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

Eric Weisbrod
W.P. Carey School of Business
Arizona State University
Eric.Weisbrod@asu.edu
January 11, 2012

Abstract:

I examine the manner in which stockholders' aggregate unrealized capital gain or loss position at the time earnings are announced affects their trading response to earnings disclosures. 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 reverses in December, consistent with the cognitive bias referred to as the disposition effect (Shefrin and Statman 1985). I also present evidence on the 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) affect 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.

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 and seminar participants at Arizona State University and UT Dallas.

1. Introduction

This study analyzes the market response to earnings announcements. 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 2000; 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 section 2, I develop predictions about the role of the disposition effect in the market reaction to earnings announcements. Section 3 describes my research design. Section 4 presents the results of my analysis, and Section 5 concludes.

2. Hypotheses Development

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

[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 2000; Coval and Shumway 2005), as well as individual home owners (Genesove and Mayer 2001). See Kaustia (2010) for a review of the literature.

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 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:

> ***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:

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

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.

3. Methodology

3.1. Variable Measurement

3.1.1. The Capital Gains Overhang

To test hypotheses related to the disposition effect, I construct a measure of investors' aggregate unrealized capital gains/losses in a given stock. This requires an assumption about stockholders' aggregate reference price ("cost basis") at any given point in time. Following Grinblatt and Han (2005) and Frazzini (2006), I calculate the aggregