

LIST OF FIGURES

CHAPTER I: INTRODUCTION

Prior literature is mixed on the role, if any, that stockholders' aggregate unrealized capital gain/loss position (hereafter, capital gains overhang) plays in determining their trading response to earnings announcements. Prior studies examining investors' trading response to earnings announcements generally assume that investors make rational trading decisions with the objective of maximizing the present value of expected future cash flows (e.g. Holthausen and Verrecchia 1990; Kim and Verrecchia 1991, 1997). Accordingly, this stream of literature predicts that, if investors consider their capital gains when trading, it will be in the context of optimizing expected capital gains tax payments (Shackelford and Verrecchia 2002). Generally, investors who are subject to capital gains taxes face a lower tax rate on the sale of long-term investments relative to the tax rate on short-term investments. This creates incentives for stockholders to defer (accelerate) the sale of investments in a capital gain (loss) position. In contrast, cumulative prospect theory (Kahneman and Tversky 1979) predicts that investors are psychologically averse to realizing losses, which motivates them to defer (accelerate) the sale of investments in a capital loss (gain) position. This psychological "disposition" to sell winners too early and hold losers too long, combined with self-control at year-end when faced with tax deadlines, has been termed the "disposition effect" (Shefrin and Statman 1985).

While the disposition effect has been documented using individual trading data (e.g. Odean 1998; Locke and Mann 2005; Coval and Shumway 2005), it has not been shown to affect the announcement-window market reaction to earnings information. Extant empirical research finds that aggregate announcement-window abnormal trading activity varies over time with capital gains tax rates in a manner consistent with tax-rational behavior (Blouin et al. 2003; Hurtt and Seida 2004). While suggestive of an aggregate tax-rational response to earnings announcements, this evidence does not rule out the presence of the disposition effect. For example, Blouin et al. (2003) note that their research design does not rule out behavioral effects on trading, and that the authors "look forward to studies that integrate the behavioral finance papers that fail to find investor-tax rationality, with studies, such as this one, that do find tax-rational behavior" (Blouin et al. 2003, p. 626). Furthermore, Frazzini (2006) examines monthly returns following earnings announcements and finds that post-earnings-announcement drift is moderated by stockholders' aggregate post-earnings unrealized capital gain position. He speculates that his findings are caused by disposition effect trading behavior around earnings announcements, but does not test for such announcement-window behavior. As such, the role of the disposition effect as a determinant of the market response to earnings announcements is an open question.

I provide evidence on this question by examining the relation between stockholders' capital gains overhang and both abnormal trading volume and returns around earnings announcements. Consistent with the disposition effect, I find a positive relation between stockholders' capital gains overhang and abnormal announcement-window trading volume, which is stronger among seller-initiated trades and reverses in December. While this association is significantly positive in each year of my sample, I find that it varies negatively with time-series changes in the spread between short-term and long-term capital gains tax rates, consistent with the findings from prior tax research (Blouin et al. 2003, Hurtt and Seida 2004). In additional analyses, I show that the disposition effect impacts the market response to earnings information in two ways. First, I demonstrate that previously identified proxies for information-related determinants of trade (e.g. unexpected earnings, firm size, and forecast dispersion) are more (less) likely to affect trading volume when stockholders are in an aggregate gain (loss) position. Second, I find a negative relation between stockholders' capital gains overhang and abnormal announcement-window returns. This finding is consistent with the disposition effect causing, or at least contributing to, a short-window under-reaction to earnings news, and is consistent with the subsequent post-earnings-announcement drift documented in Frazzini (2006).

These results extend our understanding of investors' trading behavior in response to earnings information. Behavioral economics suggests that "behavior depends on how the economic actors perceive and represent the environment," as well as "how they define their goals" (Simon 1997, p. 271). Consistent with this view, I show that the degree to which proxies for investor disagreement are reflected in abnormal announcement-window trading volume depends on whether stockholders are in a gain or loss frame of reference when earnings are announced. This extends prior literature that assumes that investors trade in direct proportion to proxies for investor disagreement (e.g. Bamber 1987; Kandel and Pearson 1995; Bamber et al. 1997), and motivates future research on the degree to which investors' cognitive biases affect their response to earnings information. My results should also be of interest to researchers who treat abnormal trading volume as a *proxy* for investor disagreement (e.g. Garfinkel and Sokobin 2006; Garfinkel 2009), as I show that both the level of abnormal trading volume and the degree to which abnormal trading volume reflects disagreement are affected by stockholders' capital gains overhang.

My findings also extend prior literature on the pricing of earnings information. I demonstrate that, *ceteris paribus*, the announcement-window abnormal returns to good (bad) news earnings announcements are smaller in magnitude when investors are in a gain (loss) position, consistent with the disposition effect generating, or at least contributing to, investors' underreaction to earnings news. These results support Frazzini's (2006) finding that the magnitude of post-earnings-announcement drift depends on stockholders' capital gains overhang, and provide an alternate explanation for the positive association between abnormal announcement-window volume and post-earnings-announcement drift documented in Garfinkel and Sokobin (2006). In the context of the drift found by Frazzini (2006), my results suggest that a wealth transfer may take place around earnings announcements, from investors more prone to the disposition effect to those less prone to the disposition effect. That is, investors prone to the disposition effect sell too quickly when earnings indicate good news and hold stocks too long when earnings indicate bad news. This may be of interest to both market participants as well as regulators who are interested in leveling the playing field among investors.

The remainder of the paper proceeds as follows. In chapter two, I review the related literature and develop predictions about the role of the disposition effect in the market reaction to earnings announcements. Chapter three describes my research design. Chapter four presents the results of my analysis. Chapter five presents additional robustness tests, and chapter six concludes.

CHAPTER II: MOTIVATION

Shackelford and Verrecchia (2002) model trading behavior around public disclosures in the presence of capital gains tax incentives. In the model, a public disclosure provides new information about the expected value of a risky asset, which prompts rebalancing trade from investors who are overweighted in the risky asset to investors who are underweighted in the risky asset, relative to the optimal risk-sharing equilibrium. For good news disclosures, the presence of capital gains tax rate differences forces overweighted stockholders to choose between selling their shares at the time of the disclosure and paying higher short-term capital gains taxes on their certain profits, or retaining their shares and paying lower long-term capital gains taxes on uncertain profits at liquidation.

Under these circumstances, Shackelford and Verrecchia (2002) show that overweighted investors will sell less at the time of the disclosure than they would in the absence of capital gains taxes, and that, to entice sellers, buyers must provide compensation in the form of higher sales prices. In their empirical tests of these predictions, Blouin et al. (2003) develop the following formal hypothesis: "The incremental taxes from selling appreciated stock, which arise from the tax-disfavored treatment accorded short-term gains as compared with long term gains, increase stock returns and decrease trading volume around public disclosures for appreciated firms" and vice-versa for depreciated stock around the disclosures of depreciated firms (Blouin et al. 2003, p. 615).

While these predictions are intuitive within an expected utility framework, research in both experimental and archival settings has demonstrated that investors often do not act in accordance with the normative predictions from expected utility theory. A number of studies from behavioral finance document that individuals exhibit a tendency to "sell winners and ride losers", except in December, and this tendency has been termed the "disposition effect" (Shefrin and Statman 1985).[1] Except in December, this behavior runs counter to the tax-rational behavior predicted by Shackelford and Verrecchia (2002) and Blouin et al. (2003).

Shefrin and Statman (1985) introduce a four-element theoretical framework to motivate the disposition effect. The first two elements of the framework are prospect theory and mental accounting (hereafter, PT-MA). Prospect theory suggests that investors possess an S-shaped value function that is concave (risk-averse) over gains and convex (risk-loving) over losses (Kahneman and Tversky 1979). Mental accounting is invoked to suggest that the relevant reference point for determining a gain or loss for a particular stock transaction is the investor's cost basis in that individual stock (e.g. Thaler 1985). The third element describes investors' emotional motivation to seek the pride associated with recognizing gains and to avoid the regret associated with realizing losses. The final element relates to investors' self-control. Shefrin and Statman (1985) state:

> We conjecture that tax planning in general, and loss realization in particular, is disagreeable and requires self-control. Should this be the

[1] The disposition effect has been documented in the portfolios of individual stock investors (Odean 1998; Shapira and Venezia 2001; Grinblatt and Keloharju 2001), professional futures traders (Locke and Mann 2005; Coval and Shumway 2005), as well as individual home owners (Genesove and Mayer 2001). See Kaustia (2010) for a review of the literature.

> case, then it is reasonable to expect that self-motivation is easier in December than other months because of its perceived deadline characteristic. Thus, a concentration of loss realizations in December is consistent with our behavioral framework, but inconsistent with [that of a] rational individual. (Shefrin and Statman 1985, p. 785)

Thus, the disposition effect describes a general tendency to sell winners and ride losers as well as a seasonal pattern of increased loss realization in December.

Because tax motivations and the disposition effect offer conflicting predictions about the effect of stockholders' capital gains overhang on their trading behavior, it is unclear which type of behavior is expected to dominate around earnings announcements. Existing empirical evidence is both indirect and mixed. Blouin et al. (2003) find that investors trade appreciated (depreciated) stock less (more) around earnings announcements in years when there are greater tax penalties (benefits) on the sale of appreciated (depreciated) stock. They interpret this conditional time-series variation as being consistent with investors exhibiting tax-rational behavior. However, the sale of appreciated stock is tax-disfavored in every year of their sample period. Therefore, truly tax-rational behavior would suggest an *unconditional* negative relation between trading volume and stockholders' capital gains overhang around earnings announcements, which Blouin et al. (2003) do not address. In other words, investors might exhibit overall tax-irrational behavior (i.e. the disposition effect) in every year of the sample period, while at the same time behaving somewhat less irrationally in years when the tax penalties of irrational behavior are stronger. Such behavior would be consistent with Shefrin and Statman's (1985) conjecture that investors exhibit self-control over their irrational disposition preferences when the tax consequences of their behavior are more salient.

Evidence in favor of the disposition effect impacting investors' response to earnings announcements is also indirect. Frazzini (2006) examines the monthly abnormal returns to a trading strategy where portfolios are sorted on recent earnings news and stockholders' capital gains overhang. Frazzini's (2006) predictions, based on the disposition effect, are essentially the opposite of the predictions in Shackelford and Verrecchia (2002). For example, around good news announcements, Frazzini (2006) predicts that active selling by disposition prone stockholders creates excess supply, which leads to a lower price impact, and thus generates underreaction to good news. He also makes complimentary predictions for bad news announcements.

In testing these predictions, Frazzini (2006) does not examine the announcement-window market reaction to earnings news, nor does his study incorporate the tax-rational predictions and findings in Shackelford and Verrecchia (2002) and Blouin et al. (2003). Thus, while Frazzini (2006) finds evidence that monthly post-event drift is larger when earnings news and capital gains have the same sign, his results do not rule-out alternate explanations or the tax-rational behavior predicted in the accounting literature. For example, Grinblatt and Han (2005) find a general relation between the disposition effect and price momentum. Accordingly, Frazzini's (2006) earnings news proxy may capture a general news effect that is not related to the announcement-window market reaction to earnings news.

Given the conflicting predictions and ambiguous results from prior literature, the relation between stockholders' capital gains overhang and their trading behavior around earnings announcements is an open question. Because the individual accounts of many types of investors (both sophisticated and unsophisticated) have exhibited evidence of the disposition effect, and the results in Blouin et al. (2003) do not rule out such behavior, I predict that I will observe evidence of the disposition effect in the aggregate market response around earnings announcements. To the extent that aggregate investor behavior is consistent with the disposition effect, it suggests the following hypotheses.

First, if some investors are prone to the disposition effect, it should be reflected in abnormal announcement-window trading volume. This leads to my first hypothesis:

H1: There is a positive relation between stockholders' capital gains overhang and abnormal trading volume around earnings announcements.

Additionally, while trading volume measures the behavior of both buyers and sellers around earnings announcements, only sellers are directly affected by the capital gains overhang.[2] This leads to:

[2] Buyers are indirectly affected through any seller-induced price pressure.

H1a: There is a stronger positive relation between stockholders' capital gains overhang and abnormal trading volume around earnings announcements for seller-initiated trades than buyer-initiated trades.

According to Shefrin and Statman's (1985) theoretical framework, investors are less reluctant to realize losses in December, when faced with salient year-end tax deadlines. Thus, I also predict:

H1b: The positive relation between stockholders' capital gains overhang and abnormal trading volume around earnings announcements is weaker in December than other months of the year.

I also examine two additional aspects of the market response to earnings information. First, prior literature predicts and finds that earnings information will generate trading volume to the extent that earnings information either resolves differences in predisclosure information asymmetry or generates differential interpretations about the firm's future prospects (Bamber et al. 2011). Prior literature develops proxies for the magnitude of these types of information-related disagreement, and tests for a direct relation between the level of disagreement and abnormal announcement-window trading volume. However, for any given level of information-related disagreement, investors subject to the disposition effect may be more (less) likely to trade on this disagreement when they perceive themselves to be in a gain (loss) frame of reference. If enough investors exhibit announcement-window disposition effect behavior, it will affect the degree to which aggregate trading volume reflects disagreement. Thus, I examine the following hypothesis:

H2: Information-related disagreement will generate more announcement-window abnormal trading volume when stockholders are in a gain position than when stockholders are in a loss position at the time of the earnings announcement.

Finally, both tax-rational behavior and the disposition effect predict that any changes in the relative supply of equity generated by sellers' capital gains will result in price pressure. In the case of the disposition effect, sellers in a gain position will be willing to accept a price discount for the opportunity to lock in their certain gains, and sellers in a loss position will demand a price premium to compensate for the regret associated with realizing a loss. This hypothesized price effect is a key component of Frazzini's (2006) motivation for examining the relation between the disposition effect and post-earnings-announcement drift, and is contrary to Blouin et al.'s (2003) interpretation of their pricing results. Thus, I examine the following hypothesis for evidence of investors' disposition effect behavior impacting the aggregate price response to earnings announcements:

H3: Abnormal announcement-window returns will be more negative when investors are in a gain position than when investors are in a loss position at the time of the earnings announcement.

CHAPTER III: METHODOLOGY

Variable Measurement

The Capital Gains Overhang

To test hypotheses related to the disposition effect, I construct a measure of investors' aggregate unrealized capital gain or loss position in a given stock. This requires an assumption about stockholders' aggregate reference price ("cost basis") at any given point in time. Following Frazzini (2006), I use the time series of net purchases by 13-F institutional investors to compute the firm-level weighted average reference price on a given date. Specifically, the reference price (RP) is calculated as

$$RP_t = \phi^{-1} \sum_{n=0}^{t} V_{t,t-n} P_{t-n} \qquad (1)$$

where $V_{t,t-n}$ is the number of shares purchased at date *t-n* that are still held by the original purchasers at date t, ϕ is a normalizing constant such that $\phi = \sum_{n=0}^{t} V_{t,t-n}$, and P_t is the stock price at the end of month *t*. When a stock is purchased several times, and partially sold at different dates, it is assumed that investors use the purchase price of the shares sold as the basis for computing capital gains and losses. To maintain consistency with Frazzini (2006), I assume that investors use a first-in, first-out (FIFO) mental accounting method to associate shares sold with their cost basis.[3] Given this estimated average reference price, investors'

[3] Frazzini (2006) notes that his results are robust to alternately using LIFO, HIFO, the last trading price, the last buying price, or averages of past buying and selling prices when constructing the reference price. Based on his analysis, along with the volume-based sensitivity analysis I perform in chapter five, I believe that my results would also remain robust to alternate inventory cost basis assumptions.

estimated average unrealized capital gain/loss position in a given stock, referred to as the capital gains overhang (*CGO*), can be defined for firm *i* at any given time *t* as

$$CGO_{it} = \frac{P_{it} - RP_{it}}{P_{it}} \tag{2}$$

The following example illustrates how investors' net purchases and the FIFO assumption are used to compute the reference price and capital gains overhang: Assume that an investor purchases 100 shares of a stock at date 0 for P_0 = \$10, 150 shares at date 1 for P_1 = \$8, and an additional 50 shares at date 2 for P_2 = \$11, and subsequently sells 200 shares at date 3. The investor's "mental book" at the end of period 3 will be given by $V_{3,0} = 0$, $V_{3,1}=50$, and $V_{3,2} = 50$. Assuming this investor were the only investor in the stock and that P_3 = \$13, the weighted average reference price at date 3 (RP_3) will be (50*\$8 + 50*\$11)/100 = \$9.50 and the capital gains overhang (CGO_3) will be (\$13 - \$9.50)/\$13 ≈ 26.9%

CGO_{it} is intended to represent the best estimate of a stock's deviation from its cost basis for the representative investor. The ideal measure of CGO_{it} would incorporate the holdings data of all shareholders at time *t*, as opposed to estimating a proxy using the observed quarterly holdings of 13-F institutions. While it is not possible to obtain holdings data for all shareholders, Frazzini (2006) repeats his analysis on a subsample for which he is able to combine retail investor data from a discount brokerage with his institutional data, and does not find a noticeable difference in results using the combined reference price. Furthermore, in chapter five I perform sensitivity analysis using an alternate volume-based measure of CGO_{it} similar to that employed by Grinblatt and Han (2005), incorporating the historical trading volume of all shareholders, and find that all inferences from the results presented in the paper remain unchanged.

For ease of interpretation, in the majority of my analyses I employ a binary measure of investors' unrealized gain/loss position, CGO_DUMMY_{it}, which is equal to 1 when $CGO_{it} > 0$ and zero otherwise.[4] This allows readers to interpret the coefficients on interacted terms, and also corresponds to the simple description of the disposition effect as a "disposition to sell winners and ride losers" (Shefrin and Statman 1985). In untabulated analysis, results are stronger using the continuous CGO_{it} measure, consistent with the reported results representing a conservative estimate of the impact of the disposition effect on aggregate investor behavior.

Abnormal Trading Volume

I employ a transaction-based measure of abnormal trading volume to examine investor trading behavior around earnings announcements. Specifically, I estimate abnormal three-day volume, $AVOL_{ijt}$ as

$$AVOL_{ijt} = \ln\left(\frac{\text{Number of firm } i \text{ trades by investor group } j \text{ during three-day earnings announcement interval } t}{\text{Median number of firm } i \text{ trades by investor group } j \text{ during three-day non-announcement intervals}}\right)$$

[4] This coding includes four firm-quarter observations for which *CGO*=0 in the unrealized loss sample. Results are identical if these very few observations are instead deleted or included in the gain sample.

where the three-day earnings announcement interval is measured from days [-1,+1] relative to Compustat quarterly earnings announcement date t , and the non-announcement period includes all contiguous three-day periods from trading days [-250, -2] relative to the earnings announcement date, excluding any three-day periods containing previous earnings announcements. In primary analyses I examine all trades, denoted $AVOL_{TOTAL\ TRADES}$, but I also separately calculate additional measures of $AVOL_{ijt}$ for buyer-initiated and seller-initiated trades in order to test *H1a*.[5] For comparison with prior literature, I also compute a measure of abnormal trading volume based on daily CRSP share turnover. Definitions of these alternate abnormal volume measures are provided in Appendix A.

I use a transaction-based measure because the disposition effect is generally motivated and examined with respect to each investor's decision of whether or not to engage in trade (e.g. Odean 1998), as opposed to the magnitude of shares traded. Also, Cready and Ramanan (1995) perform simulation analysis on market data to examine differences in transaction-based versus volume-based measures of abnormal trading activity, and find that transaction-based research designs are more powerful in detecting changes in trading activity than volume-based designs.

As my research question examines the incremental role of the disposition effect in explaining *announcement-induced* trading, I scale the number of announcement-window trades by median non-announcement trading, using the most common non-announcement window found in prior literature examining

[5] Trades are classified as buyer or seller-initiated using the Lee-Ready (1991) algorithm.

abnormal trading volume around earnings announcements (e.g. Bamber 1986, 1987; Atiase and Bamber 1994; Bamber et al. 1997; Ahmed et al. 2003; Barron et al. 2011). I examine the natural log of this ratio to mitigate the impact of skewness in the distribution of trading volume.

Cumulative Abnormal Returns

To test *H3*, I examine the three-day [-1,+1] announcement-window cumulative abnormal return (*CAR*) relative to the Fama-French-momentum four-factor benchmark model (Carhart 1997). Using a four-factor benchmark controls for standard risk factors, including momentum (Jegadeesh and Titman 1993). Controlling for momentum in the benchmark return also controls for any mechanical correlation between momentum and my measure of *CGO*.

Tests of the Disposition Effect in Abnormal Trading Volume Around Earnings Announcements

H1 predicts that, *ceteris paribus*, there will be a positive relation between investors' unrealized capital gains and abnormal trading volume around earnings announcements. To test for this relation, controlling for previously identified determinants of abnormal trading around earnings announcements, I estimate the following OLS model:

$$AVOL_{ijt} = \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 SIZE_{it} + \alpha_4 DISPERSION_{it} + \alpha_5 ABS\_RETURN_{it} + \alpha_6 MKT\_TURN_{it} + \alpha_7 PRICE_{it} + \alpha_8 AVG\_TURN_{it} + \alpha_9 MOMENTUM_{it} + \varepsilon_{it} \quad (3)$$

where $AVOL_{ijt}$ is abnormal trading volume as defined earlier in this chapter, and CGO_DUMMY_{it} is a binary measure equal to one when CGO_{it} is greater than zero, and zero otherwise. If *H1* is supported, I predict a positive coefficient on CGO_DUMMY_{it} ($\alpha_1 > 0$). I include a number of control variables identified in prior literature as associated with either abnormal trading volume around earnings announcements or my measure of the capital gains overhang.

Prior literature predicts that earnings announcements generate trading volume to the extent that earnings information resolves differences in predisclosure information or generates differential interpretations about the firm's future prospects (Bamber et al. 2011). Thus, I include three controls which proxy for these information-related determinants of announcement-window trading volume. Bamber (1986, 1987) identifies the absolute value of unexpected earnings as a proxy for differential beliefs created by the earnings announcement, stating that "both capital markets research and human information processing research suggest that, on average, the more informative a disclosure, the greater the subsequent dispersion of beliefs" (Bamber 1987, p. 512). Therefore, I predict a positive coefficient on ABS_UE_{it}, defined as one hundred times the absolute value of I/B/E/S actual EPS for quarter *t* minus the most recent mean I/B/E/S consensus quarter *t* EPS forecast prior to the earnings announcement, scaled by beginning of quarter *t* stock price in Compustat. Bamber (1986, 1987) also predicts and finds that, because there is less pre-announcement information available for smaller firms, earnings announcements will generate more belief revision and spur heavier trading volume for small firms compared to large firms. Thus, I predict a negative coefficient on *SIZE*, calculated as the natural log of market value of equity at the beginning of quarter *t*. Previous literature also examines pre-announcement dispersion in analyst forecasts as a measure of predisclosure information uncertainty (e.g. Bamber et al. 1997). Consistent with earnings announcements generating greater abnormal trading volume when there is greater predisclosure information uncertainty, I predict a positive coefficient on *DISPERSION*, the natural log of preannouncement forecast dispersion, measured as the standard deviation of the most recent I/B/E/S consensus EPS forecast for quarter *t* prior to the earnings announcement scaled by beginning of quarter *t* stock price in Compustat.

I also include five additional control variables. ABS_RETURN_{it}, the absolute value of firm *i*'s cumulative return for the three-day window centered on earnings announcement date *t* controls for the positive contemporaneous association between price and volume (Karpoff 1987). I control for the effect of market-wide trading by including MKT_TURN_{it}, the natural log of the percentage of all NYSE/AMEX firms' outstanding shares that are traded over the three-day event window (e.g. Bamber et al. 1997). I also include $PRICE_{it}$, the natural log of closing price at the beginning of quarter *t* as an inverse proxy for commission and structural bid/ask spread transaction costs (Utama and Cready 1997). Finally, I include AVG_TURN_{it}, the average monthly share turnover for firm *i* over the prior twelve months, and $MOMENTUM_{it}$, the 11-month buy-and-hold return for firm i beginning twelve months prior to the month of the earnings announcement, to control for any mechanical correlation between these variables and my measure of CGO_{it} (Grinblatt and Han 2005; Frazzini 2006). Garfinkel and Sokobin (2006) also document a positive association between abnormal earnings announcement trading volume and AVG_TURN_{it}, supporting its inclusion in the model.

Hypotheses *H1a* and *H1b* predict that the positive relation between the capital gains overhang and abnormal announcement-window trading volume will be stronger for seller initiated trades and weaker in December. In support of *H1a*, I predict that the coefficient on *CGO_DUMMY* in equation (3) will be larger when the dependent measure is $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ than when the dependent measure is $AVOL_{BUYER\text{-}INITIATED\ TRADES}$. To test *H1b*, I estimate the following OLS model:

$$\begin{aligned} AVOL_{TOTAL\_TRADES} = &\alpha_0 + \alpha_1 CGO_{it} \\ &+\alpha_2 DECEMBER_{it} + \alpha_3 CGO_{it} * DECEMBER_{it} \\ &+\alpha_4 ABS\_SUE_{it} + \alpha_5 SIZE_{it} + \alpha_6 ABS\_RETURN_{it} \\ &+\alpha_7 MKT\_TURN_{it} + \alpha_8 PRICE_{it} + \alpha_9 AVG\_TURN_{it} \\ &+\alpha_{10} MOMENTUM_{it} + \varepsilon_{it} \end{aligned} \tag{4}$$

where *DECEMBER* is a binary variable equal to 1 for earnings announcements that occur during the month of December, and zero otherwise. If *H1b* is supported, I predict a negative coefficient on $CGO_{it}*DECEMBER_{it}$ ($\alpha_3 < 0$). In addition to including *DECEMBER* in the model, there are three other differences between equation (3) and equation (4). First, because the December reversal of the disposition effect is motivated by tax-loss selling, the magnitude of the capital gains overhang is relevant when examining *H1b*, and the December reversal may be more pronounced for depreciated than appreciated stocks. Thus, I include *CGO*, instead of *CGO_DUMMY*, as the variable of interest in the model, and examine equation (4) on subsamples of appreciated and depreciated stocks, in addition to the full sample. Also, because few earnings announcements occur during December, the analyst following requirement for computing *ABS_UE* and *DISPERSION* overly limits the incidence of December earnings announcements in the sample. Thus, when estimating equation (4), I relax the analyst following requirement by dropping *DISPERSION* from the model. I also replace the analyst-based *ABS_UE* with a seasonal random-walk measure of earnings surprise, *ABS_SUE*, measured as abs($EARNINGS_t$ – $EARNINGS_{t-4}$) scaled by the standard deviation of *EARNINGS* over the previous twenty quarters (minimum of eight quarters of data required), where *EARNINGS* is income before extraordinary items scaled by beginning-of-quarter total assets. All other variables in equation (4) are as defined in equation (3).

Hypothesis H2 also examines the relation between the capital gains overhang and abnormal announcement-window trading volume. Hypothesis *H2* predicts that investors' capital gains position will affect the degree to which information-related belief revision around earnings announcements generates trade. Accordingly, to test *H2* I re-estimate equation (3) including interactions between *CGO_DUMMY* and the three information-related determinants of abnormal trading volume included in the model:

$$
\begin{aligned}
AVOL_{TOTAL\_TRADES} = {} & \alpha_0 + \alpha_1 CGO\_DUMMY_{it} \\
& + \alpha_2 ABS\_UE_{it} + \alpha_3 CGO\_DUMMY_{it} * ABS\_UE_{it} \\
& + \alpha_4 SIZE_{it} + \alpha_5 CGO\_DUMMY_{it} * SIZE_{it} \\
& + \alpha_6 DISPERSION_{it} + \alpha_7 CGO\_DUMMY_{it} * DISPERSION_{it} \\
& + \alpha_8 ABS\_RETURN_{it} + \alpha_9 MKT\_TURN_{it} + \alpha_{10} PRICE_{it} \\
& + \alpha_{11} AVG\_TURN_{it} + \alpha_{12} MOMENTUM_{it} + \varepsilon_{it}
\end{aligned}
\qquad (5)
$$

where all variables are as defined in equation (3) above. *H2* predicts that, to the extent that the information-related proxies are expected to generate trade, they will generate more trade when investors are in an unrealized gain position. Thus, I predict positive coefficients on the interactive terms $CGO\_DUMMY_{it}*ABS\_UE_{it}$ ($\alpha_3>0$) and $CGO\_DUMMY_{it}*DISPERSION_{it}$ ($\alpha_7 > 0$), and a negative coefficient on the interactive term $CGO\_DUMMY_{it}*SIZE_{it}$ ($\alpha_5 < 0$).

Tests of the Disposition Effect in Abnormal Returns Around Earnings Announcements

H3 predicts that, *ceteris paribus*, there will be a negative relation between investors' unrealized capital gains and abnormal returns around earnings announcements. To test for this relation, controlling for previously identified determinants of abnormal returns around earnings announcements, I estimate the following OLS model:

$$CAR_{(-1,+1)} = \beta_0 + \beta_1 CGO\_DUMMY_{it} + \beta_1 UE_{it} + \beta_2 NONLINEAR_{it} + \beta_3 LOSS_{it} + \beta_4 ROA_{it} + \beta_5 DISPERSION_{it} + \beta_6 PRICE_{it} + \beta_7 AVG\_TURN_{it} + \varepsilon_{it}$$

(6)

where $CAR_{(-1,+1)}$ is firm *i*'s three-day cumulative abnormal return around earnings announcement date *t*, relative to the Fama-French-momentum four-factor benchmark return (Carhart 1997), and CGO_DUMMY_{it} is as previously defined. If *H3* is supported, I predict a negative coefficient on CGO_DUMMY_{it} ($\beta_1 < 0$). While $CAR_{(-1,+1)}$ is adjusted for common risk factors (i.e. beta, firm size, book-to-market, momentum), I also control for a number of previously identified determinants of abnormal returns around earnings announcements. I predict a positive coefficient on *UE*, the signed equivalent of *ABS_UE* defined above, to control for the well-documented earnings-return relation. I also allow for a non-linear earnings return-relation (Freeman and Tse 1992) by including *NONLINEAR*, defined as *UE*ABS_UE*. I allow for abnormal returns to differ around quarterly loss announcements (e.g. Hayn 1995) by including a *LOSS* indicator, equal to 1 when reported quarterly income before extraordinary items is negative, and zero otherwise. Recent studies have also identified an earnings *level* effect as a determinant of abnormal returns around earnings announcements, distinct from the effect of unexpected earnings (e.g. Balakrishnan et al. 2010, Chen et al. 2011). Thus, I include *ROA*, defined as income before extraordinary items scaled by beginning-of-quarter total assets. Finally, I include three variables from the abnormal volume model that may also impact abnormal returns, *DISPERSION*, *PRICE*, and *AVG_TURN*, as defined in equation (4).[6]

[6] Barron et al. (2009) identify a negative relation between forecast dispersion and returns, and Bhushan (1994) finds that price and average turnover exhibit inverse relations with the return reaction to earnings announcements.

CHAPTER IV: DATA AND RESULTS

Sample Selection

My study incorporates data from a number of different sources. Accounting data is obtained from Compustat, daily stock price and share volume data is from CRSP, and analyst forecast data is from the monthly I/B/E/S summary file. My study also incorporates stock quotes and detailed trade data from the NYSE's Trade and Quote (TAQ) database, as well as 13-F institutional holdings data from the Thompson Reuters CDA/Spectrum database. Following prior literature (Lee 1992, Bhattacharya 2001), my study includes TAQ trades with a condition code of "regular sale" between 9:30 AM and 4:15 PM EST, excluding each day's opening trade.

The Thompson Reuters 13-F database (also referred to as S34) used to compute CGO_{it} contains holdings information for all registered institutional investment managers who file form 13-F with the SEC. Any investment entity with over $100 million under its control is required to file form 13-F, and smaller entities who choose to report their holdings are also included in the database. Small holdings of less than 10,000 shares or $200,000 in a single asset are not required to be reported and therefore may be omitted from the holdings data if not voluntarily disclosed by the institution. Form 13-F is required to be filed quarterly with the SEC. Following Frazzini (2006), the stock price at the quarterly report date is used as a proxy for each institution's buying or selling price each quarter. Clearly, an institution's actual transaction price is generally different from the price at the report date. To the extent that stock prices follow a random walk after a purchase or sale, any measurement error due to this data limitation should generate noise in CGO_{it} but not bias the results in any particular direction (Frazzini 2006, p. 2024 – 2025).

Using these data, I examine a sample of quarterly earnings announcements of NYSE/AMEX listed firms for the years 1994, the first year for which TAQ data is available during the [-250, -2] day window prior to the earnings announcement, through 2007. I obtain earnings announcement dates from the Compustat quarterly file, and require each firm-quarter observation in the primary sample to have sufficient data to calculate $AVOL_{TOTAL\ TRADES}$, CGO_{it}, and the control variables defined in equation (3), resulting in a sample size of 55,245 firm-quarter observations for 2,430 unique firms. Table 1 summarizes the sample selection procedures. Other than the elimination of NASDAQ firms, which is common in studies examining trading volume (Statman et al. 2006), the most restrictive sample selection requirements in my study are the need for sufficient 13-F data to compute CGO_{it} and a minimum of three analysts following the firm in order to calculate *DISPERSION*. In chapter five, I perform sensitivity analysis relaxing each of these requirements in order to confirm that my results can be generalized to firms without available 13-F data or analyst coverage. All continuous variables are winsorized at 1% and 99% to mitigate the impact of outliers.

[INSERT TABLE 1 HERE]

Descriptive Statistics

Table 2 presents descriptive statistics for the variables included in equation (3), both for the full sample (N=55,245), and separately for the unrealized gain (N=15,830) and loss (N=39,415) samples. Note that many of the variables have been log transformed, including the measures of $AVOL_{ijt}$, Therefore, when interpreting the mean sample values of $AVOL_{ijt}$, one must remember that the log transformation will understate the percentage increase in trading activity during the announcement-window. For example, after exponentiation, the mean value of $AVOL_{TOTAL\ TRADES}$ (0.448) in the sample represents an increase in total trades of roughly 56.5% during the announcement window, relative to the median number of three-day non-announcement trades. Table 2 reports similar mean increases in abnormal trading volume around earnings announcements across all measures of $AVOL_{ijt}$, consistent with prior literature examining abnormal trading volume around earnings announcements.

[INSERT TABLE 2 HERE]

CGO is negatively skewed, which is to be expected given that the measure is bounded above at 1, but unbounded at the bottom of the distribution. The untabulated time-series distribution of *CGO* compares reasonably to the values presented in Fig. 2 of Grinblatt and Han (2005). Other independent variables also exhibit distributions in line with expectations. The means of all of the variables presented in Table 2 are significantly different across unrealized gain and loss observations ($p < 0.01$). Consistent with *H1*, $AVOL_{ijt}$ is significantly higher for unrealized gain observations than unrealized loss observations for all four measures presented. Consistent with *H1a*, the difference in mean abnormal volume is larger for $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ than $AVOL_{BUYER\text{-}INITIATED\ TRADES}$. Significant differences across the control variables presented in Table 2 support their inclusion in the multivariate analysis. Confirming the univariate results presented in Table 2, Figure 1 displays the differences in mean $AVOL_{TOTAL\ TRADES}$ and $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ between unrealized gain and unrealized loss observations for each year in the sample. Consistent with *H1* and *H1a* the differences are positive and significant ($p < 0.01$) for each year in the sample period, and consistently larger for $AVOL_{SELLER\text{-}INITIATED\ TRADES}$.

[INSERT FIGURE 1 HERE]

Table 3 presents pearson correlations among the variables included in equation (3). All of the correlations presented in Table 3 are statistically significant ($p < 0.01$), except for those between *SIZE* and both $AVOL_{TOTAL\ TRADES}$ and $AVOL_{BUYER\text{-}INITIATED\ TRADES}$ and between *ABS_UE* and $AVOL_{BUYER\text{-}INITIATED\ TRADES}$. There are fairly high correlations among the various measures of *AVOL* (ranging from 0.732 to 0.951), which is to be expected. Consistent with *H1* and *H1a*, *CGO* is positively correlated with all measures of *AVOL,* and the largest correlation is with $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ (0.098). Of the control variables, *ABS_RETURN* is the most highly correlated with the measures of *AVOL*, which is consistent with the well-documented contemporaneous relation between price changes and volume (Karpoff 1987). *CGO* is also noticeably correlated with a number of the control variables, indicating that multivariate analysis will be helpful in determining the conditional relation between *CGO* and *AVOL*.

[INSERT TABLE 3 HERE]

Multivariate Evidence of a Disposition Effect in The Abnormal Trading Volume Around Earnings Announcements

Table 4 presents the results of OLS regressions of Equation (3). Each column in Table 4 presents the results of estimating equation (3) using a different specification of $AVOL_{ijt}$ as the dependent measure. *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and calendar quarter (Petersen 2009).

[INSERT TABLE 4 HERE]

As predicted, the coefficients on *CGO_DUMMY* are positive and significant ($p < 0.01$) across all specifications of *AVOL,* consistent with the presence of a disposition effect in abnormal announcement-window trading volume. The first column reports the results of estimating equation (4) with

$AVOL_{TOTAL\ TRADES}$ as the dependent measure. As shown in the first column, the coefficient of 0.068 on *CGO_DUMMY* indicates that, *ceteris paribus*, the exponentiated level of $AVOL_{TOTAL\ TRADES}$ is approximately 7.0% higher around earnings announcements when shareholders are in an aggregate unrealized gain versus unrealized loss position at the time of the earnings announcement. In order to interpret the economic significance of this difference in trading activity, recall that the mean value of $AVOL_{TOTAL\ TRADES}$ (.448) in the sample represents an increase in total trades of roughly 56.5% during the announcement window, relative to the median number of three-day non-announcement trades. Evaluated at this mean level, the marginal effect of stockholders being in an aggregate unrealized gain instead of unrealized loss position at the time of the announcement leads to an additional 11.0% of abnormal announcement-window trades. For comparison, the marginal effect of a one standard deviation increase in *ABS_UE* evaluated at the sample mean only leads to an additional 1.5% of abnormal announcement-window trades.

For consistency with prior literature, which has examined abnormal trading volume around earnings announcements using security-level share turnover data from CRSP, I examine $AVOL_{SHARE\ TURNOVER}$ in column two, and find that inferences remain unchanged. Columns 3 and 4 examine the presence of the disposition effect among buyer- and seller-initiated trades. Consistent with *H1a*, untabulated Wald tests from multivariate multiple regressions confirm that the coefficient on *CGO_DUMMY* is significantly larger ($p < 0.01$) when equation (4) is estimated using $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ than when using $AVOL_{BUYER\text{-}}$

$_{INITIATED\ TRADES}$ as the dependent measure. The control variables included in equation 4 are significant as predicted with the exception of *AVG_TURN*, which is insignificant in some specifications, and *DISPERSION* which is negative and significant in column 2, contrary to the predicted positive relation, and insignificant in all other specifications.[7]

[INSERT TABLE 5 HERE]

Table 5 presents the results of OLS regressions of equation (4), which is the model used to test for the December seasonality in the disposition effect predicted by *H1b*. The dependent measure in equation (4) is $AVOL_{TOTAL\ TRADES}$. As in Table 4, *t*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. In Column 1, I estimate equation (4) for the full sample. Consistent with *H1b*, there is a negative and significant ($p < 0.01$) coefficient on *CGO*DECEMBER*. The coefficient on *CGO*DECEMBER* is -0.079, while the coefficient on *CGO* is 0.069. A Wald test indicates that the sum of the coefficients is not significantly different from zero, consistent with the disposition effect being eliminated during the month of December. In columns 2 and 3, I examine the December effect separately for unrealized gain (CGO > 0) and unrealized loss (CGO < 0) observations, respectively. I find a December effect for both the unrealized gain and unrealized

[7] Untabulated analysis indicates that the relation between *DISPERSION* and abnormal trading volume is sensitive to the sample period and measure of abnormal trading volume used in estimation, indicating that this unexpected result may be due to differences in my sample period and research design compared with those in prior literature

loss samples. While the December effect is generally thought to relate to tax-loss selling, my results may be consistent with taxpayers also deferring the sale of gains in December, in order to defer the cash payment of capital gains taxes. However, comparison of the December effect between the unrealized gain and loss subsamples in my study should be interpreted with caution, as there are relatively few December earnings announcements in each subsample.[8] The majority of the control variables are significant in the predicted direction, and the few that are not remain insignificantly different from zero.

In untabulated analysis, I also replicate the tests in Blouin et al. (2003) for my sample period and variable definitions. Consistent with Blouin et al. (2003), I find evidence of a negative interaction between *CGO* and the spread between short-term and long-term enacted capital gains rates, as well as a negative interaction between *CGO* and an indicator variable for earnings announcements which occur when the long-term capital gains rate is relatively high compared to historical levels.[9] While these results confirm that capital gains tax incentives mitigate the disposition effect, the overall set of results presented in the paper suggest that, except in December, tax incentives do no overwhelm the disposition

[8] There are 1,767 December earnings announcements (1.97% of the total sample) in the Table 5 sample. Of these 1,767 December announcements, 748 (1,019) are included in the unrealized loss (gain) subsample, representing 2.29% (1.79%) of the total unrealized loss (gain) subsample. In both subsamples, December earnings announcements are roughly evenly distributed with respect to which of the firm's fiscal quarters (one through four) the announced earnings relate to.

[9] I also repeat the analyses in my study and the replication of Blouin et al. (2003) using a measure of *CGO* based on a reference price which only includes purchases within one year prior to the earnings announcement date, in order to align the capital gains proxy with the short-term capital gains tax holding period during my sample. While weaker in magnitude, all qualitative inferences from my analyses as well as the Blouin et al. (2003) replication remain unchanged.

effect as a determinant of abnormal trading volume around earnings announcements.

[INSERT TABLE 6 HERE]

Moving on to tests of the impact of the disposition effect on the market response to earnings information, Table 6 presents the results of OLS regressions of equation (5). As in Table 5, the dependent measure in equation (5) is $AVOL_{TOTAL\ TRADES}$ and *t*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. Table 6 provides evidence on the extent to which the coefficients on *ABS_UE*, *SIZE*, and *DISPERSION* vary with stockholders' capital gains overhang. Columns 1, 2, and 3 examine separate interactions between *CGO_DUMMY* and *ABS_UE*, *SIZE*, and *DISPERSION*, respectively. The coefficients on each interaction term are in the predicted direction, with varied levels of statistical significance (the coefficients on the interaction terms for *ABS_UE*, *SIZE*, and *DISPERSION* are significant at the 0.01, 0.05, and 0.10 levels, respectively). This suggests that these proxies for earnings-related disagreement are stronger determinants of trading behavior when stockholders are in a capital gain position than when stockholders are in a capital loss position and reluctant to trade, even in the presence of earnings-related disagreement.

For example, in column 1, the coefficient on *CGO_DUMMY*ABS_UE* is 0.024, while the coefficient on *ABS_UE* is 0.004. Evaluated at the sample mean of

AVOL$_{TOTAL\ TRADES}$, these coefficients suggest that, *ceteris paribus*, a one standard deviation increase in *ABS_UE* would generate an additional 4.9% in announcement-window total trades over the median level of non-announcement total trades for firms whose stockholders are in an aggregate unrealized gain position when earnings are announced, but only an additional 0.8% increase in announcement-window total trades when stockholders are in an aggregate unrealized loss position.

In column 3, the coefficient on *DISPERSION* is -0.012 ($p < 0.05$), while the coefficient on *CGO_DUMMY*DISPERSION* is 0.010 ($p < 0.10$), indicating that the unexpected negative coefficient on *DISPERSION* observed in Table 4 may only hold for firms whose stockholders are in an unrealized loss position. However, in column 4, which presents the results of estimating equation (5) including all three interaction terms, the coefficients on both *DISPERSION* and *CGO_DUMMY*DISPERSION* become insignificantly different from zero. In contrast, the coefficients on the interaction terms for both *ABS_UE* and *SIZE* remain statistically significant and relatively stable in magnitude when all interactions are included together in the model. Given the unexpected direction and the sensitivity of the observed coefficients on *DISPERSION* throughout my analyses, further research on *DISPERSION* as a proxy for earnings-related disagreement and its relation with abnormal trading volume may be called for.

Evidence of the Disposition Effect in the Abnormal Returns Around Earnings Announcements

H3 predicts abnormal announcement-window returns will be more negative around earnings announcements when stockholders are in an aggregate unrealized gain versus loss position. Figure 2 presents univariate evidence on this hypothesis by illustrating the mean three-day cumulative abnormal returns around unrealized gain and loss observations, for each decile of unexpected earnings. Consistent with *H3*, the mean *CAR* is more negative for unrealized gain observations than unrealized loss observations over all deciles of unexpected earnings. Untabulated Satterthwaite *t*-statistics indicate that the differences in mean *CAR* are statistically significant at the 0.01 (0.05) level for six (seven) out of ten deciles of unexpected earnings.

[INSERT TABLE 7 HERE]

To provide multivariate evidence on *H3*, Table 7 presents the results of OLS regressions of equation (6). The dependent measure in equation (6) is $CAR_{(-1,+1)}$, and *H3* predicts a negative coefficient on *CGO_DUMMY*. As in previous tables, *t*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. Column 1 presents the results of estimating equation (7) on the full sample. Consistent with *H3*, the coefficient of -0.007 on *CGO_DUMMY* indicates that, *ceteris paribus*, abnormal returns are 0.7% lower around earnings announcements where stockholders are in an unrealized gain position relative to earnings announcements where stockholders are in an unrealized loss position. Control variables in column 1 are significant as predicted with the exception of *AVG_TURN*, *PRICE* and *DISPERSION*, which are statistically insignificant.

Frazzini (2006) finds that the disposition effect impacts the pricing of both good and bad news. Furthermore, a negative coefficient on *CGO_DUMMY* for good news announcements indicates that unrealized gains dampen the announcement-window reaction to good news, while a negative coefficient on *CGO_DUMMY* for bad news announcements indicates that unrealized gains *magnify* the reaction to bad news. Thus, to confirm that my results are not confined to one type of earnings news, columns 2 and 3 separately estimate equation (7) on good (UE > 0) and bad (UE < 0) news announcements, respectively. I find that the coefficient on *CGO_DUMMY* is negative ($p < 0.01$) for both good and bad news announcements, which is consistent with Frazzini's (2006) prediction that the disposition effect causes the market to underreact to earnings news when news and capital gains have the same sign. In the case of good news announcements, the incremental negative three-day abnormal return associated with being in an aggregate unrealized gain position is an economically meaningful -1.2%.

CHAPTER V: ROBUSTNESS

In addition to the analysis presented in chapter four, I perform several tests to examine whether my findings are sensitive to my research design choices. When relevant, untabulated sensitivity tests have been discussed throughout the text. In this chapter, I tabulate and present the results of two additional sets of sensitivity analysis.

One aspect of my research design which may limit the generalizability of my results is my sample selection procedure. In order to control for differential predisclosure earnings expectations as a determinant of the market reaction to earnings announcements, I require each firm-quarter observation in my sample to have available quarterly earnings forecasts from a minimum of three different analysts. Since many publicly traded firms are not followed by three or more analysts (as reported by I/B/E/S) each quarter, I examine whether the inferences drawn from my study may be generalized to firms without high levels of analyst coverage. Investor trading behavior may differ for these firms, because prior literature demonstrates that investors in firms with low or no analyst coverage must make trading decisions in a relatively impoverished information environment relative to the information environment faced by investors in firms with high levels of analyst following (e.g. Lang and Lundholm 1996; Hong et al. 2000; Gleason and Lee 2003).

In this regard, prior literature suggests that the impact of the disposition effect is likely to be even greater among firms with weaker information environments and greater valuation uncertainty. Specifically, using individual account data from a discount brokerage, Kumar (2009) finds that the disposition effect is stronger for firms with greater valuation uncertainty, consistent with the notion from behavioral psychology that decision-makers are generally more likely to resort to behavioral biases and heuristics when faced with solving more difficult problems. Kumar (2009) states that he does not control for analyst forecast dispersion in his study because a large number of firms with high valuation uncertainty do not have analyst coverage and would be excluded from the analysis if coverage were required. Extending Kumar's (2009) research to my setting enhances the contribution of my study and also allows me to confirm that the results documented in the previous chapters of the paper provide a reasonable (if not conservative) estimate of the impact of the disposition effect on the market reaction to earnings announcements for firms not included in my primary sample.

Accordingly, I analyze whether my results vary with the strength of the firm's information environment by allowing the coefficients in equation (3) to vary with the level of analyst following. Similar to the analysis of the December effect presented in Table 5, I relax the analyst following sample selection requirement and replace *ABS_UE* with *ABS_SUE*, allowing me to include firms with no or low analyst following in the analysis. This provides a sample of 89,596 observations with available data, which is the same sample examined in Table 5, and is identified in the sample selection diagram in Table 1 as the "Analyst Following Robustness Sample."

[INSERT TABLE 8 HERE]

Table 8 presents the results of the analysis. Column 1 presents the results of estimating the revised equation (3) on the full analyst following robustness sample, while columns 2 – 4 present the results of the estimation for subsamples of firms with no, low (1-5 analysts), and high (more than 5 analysts) analyst following, respectively. The coefficient on *CGO_DUMMY* remains positive and significant ($p < 0.01$) in all specifications. Consistent with a stronger disposition effect among firms with weaker information environments, the coefficient on *CGO_DUMMY* decreases monotonically as analyst coverage increases, varying from 0.183 for firms with no analyst following to 0.064 for firms with high analyst following. Untabulated analysis from fully-interacted models on the pooled sample confirm that the coefficients on *CGO_DUMMY* for each analyst following subsample are significantly ($p < 0.01$) different from one another. Consistent with the sample selection requirements for the primary sample, the primary sample coefficient of 0.068 on *CGO_DUMMY* from Table 3 is similar to that of the high analyst following subsample. The larger coefficients on *CGO_DUMMY* among subsamples with less analyst following, as well as the larger coefficient of 0.109 for the full sample of 89,596 observations presented in column 1, suggest that the main results in the paper are likely to generalize to, and may even be stronger in, a broader cross-section of firms with more variation in information environment.

Another key aspect of my research design is the measurement of my variables of interest. As discussed earlier in the text, I repeat all of my analysis using an alternate, more conventional, turnover-based measure of abnormal trading volume to ensure that my findings are not sensitive to my choice of a transaction-based measure of abnormal volume. Likewise, in this chapter I test whether my findings are sensitive to my use of *CGO* as a proxy for the representative investor's unrealized capital gain/loss position in any given stock. While I believe that *CGO* is a reliable proxy, shown to be robust to a number of validation tests performed by Frazzini (2006), there are two possible sources of measurement error in *CGO* that could affect my results. First, the computation of *CGO* assumes that the available holdings data of 13-F filing institutions is representative of the aggregate purchasing patterns of all shareholders in a stock. This may not be true for firms with low levels of institutional ownership. Second, 13-F holdings data is reported only once each calendar quarter, which may lead to stale reference price data for earnings announcements that occur more than a month after the most recent 13-F reporting date. To ensure that my findings are not sensitive to these potential measurement errors, I repeat my analysis using an alternate proxy for stockholders' aggregate reference price.

I calculate this alternate reference price using each stock's historical series of prices and turnover, following the methodology developed by Grinblatt and Han (2005). Intuitively, the measure is based on the assumption that, "If a stock had high turnover a year ago, but volume has been very low ever since, then most of the current holders probably bought the stock a year ago, so we can use the past year's price as a proxy for the purchase price. Similarly, if a stock had high turnover in the past month, most investors probably bought it recently, so we can use last month's average or closing price as a proxy for the purchase price" (Frazzini 2006, p. 2042).

Formally, the reference price is calculated using the following two-stage process. First, I calculate $\tilde{V}_{t,t-n}$, the percentage of outstanding shares purchased at date *t-n* that are still held by their original purchasers on date *t*, as

$$\tilde{V}_{t,t-n} = TO_{t-n}\left[\prod_{\tau=1}^{n-1}\left(1-TO_{t-n+\tau}\right)\right] \tag{7}$$

where TO_t is turnover in month *t*. The reference price is then estimated as

$$RP_t = \phi^{-1}\sum_{n=0}^{t}\tilde{V}_{t,t-n}P_{t-n} \tag{8}$$

where ϕ is a normalizing constant such that $\phi = \sum_{n=0}^{t}\tilde{V}_{t,t-n}$, and P_t is the stock price at the end of month *t*. Following Grinblatt and Han (2005), I truncate the estimation period to include the prior five years of data and normalize the monthly trading probabilities so that they sum to one.[10]

Given this alternate reference price, I compute an alternate measure of the capital gains overhang (*CGO_ALT*) in the same manner defined previously in equation (2). The computation of *CGO_ALT* incorporates the trading history of all shareholders in a given stock, does not require the availability of 13-F filing data, and is updated monthly to provide a more timely proxy. While *CGO_ALT*

[10] Grinblatt and Han (2005) note that distant market prices likely have little influence on the reference price, and report that their results were robust to alternately using three or seven years of prior data to estimate the reference price.

addresses the potential measurement error concerns of *CGO*, it suffers from other limitations which justify its use as an alternate, instead of primary, proxy for the capital gains overhang in my study. Namely, *CGO_ALT* does not incorporate directly observed holdings data for *any* of the firm's shareholders, instead relying on assumed trading patterns implied from aggregate trading volume. This assumption will generate greater measurement error in *CGO_ALT* whenever investors exhibit heterogeneous purchasing patterns (Frazzini 2006). Further, in untabulated analysis, I find that *CGO_ALT* is more highly correlated with *MOMENTUM* and *AVG_TURN* than *CGO*, making it more difficult to determine whether that results based on *CGO_ALT* are caused by disposition effect behavior as opposed to firm-level microstructure or liquidity concerns.

Since *CGO* and *CGO_ALT* each suffer from *different* potential limitations and sources of measurement error, examining the robustness of my results using both proxies increases the probability that my findings are driven by investors' aggregate capital gains position instead of a spurious aspect of either proxy.[11] Another advantage of incorporating *CGO_ALT* in my analysis is that it allows me to examine the sensitivity of my results to varying levels of institutional ownership. Unsurprisingly, prior literature examining demographic data for individual accounts at a major discount brokerage finds that the disposition effect is more pronounced for less sophisticated investors (Dhar and Zhu 2006). Thus, my results may be stronger among firms with greater proportions of individual

[11] The pearson correlation between CGO and CGO_ALT is 0.67 ($p < 0.01$), consistent with both proxies measuring the same underlying construct while being subject to independent sources of variation.

ownership relative to those with ownership concentrated among sophisticated institutional investors.

Accordingly, I analyze whether my results are sensitive to the use of *CGO_ALT,* as well the sensitivity of my results to the firm's level of institutional ownership, by re-estimating equation (3) using *CGO_ALT*, and allowing the coefficients to vary with the firm's level of institutional ownership. For comparability with the mean results in the paper, I again employ a binary measure of investors' unrealized gain/loss position, $CGO\_DUMMY\_ALT_{it}$, which is equal to 1 when $CGO\_ALT_{it} > 0$ and zero otherwise. To allow the inclusion of firms with low levels of institutional ownership in the analysis, I again relax the analyst following sample selection requirement and replace *ABS_UE* with *ABS_SUE*. I also relax the sample selection requirements with respect to 13-F holdings data, which results in a robustness sample of 105,308 observations. This sample is identified in the sample selection diagram in Table 1 as the "13-F Robustness Sample."

[INSERT TABLE 9 HERE]

Table 9 presents the results of the analysis. Column 1 presents the results of estimating the revised equation (3) on the full 13-F robustness sample, while columns 2 – 4 present the results of the estimation for subsamples of firms with low (< 20%), medium (20 – 60%), and high (> 60%) institutional ownership, respectively. The coefficient on *CGO_DUMMY_ALT* is positive and significant

($p < 0.01$) in all specifications. Consistent with a stronger disposition effect among less sophisticated investors, the coefficient on *CGO_DUMMY_ALT* decreases monotonically as institutional ownership increases, varying from 0.153 for firms with low institutional ownership to 0.060 for firms with high institutional ownership. Untabulated analysis from fully-interacted models on the pooled sample confirm that the coefficients on *CGO_DUMMY_ALT* for each institutional ownership subsample are significantly ($p < 0.01$) different from one another. The positive coefficient of 0.099 for the full sample of 105,308 observations presented in column 1 suggests that my findings are robust to the alternate capital gains overhang measure. To confirm this, I repeat all of the analysis (untabulated) from Tables 2 – 7 changing only the definition of the capital gains overhang measure and find that all inferences remain unchanged.

Taken together, the robustness tests performed in this chapter confirm that my findings are robust to alternate sample selection requirements and variable definitions. The results of the sensitivity analysis also provide additional evidence in support of the behavioral theories motivating the study by demonstrating that my results are stronger among firms with weaker information environments and less sophisticated investors.

CHAPTER VI: CONCLUSION

This paper presents robust evidence that the disposition effect documented in the behavioral finance literature can be observed in the aggregate trading response to the release of earnings information, even after controlling for information-related determinants of the trade around earnings announcements. In addition to finding evidence of a positive relation between investors' unrealized capital gains and aggregate abnormal trading volume around earnings announcements, I also find that this relation is stronger among seller-initiated trades than buyer-initiated trades and exhibits a seasonal December effect. In sensitivity analysis, I also find that this relation is stronger among less sophisticated investors and for firms with weaker information environments, consistent with the behavioral explanation.

Furthermore, I show that this aggregate disposition effect moderates the impact of information-related determinants of abnormal announcement-window trading volume and affects announcement-window abnormal returns. These results motivate future research on the degree to which investors' cognitive biases affect their response to earnings information. My results should also be of interest to researchers who treat abnormal trading volume as a *proxy* for investor disagreement (e.g. Garfinkel 2009; Garfinkel and Sokobin 2006), as I show that both the level of abnormal trading volume and the degree to which abnormal trading volume reflects disagreement are affected by stockholders' capital gains overhang.

In the context of the drift found by Frazzini (2006), my results suggest that a wealth transfer may take place around earnings announcements, from investors more prone to the disposition effect to those less prone to the disposition effect, as well as from investors prone to the disposition effect to the government in the form of higher capital gains tax payments. However, beyond presenting evidence of systematically predictable announcement-window abnormal returns, I do not directly examine the welfare implications of the disposition effect on investors' earnings-related trading decisions. Future archival or experimental research may wish to further examine the welfare implications of this behavior.

REFERENCES

Ahmed, A. S., R. A. Schneible Jr, and D. E. Stevens. 2003. An empirical analysis of the effects of online trading on stock price and trading volume reactions to earnings announcements*. *Contemporary Accounting Research* 20, (3): 413-39.

Atiase, R. K., and L. S. Bamber. 1994. Trading volume reactions to annual accounting earnings announcements-the incremental role of predisclosure information asymmetry. *Journal of Accounting and Economics* 17, (3): 309-29.

Balakrishnan, K., E. Bartov, and L. Faurel. 2010. Post loss/profit announcement drift. *Journal of Accounting and Economics* 50, (1): 20-41.

Bamber, L. S. 1986. The information content of annual earnings releases: A trading volume approach. *Journal of Accounting Research* 24, (1): 40-56.

Bamber, L. S. 1987. Unexpected earnings, firm size, and trading volume around quarterly earnings announcements. *Accounting Review*: 510-32.

Bamber, L. S., O. E. Barron, and T. L. Stober. 1997. Trading volume and different aspects of disagreement coincident with earnings announcements. *Accounting Review*: 575-97.

Bamber, Linda Smith, Orie E. Barron, and Douglas E. Stevens. 2011. Trading volume around earnings announcements and other financial reports: Theory, research design, empirical evidence, and directions for future research*. *Contemporary Accounting Research* 28, (2): 431-71.

Barron, O., R. Schneible, and D. Stevens. 2011. *What do we really Know about the Firm Size Effect on Trading Volume Reactions to Earnings Announcement? A Re-Examination and Extension*. Working paper.

Barron, O. E., M. H. Stanford, and Y. Yu. 2009. Further evidence on the relation between analysts' forecast dispersion and stock returns. *Contemporary Accounting Research* 26, (2): 329-57.

Bhattacharya, N. 2001. Investors' trade size and trading responses around earnings announcements: An empirical investigation. *Accounting Review*: 221-44.

Bhushan, R. 1994. An informational efficiency perspective on the post-earnings announcement drift. *Journal of Accounting and Economics* 18, (1) (7): 45-65.

Blouin, J. L., J. S. Raedy, and D. A. Shackelford. 2003. Capital gains taxes and equity trading: Empirical evidence. *Journal of Accounting Research* 41, (4): 611-51.

Carhart, Mark M. 1997. On persistence in mutual fund performance. *Journal of Finance* 52, (1) (03): 57-82.

Chen, L., R. Novy-Marx, and L. Zhang. 2011. An alternative three-factor model. Working paper.

Coval, Joshua D., and Tyler Shumway. 2005. Do behavioral biases affect prices? *The Journal of Finance* 60, (1): 1-34.

Cready, W. M., and R. Ramanan. 1995. Detecting trading response using transaction-based research designs. *Review of Quantitative Finance and Accounting* 5, (2): 203-21.
Dhar, Ravi, and Ning Zhu. 2006. Up close and personal: Investor sophistication and the disposition effect. *Management Science* 52, (5) (May 1): 726-40.
Frazzini, Andrea. 2006. The disposition effect and underreaction to news. *The Journal of Finance* 61, (4): 2017-46.
Freeman, R. N., and S. Y. Tse. 1992. A nonlinear model of security price responses to unexpected earnings. *Journal of Accounting Research* 30, (2): 185-209.
Garfinkel, J. A. 2009. Measuring investors' opinion divergence. *Journal of Accounting Research* 47, (5): 1317-48.
Garfinkel, J. A., and J. Sokobin. 2006. Volume, opinion divergence, and returns: A study of post–earnings announcement drift. *Journal of Accounting Research* 44, (1): 85-112.
Genesove, D., and C. Mayer. 2001. Loss aversion and seller behavior: Evidence from the housing market. *Quarterly Journal of Economics* 116, (4): 1233-60.
Gleason, C., and C. Lee. 2003. Analyst Forecast Revisions and Market Price Discovery. *The Accounting Review* 78: 193-225.
Grinblatt, M., and M. Keloharju. 2001. What makes investors trade? *Journal of Finance*: 589-616.
Grinblatt, Mark, and Bing Han. 2005. Prospect theory, mental accounting, and momentum *Journal of Financial Economics* 78, (2): 311-339.
Hayn, C. 1995. The information content of losses. *Journal of Accounting and Economics* 20, (2): 125-53.
Holthausen, R. W., and R. E. Verrecchia. 1990. The effect of informedness and consensus on price and volume behavior. *Accounting Review*: 191-208.
Hong, H., T. Lim, and J. Stein. 2000. Bad News Travels Slowly: Size, Analyst Coverage, and the Profitability of Momentum Strategies. *The Journal of Finance* 55: 265-295.
Hurtt, David, and Jim Seida. 2004. Do holding period tax incentives affect earnings release period selling activity of individual investors? *The Journal of the American Taxation Association* 26, (2): 43,43-64.
Jegadeesh, Narasimhan, and Sheridan Titman. 1993. Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance* 48, (1) (03): 65-91.
Kahneman, D., and A. Tversky. 1979. Prospect theory: An analysis of decision under risk. *Econometrica: Journal of the Econometric Society*: 263-91.
Kandel, E., and N. D. Pearson. 1995. Differential interpretation of public signals and trade in speculative markets. *Journal of Political Economy*: 831-72.
Karpoff, J. M. 1987. The relation between price changes and trading volume: A survey. *Journal of Financial and Quantitative Analysis* 22, (01): 109-26.
Kaustia, M. 2010. Disposition effect. *Behavioral Finance: Investors, Corporations, and Markets*.

Kim, Oliver, and Robert E. Verrecchia. 1991. Trading volume and price reactions to public announcements. *Journal of Accounting Research* 29, (2) (Autumn): pp. 302-321.

Kim, Oliver, and Robert E. Verrecchia. 1997. Pre-announcement and event-period private information. *Journal of Accounting and Economics* 24, (3) (12/31): 395-419.

Kumar, Alok. 2009. Hard-to-value stocks, behavioral biases, and informed trading. *Journal of Financial and Quantitative Analysis* 44, (06): 1375.

Lang, M., and R. Lundholm. 1996. Corporate Disclosure Policy and Analyst Behavior. *The Accounting Review* 71467-492.

Lee, C.M.C., and M.J. Ready. 1991. Inferring trade direction from intraday data. *The Journal of Finance* 46 (June): 733-746.

Lee, C.M.C. 1992. Earnings news and small traders: An intraday analysis. *Journal of Accounting and Economics* 15 (June/September): 265-302.

Locke, Peter R., and Steven C. Mann. 2005. Professional trader discipline and trade disposition. *Journal of Financial Economics* 76, (2) (5): 401-44.

Odean, Terrance. 1998. Are investors reluctant to realize their losses? *The Journal of Finance* 53, (5) (Oct.): pp. 1775-1798.

Petersen, M. A. 2009. Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies* 22, (1): 435.

Shackelford, D. A., and R. E. Verrecchia. 2002. Intertemporal tax discontinuities. *Journal of Accounting Research* 40, (1): 205-22.

Shapira, Z., and I. Venezia. 2001. Patterns of behavior of professionally managed and independent investors. *Journal of Banking & Finance* 25, (8): 1573-87.

Shefrin, Hersh, and Meir Statman. 1985. The disposition to sell winners too early and ride losers too long: Theory and evidence. *The Journal of Finance* 40, (3, Papers and Proceedings of the Forty-Third Annual Meeting American Finance Association, Dallas, Texas, December 28-30, 1984) (Jul.): pp. 777-790.

Simon, H. A. 1997. *Models of bounded rationality: Empirically grounded economic reason*. Vol. 3. MIT press.

Thaler, R. 1985. Mental accounting and consumer choice. *Marketing Science*: 199-214.

Utama, S., and W. M. Cready. 1997. Institutional ownership, differential predisclosure precision and trading volume at announcement dates. *Journal of Accounting and Economics* 24, (2): 129-50.

APPENDIX A

VARIABLE DEFINITIONS

AVOL$_j$	$$\ln\left(\frac{\text{Number of firm } i \text{ trades by investor group } j \text{ during three-day earnings announcement interval } t}{\text{Median number of firm } i \text{ trades by investor group } j \text{ during three-day non-announcement intervals}}\right)$$ Where the three-day earnings announcement interval is measured from days [-1,+1] relative to Compustat quarterly earnings announcement date *t* , and the non-announcement period includes all contiguous three-day periods from trading days [-250, -2] relative to the earnings announcement date, excluding any three-day periods containing previous earnings announcements. Investor groups *j* are defined as: TOTAL TRADES = All trades within TAQ sample selection requirements BUYER-INIT TRADES = Buyer-Initiated Trades, classified using the Lee-Ready (1991) algorithm SELLER-INIT TRADES= Seller-Initiated Trades, classified using the Lee-Ready (1991) algorithm I also examine an alternate definition of $AVOL_j$ defined as $$AVOL_{SHARE\ TURNOVER} = \ln\left(\frac{\text{Cumulative three-day share turnover during earnings announcement interval } t}{\text{Median cumulative three-day share turnover during non-announcement intervals}}\right)$$ Where share turnover is defined as volume divided by shares outstanding from the CRSP daily stock file, and announcement periods remain the same.
CGO	Capital Gains Overhang, defined as the percentage deviation of the aggregate reference price from the current end-of-month price (P_t - RP_t)/P_t. The reference price is defined as $RP_t = \phi^{-1}\sum_{n=0}^{t} V_{t,t-n}P_{t-n}$, where $V_{t,t-n}$ is the number of shares purchased by observable 13-F institutions at date *t-n* that are still held by the original purchasers at date *t*, ϕ is a normalizing constant such that $\phi = \sum_{n=0}^{t} V_{t,t-n}$, and P_t is the stock price at the end of month *t*.
CGO_ALT	Capital Gains Overhang, defined as the percentage deviation of the aggregate reference price from the current end-of-month price (P_t -

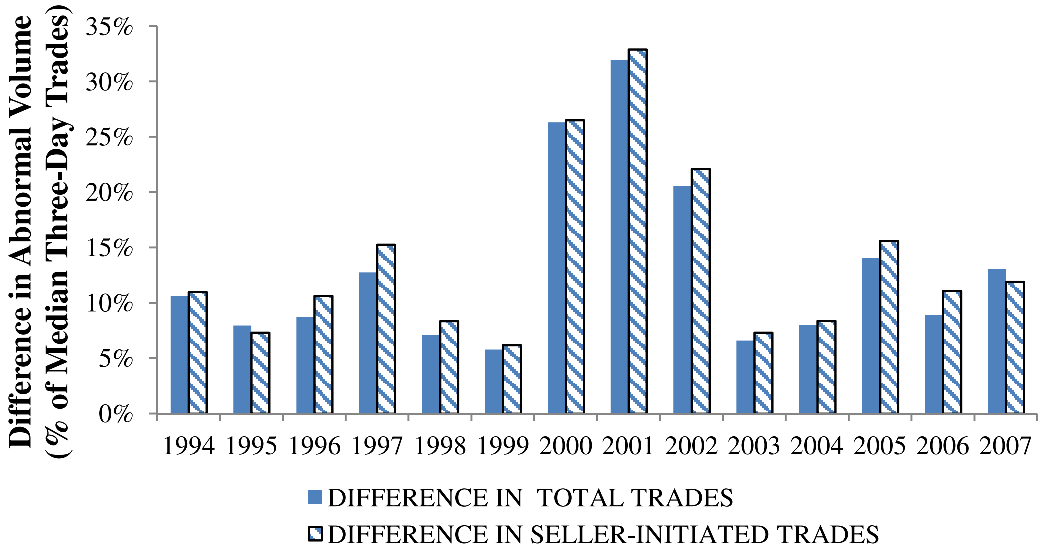
	$RP_t)/P_t$. The reference price is defined as $RP_t = \phi^{-1}\sum_{n=0}^{t}\tilde{V}_{t,t-n}P_{t-n}$, where $\tilde{V}_{t,t-n} = TO_{t-n}\left[\prod_{\tau=1}^{n-1}(1-TO_{t-n+\tau})\right]$ and TO_t is turnover, defined as monthly volume divided by shares outstanding for month *t*. ϕ is a normalizing constant such that $\phi = \sum_{n=0}^{t}\tilde{V}_{t,t-n}$, and P_t is the stock price at the end of month *t*.
CGO_DUMMY	A binary variable equal to 1 when *CGO* > 0, and zero otherwise.
ABS_UE	100* (The absolute value of I/B/E/S actual EPS for quarter *t* minus the most recent mean I/B/E/S consensus quarter *t* EPS forecast prior to the earnings announcement, scaled by beginning of quarter *t* stock price in Compustat).
SIZE	The natural log of market value of equity at the beginning of quarter *t*.
DISPERSION	The natural log of preannouncement dispersion, measured as the standard deviation of the most recent I/B/E/S consensus EPS forecast for quarter *t* prior to the earnings announcement scaled by beginning of quarter *t* stock price in Compustat.
ABS_RETURN	Absolute value of the cumulative return over the three-day window centered on the earnings announcement.
MKT_TURN	The natural log of the percentage of all NYSE/AMEX firms' outstanding shares that are traded over the three-day event window.
PRICE	The natural log of closing price at the beginning of quarter *t*.
AVG_TURN	Average monthly share turnover for the prior twelve months
MOM	The 11-month buy-and-hold return on firm *i* beginning 12 months prior to the month of the earnings announcement
DECEMBER	equals 1 if the earnings announcement date occurs during December, and 0 otherwise
ABS_SUE	abs($EARNINGS_t$ – $EARNINGS_{t-4}$) scaled by the standard deviation of *EARNINGS* over the previous twenty quarters (minimum of eight quarters of data required) , where *EARNINGS* is defined as income before extraordinary items scaled by beginning of quarter total assets.

CAR$_{(-1,+1)}$	Three-day cumulative abnormal return around earnings announcement date *t*, relative to the Fama-French-momentum four-factor benchmark return (Carhart 1997)
UE	100* (I/B/E/S actual EPS for quarter *t* minus the most recent mean I/B/E/S consensus quarter *t* EPS forecast prior to the earnings announcement, scaled by beginning of quarter *t* stock price in Compustat).
NONLINEAR	*UE**abs(*UE*)
LOSS	Equals 1 if reported earnings before extraordinary items are negative, and 0 otherwise.
ROA	Income before extraordinary items scaled by beginning of quarter total assets.

APPENDIX B

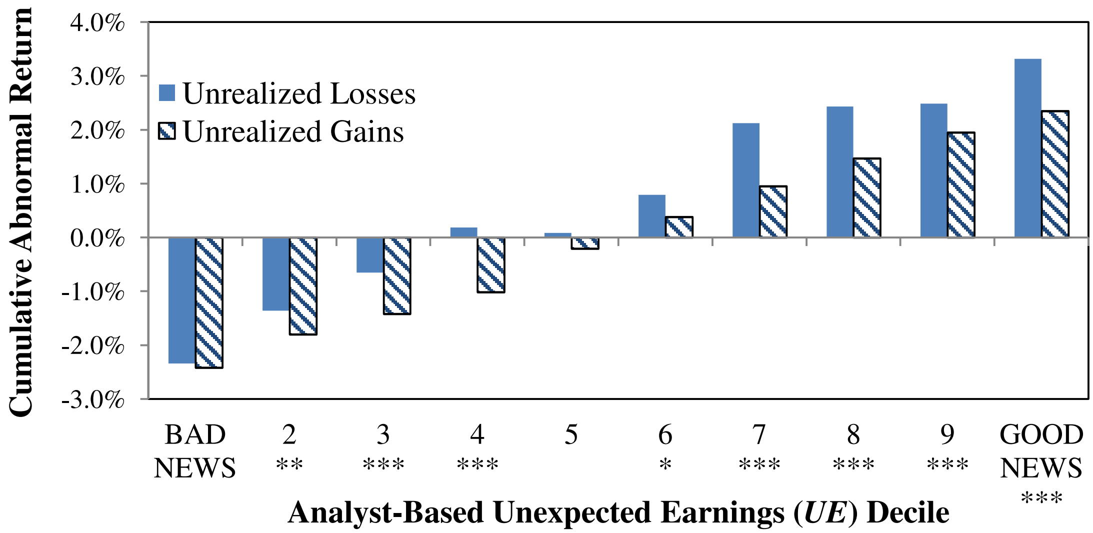
FIGURES AND TABLES

Figure 1: Annual Differences in Mean Abnormal Announcement-Window Volume when Stockholders are in a Gain vs Loss Position at the time of the Earnings Announcement



This figure depicts annual differences in mean abnormal announcement-window trading volume between earnings announcements where stockholders are in an aggregate unrealized gain versus aggregate unrealized loss position at the time of the announcement (gain – loss). Unrealized gain observations are observations where capital gains overhang is greater than zero ($CGO > 0$) and unrealized loss observations are observations where the capital gains overhang is less than or equal to zero ($CGO <= 0$). Differences in means are displayed for two different measures of abnormal trading volume (*AVOL*). The solid bar depicts differences in $\exp(AVOL_{TOTAL\ TRADES})$, while the striped bar depicts differences in $\exp(AVOL_{SELLER\text{-}INIT\ TRADES})$. CGO, $AVOL_{TOTAL\ TRADES}$, and $AVOL_{SELLER\text{-}INIT\ TRADES}$ are defined in Appendix A. All annual volume differences are statistically significnat at the 1% level based on (two-tailed) Satterthwaite *t*-statistics for groups with unequal variance.

Figure 2: Average Three-Day Cumulative Abnormal Returns Around Earnings Announcements Based on Stockholders' Unrealized Gain/Loss Position



This figure depicts mean three-day cumulative abnormal returns around earnings announcements separately for observations where stockholders are in an aggregate unrealized gain versus aggregate unrealized loss position at the time of the announcement. Unrealized gain observations are observations where capital gains overhang is greater than zero (*CGO* > 0) and unrealized loss observations are observations where the capital gains overhang is less than or equal to zero (*CGO* < =0). Three-day cumulative abnormal returns centered on the earnings announcement date ($CAR_{(-1,+1)}$) are calculated relative to benchmark returns from the Fama-French-Momentum four-factor model (Carhart 1997).Average three-day cumulative abnormal returns are presented for each decile of unexpected earnings (*UE*). The solid (striped) bar depicts average three day cumulative abnormal returns for earnings announcements where stockholders are in an unrealized loss (gain) position. *CGO*, $CAR_{(-1,+1)}$, and *UE* are formally defined in Appendix A. Stars indicate statistically significant differences in mean cumulative abnormal returns between the unrealized gain and loss sample for each decile of unexpected earnings. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively based on Satterthwaite *t*-statistics for groups with unequal variances.

Table 1
Sample Selection

	Firm-Quarter Observations	Unique Firms
Compustat observations 1994 - 2007 with all necessary data items available	342,209	14,530
Retain NYSE-AMEX Firms with necessary return data available from CRSP	118,158	4,464
Retain firms with sufficient CRSP price and volume history to compute volume-based capital gains overhang measure	116,491	4,384
(13-F Robustness Sample) Retain firms with available TAQ data to calculate abnormal trading volume measures	105,308	4,223
(Analyst Following Robustness Sample) Retain firms with available Thompson Reuters 13-F data to calculate holdings-based capital gains overhang measure	89,596	3,524
Firms with available I/B/E/S summary file quarterly earnings estimates for the month prior to the earnings announcement	70,245	2,927
(Primary Sample) Retain firms with at least three analyst estimates included in the I/B/E/S summary file quarterly earnings estimates for the month prior to the earnings announcement	55,245	2,430

This table illustrates the sample selection procedure. Appendix A specifies the required data items for each variable included in the analysis.

Table 2
Descriptive Statistics

Variable	Statistic	Full Sample (N=55,245)	Unrealized Loss Sample (N=15,830)	Unrealized Gain Sample (N=39,415)
$AVOL_{TOTAL\ TRADES}$	Mean	0.448	0.367	0.480
	Median	0.410	0.329	0.439
	St. Dev.	0.445	0.459	0.435
$AVOL_{SHARE\ TURNOVER}$	Mean	0.478	0.455	0.487
	Median	0.448	0.421	0.457
	St. Dev.	0.581	0.621	0.564
$AVOL_{BUYER\text{-}INITIATED\ TRADES}$	Mean	0.458	0.379	0.489
	Median	0.434	0.359	0.462
	St. Dev.	0.479	0.501	0.466
$AVOL_{SELLER\text{-}INITIATED\ TRADES}$	Mean	0.440	0.353	0.475
	Median	0.404	0.318	0.436
	St. Dev.	0.464	0.476	0.454
CGO	Mean	0.028	-0.474	0.230
	Median	0.142	-0.202	0.216
	St. Dev.	0.589	0.901	0.137
ABS_UE	Mean	0.346	0.765	0.178
	Median	0.081	0.179	0.061
	St. Dev.	1.207	2.020	0.554
SIZE	Mean	7.697	7.118	7.929
	Median	7.597	6.985	7.826
	St. Dev.	1.477	1.499	1.402
DISPERSION	Mean	-7.177	-6.510	-7.445
	Median	-7.255	-6.579	-7.477
	St. Dev.	1.181	1.283	1.021
ABS_RET	Mean	0.046	0.057	0.041
	Median	0.031	0.039	0.029
	St. Dev.	0.047	0.058	0.041
MKT_TURN	Mean	-3.973	-3.962	-3.977
	Median	-3.908	-3.899	-3.919
	St. Dev.	0.323	0.301	0.331
PRICE	Mean	3.336	2.839	3.536
	Median	3.399	2.907	3.559
	St. Dev.	0.666	0.697	0.535
AVG_TURN	Mean	6.800	6.651	6.860
	Median	6.821	6.640	6.901
	St. Dev.	1.642	1.616	1.649
MOM	Mean	0.149	-0.134	0.263
	Median	0.112	-0.159	0.196
	St. Dev.	0.390	0.326	0.354

(Continued from Table 2) This table presents descriptive statistics for the full sample, unrealized gain, and unrealized loss samples. Unrealized gain observations are observations where capital gains overhang is greater than zero (*CGO* > 0) and unrealized loss observations are observations where the capital gains overhang is less than or equal to zero (*CGO* < =0). All variables are defined in Appendix A. All variable means are significantly different between the unrealized gain and unrealized loss samples at the 1% level based on (two-tailed) Satterthwaite *t*-statistics for groups with unequal variances.

Table 3
Simple Pearson Correlations Among Key Measures

	AVOL Measures											
	TOTAL TRADES	***SHARE TURNOVER***	***BUYER INITIATED TRADES***	***SELLER INITIATED TRADES***	***CGO***	***ABS_UE***	***SIZE***	***DISPER-SION***	***ABS_RET***	***MKT TURN***	***PRICE***	***AVG TURN***
$AVOL_{SHARE\ TURNOVER}$	0.782											
$AVOL_{BUYER\text{-}INITIATED\ TRADES}$	0.951	0.740										
$AVOL_{SELLER\text{-}INITIATED\ TRADES}$	0.944	0.732	0.816									
CGO	0.097	0.014	0.091	0.098								
ABS_UE	0.016	0.044	0.008	0.020	-0.383							
SIZE	0.008	-0.018	0.007	0.025	0.206	-0.186						
DISPERSION	-0.052	-0.023	-0.054	-0.048	-0.381	0.431	-0.278					
ABS_RETURN	0.417	0.436	0.400	0.388	-0.175	0.119	-0.117	0.070				
MKT_TURN	0.305	0.195	0.272	0.325	-0.036	0.041	0.166	0.055	0.117			
PRICE	0.090	0.025	0.084	0.095	0.443	-0.313	0.627	-0.477	-0.148	0.027		
AVG_TURN	0.187	0.125	0.158	0.212	0.021	-0.019	0.674	-0.023	0.052	0.631	0.272	
MOMENTUM	0.222	0.084	0.213	0.219	0.402	-0.137	0.084	-0.204	-0.031	0.022	0.249	0.033

This table presents simple pearson correlations among key variables in the sample. All variables are defined in Appendix A. All correlations greater than 0.011 are statistically significant at the 1% level (two-tailed).

Table 4
Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of the Impact of Capital Gains Overhang on Abnormal Trading Volume Around Quarterly Earnings Announcements from 1994 to 2007

$$AVOL_{ijt} = \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 SIZE_{it} + \alpha_4 DISPERSION_{it} + \alpha_5 ABS\_RETURN_{it} + \alpha_6 MKT\_TURN_{it} + \alpha_7 PRICE_{it} + \alpha_8 AVG\_TURN_{it} + \alpha_9 MOMENTUM_{it} + \varepsilon_{it} \quad (3)$$

		Measure of $AVOL_{ijt}$							
		(1)		(2)		(3)		(4)	
	Pred. Sign	*TOTAL TRADES*		*SHARE TURNOVER*		*BUYER-INITIATED TRADES*		*SELLER-INITIATED TRADES*	
Constant		1.296	***	0.716	**	1.350	***	1.350	***
		(3.52)		(2.57)		(4.27)		(3.25)	
CGO_DUMMY	(+)	0.068	***	0.052	***	0.058	***	0.074	***
		(4.12)		(3.83)		(3.26)		(4.78)	
ABS_UE	(+)	0.008	***	0.013	***	0.005	**	0.012	***
		(4.39)		(5.81)		(2.43)		(5.13)	
SIZE	(-)	-0.048	***	-0.051	***	-0.039	***	-0.051	***
		(-5.12)		(-6.22)		(-4.10)		(-5.50)	
DISPERSION	(+)	-0.006		-0.014	***	-0.006		-0.005	
		(-1.24)		(-2.60)		(-1.35)		(-1.03)	
ABS_RETURN	(+)	3.787	***	5.215	***	3.948	***	3.627	***
		(12.69)		(18.90)		(11.94)		(13.98)	
MKT_TURN	(+)	0.313	***	0.191	***	0.322	***	0.338	***
		(3.49)		(2.97)		(4.10)		(3.39)	
PRICE	(+)	0.098	***	0.090	***	0.094	***	0.100	***
		(7.18)		(8.17)		(7.20)		(6.91)	
AVG_TURN	(+)	0.022		0.032	***	0.011		0.030	**
		(1.64)		(2.72)		(0.80)		(2.15)	
MOMENTUM	(+)	0.197	***	0.083	***	0.210	***	0.199	***
		(8.25)		(4.78)		(7.58)		(8.82)	
Observations		55,245		55,245		55,245		55,245	
Adjusted R^2		31.2%		24.3%		29.2%		32.9%	

This table reports various specifications of the OLS regression outlined in equation (4). *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.

Table 5
Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of a December Effect on the Impact of the Capital Gains Overhang on Abnormal Trading Volume Around Quarterly Earnings Announcements from 1994 to 2007

$$AVOL_{TOTAL\_TRADES} = \alpha_0 + \alpha_1 CGO_{it} + \alpha_2 DECEMBER_{it} + \alpha_3 CGO_{it} * DECEMBER_{it} + \alpha_4 ABS\_SUE_{it} + \alpha_5 SIZE_{it} + \alpha_6 ABS\_RETURN_{it} + \alpha_7 MKT\_TURN_{it} + \alpha_8 PRICE_{it} + \alpha_9 AVG\_TURN_{it} + \alpha_{10} MOMENTUM_{it} + \varepsilon_{it} \quad (4)$$

	Pred. Sign	(1) All Obs.		(2) Unrealized Gains ($CGO > 0$)		(3) Unrealized Losses ($CGO < 0$)	
Constant		1.513	***	1.622	***	1.318	***
		(4.97)		(5.06)		(4.01)	
CGO	(+)	0.069	***	0.349	***	0.039	***
		(7.27)		(11.30)		(5.16)	
DECEMBER		0.063	*	0.064	*	0.146	***
		(1.76)		(1.74)		(3.53)	
*CGO*DECEMBER*	(-)	-0.079	***	-0.275	***	-0.046	***
		(-4.87)		(-2.72)		(-3.46)	
ABS_SUE	(+)	0.011	***	0.015	***	0.007	
		(2.84)		(3.82)		(1.54)	
SIZE	(-)	-0.035	***	-0.039	***	-0.015	
		(-3.48)		(-3.53)		(-1.14)	
ABS_RETURN	(+)	4.310	***	4.857	***	3.908	***
		(17.25)		(16.23)		(20.00)	
MKT_TURN	(+)	0.311	***	0.316	***	0.273	***
		(4.01)		(3.94)		(3.34)	
PRICE	(+)	0.055	***	0.001		0.057	***
		(4.22)		(0.04)		(3.48)	
AVG_TURN	(+)	0.000		0.012		-0.019	
		(0.01)		(0.95)		(-1.11)	
MOMENTUM	(+)	0.235	***	0.154	***	0.206	***
		(11.29)		(6.14)		(10.58)	
Observations		89,596		56,902		32,682	
Adjusted R^2		26.5%		30.6%		21.4%	
F-Statistic, test of $(\alpha_1 + \alpha_3) = 0$		0.317		0.464		0.235	

This table reports various specifications of the OLS regression outlined in equation (5). *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.

Table 6
Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of the Impact of Capital Gains Overhang on the Relation Between Earnings Information and Abnormal Trading Volume Around Quarterly Earnings Announcements from 1994 to 2007

$$\begin{aligned} AVOL_{TOTAL\_TRADES} = {} & \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 CGO\_DUMMY_{it} * ABS\_UE_{it} \\ & + \alpha_4 SIZE_{it} + \alpha_5 CGO\_DUMMY_{it} * SIZE_{it} + \alpha_6 DISPERSION_{it} \\ & + \alpha_7 CGO\_DUMMY_{it} * DISPERSION_{it} + \alpha_8 ABS\_RETURN_{it} + \alpha_9 MKT\_TURN_{it} \\ & + \alpha_{10} PRICE_{it} + \alpha_{11} AVG\_TURN_{it} + \alpha_{12} MOMENTUM_{it} + \varepsilon_{it} \end{aligned} \quad (5)$$

	Pred. Sign	(1)		(2)		(3)		(4)	
Constant		1.284	***	1.201	***	1.249	***	1.207	***
		(3.49)		(3.13)		(3.39)		(3.17)	
CGO_DUMMY	(+)	0.060	***	0.218	***	0.136	***	0.186	***
		(3.66)		(3.46)		(3.47)		(2.95)	
ABS_UE	(+)	0.004	**	0.009	***	0.009	***	0.006	***
		(2.54)		(4.97)		(4.51)		(2.65)	
*CGO_DUMMY*ABS_UE*	(+)	0.026	***					0.023	***
		(3.66)						(3.31)	
SIZE	(-)	-0.048	***	-0.034	***	-0.048	***	-0.035	***
		(-5.08)		(-3.68)		(-5.08)		(-3.78)	
*CGO_DUMMY*SIZE*	(-)			-0.020	**			-0.019	**
				(-2.56)				(-2.20)	
DISPERSION	(+)	-0.007	*	-0.005		-0.012	**	-0.006	
		(-1.76)		(-1.21)		(-2.50)		(-1.12)	
*CGO_DUMMY*DISPERSION*	(+)					0.010	*	-0.002	
						(1.71)		(-0.33)	
ABS_RETURN	(+)	3.786	***	3.785	***	3.788	***	3.784	***
		(12.70)		(12.58)		(12.71)		(12.59)	
MKT_TURN	(+)	0.313	***	0.314	***	0.312	***	0.313	***
		(3.48)		(3.48)		(3.48)		(3.48)	
PRICE	(+)	0.097	***	0.096	***	0.097	***	0.096	***
		(7.22)		(7.21)		(7.18)		(7.26)	
AVG_TURN	(+)	0.022		0.022		0.022		0.022	
		(1.64)		(1.63)		(1.64)		(1.63)	
MOMENTUM	(+)	0.195	***	0.194	***	0.197	***	0.193	***
		(8.22)		(8.00)		(8.23)		(7.99)	
Observations		55,245		55,245		55,245		55,245	
Adjusted R^2		31.3%		31.2%		31.3%		31.2%	

This table reports various specifications of the OLS regression outlined in equation (6). *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.

Table 7
Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of the Impact of Capital Gains Overhang on Abnormal Returns Around Quarterly Earnings Announcements from 1994 to 2007

$$CAR_{(-1,+1)} = \beta_0 + \beta_1 CGO\_DUMMY_{it} + \beta_1 UE_{it} + \beta_2 NONLINEAR_{it} + \beta_3 LOSS_{it} + \beta_4 ROA_{it} + \beta_5 DISPERSION_{it} + \beta_6 PRICE_{it} + \beta_7 AVG\_TURN_{it} + \varepsilon_{it} \quad (6)$$

	Pred. Sign	(1) All Obs.		(2) Good News ($UE > 0$)		(3) Bad News ($UE < 0$)	
Constant		0.007	**	-0.020	***	0.025	***
		(2.04)		(-3.12)		(5.28)	
CGO_DUMMY	(-)	-0.007	***	-0.012	***	-0.005	**
		(-5.07)		(-8.86)		(-2.19)	
UE	(+)	0.023	***	0.047	***	0.010	***
		(11.44)		(7.53)		(6.91)	
NONLINEAR	(-)	-0.002	***	-0.013	***	-0.001	***
		(-9.01)		(-6.96)		(-5.33)	
LOSS	(-)	-0.004	**	-0.006	***	-0.004	**
		(-2.33)		(-2.84)		(-2.21)	
DISPERSION	(-)	-0.000		-0.006	***	0.004	***
		(-0.71)		(-7.15)		(6.51)	
ROA	(+)	0.067	***	0.053	*	0.006	
		(3.25)		(1.94)		(0.17)	
PRICE	(-)	-0.001		-0.003	***	0.004	***
		(-0.68)		(-3.09)		(2.98)	
AVG_TURN	(-)	-0.000		0.001		-0.002	***
		(-0.39)		(1.63)		(-4.90)	
Observations		55,245		29,838		18,364	
Adjusted R^2		3.1%		2.5%		1.1%	

This table reports various specifications of the OLS regression outlined in equation (7). *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.

Table 8

Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of the Impact of Capital Gains Overhang on Abnormal Trading Volume Around Quarterly Earnings Announcements from 1994 to 2007, by Level of Analyst Following

$$AVOL_{TOTAL\_TRADES} = \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_SUE_{it} + \alpha_3 SIZE_{it} + \alpha_4 ABS\_RETURN_{it} + \alpha_5 MKT\_TURN_{it} + \alpha_6 PRICE_{it} + \alpha_7 AVG\_TURN_{it} + \alpha_8 MOMENTUM_{it} + \varepsilon_{it}$$

		Level of Analyst Following			
		(1)	(2)	(3)	(4)
				1-5	*>5*
	Pred. Sign	*Full Sample*	*No Analyst Following*	*Analysts Following*	*Analysts Following*
Constant		1.413 ***	1.453 ***	1.422 ***	1.338 ***
		(4.62)	(4.98)	(4.44)	(3.26)
CGO_DUMMY	(+)	0.109 ***	0.183 ***	0.103 ***	0.064 ***
		(6.20)	(7.03)	(5.26)	(4.06)
ABS_SUE	(+)	0.010 ***	0.013 **	0.008	0.010 ***
		(2.59)	(2.44)	(1.47)	(3.03)
SIZE	(-)	-0.038 ***	-0.038 ***	-0.049 ***	-0.053 ***
		(-3.88)	(-4.12)	(-5.90)	(-4.66)
ABS_RETURN	(+)	4.267 ***	4.804 ***	4.346 ***	3.608 ***
		(16.86)	(26.10)	(17.19)	(11.21)
MKT_TURN	(+)	0.308 ***	0.263 ***	0.303 ***	0.312 ***
		(3.97)	(3.63)	(3.90)	(3.14)
PRICE	(+)	0.066 ***	0.046 ***	0.073 ***	0.101 ***
		(4.87)	(2.79)	(6.67)	(6.58)
AVG_TURN	(+)	0.001	-0.065 ***	-0.001	0.026 *
		(0.08)	(-6.62)	(-0.07)	(1.76)
MOMENTUM	(+)	0.231 ***	0.269 ***	0.257 ***	0.174 ***
		(10.80)	(9.68)	(18.95)	(5.81)
Observations		89,596	19,289	32,726	37,581
Adjusted R^2		26.2%	24.8%	27.8%	31.7%

This table reports the results of the estimating the OLS regression defined at the top of the table over various subsamples of analyst following. Analyst following is defined as the number of analyst estimates included in the month *t*-1 I/B/E/S summary file consensus earnings forecast for quarterly earnings announcement *t* (I/B/E/S data item NUMEST). *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.

Table 9

Ordinary Least Squares Regression Coefficient Estimates (*t*-statistics) for Tests of the Impact of Capital Gains Overhang on Abnormal Trading Volume Around Quarterly Earnings Announcements from 1994 to 2007, by Level of Institutional Ownership

$$AVOL_{TOTAL\_TRADES} = \alpha_0 + \alpha_1 CGO\_DUMMY\_ALT_{it} + \alpha_2 ABS\_SUE_{it} + \alpha_3 SIZE_{it} + \alpha_4 ABS\_RETURN_{it} + \alpha_5 MKT\_TURN_{it} + \alpha_6 PRICE_{it} + \alpha_7 AVG\_TURN_{it} + \alpha_8 MOMENTUM_{it} + \varepsilon_{it}$$

		Level of Institutional Ownership							
		(1)		(2)		(3)		(4)	
	Pred. Sign	*Full Sample*		*< 20% Institutional Ownership*		*20 - 60% Institutional Ownership*		*> 60% Institutional Ownership*	
Constant		1.456	***	1.671	***	1.224	***	1.328	***
		(4.52)		(5.60)		(4.21)		(3.09)	
CGO_DUMMY_ALT	(+)	0.099	***	0.153	***	0.102	***	0.060	***
		(5.91)		(6.50)		(5.77)		(3.78)	
ABS_SUE	(+)	0.009	***	0.006		0.012	***	0.009	**
		(2.58)		(1.55)		(2.67)		(2.25)	
SIZE	(-)	-0.026	***	0.002		-0.015		-0.050	***
		(-2.73)		(0.23)		(-1.45)		(-4.15)	
ABS_RETURN	(+)	4.394	***	4.833	***	4.647	***	3.639	***
		(17.34)		(20.60)		(16.04)		(13.90)	
MKT_TURN	(+)	0.328	***	0.370	***	0.263	***	0.316	***
		(4.06)		(4.95)		(3.65)		(2.90)	
PRICE	(+)	0.066	***	0.034	**	0.053	***	0.099	***
		(4.62)		(2.07)		(3.78)		(6.86)	
AVG_TURN	(+)	-0.007		-0.048	***	-0.024	**	0.028	**
		(-0.54)		(-4.14)		(-2.11)		(2.00)	
MOMENTUM	(+)	0.226	***	0.247	***	0.237	***	0.192	***
		(11.21)		(9.23)		(14.76)		(7.54)	
Observations		105,308		29,730		35,997		39,581	
Adjusted R^2		25.8%		24.0%		25.2%		31.1%	

This table reports the results of the estimating the OLS regression defined at the top of the table over various subsamples of institutional ownership levels. Institutional ownership is defined as the percentage of outstanding shares held by observable 13-F filing institutions as of the end of the most recent calendar quarter prior to the earnings announcement date. *T*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and year. All variables are defined in Appendix A. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.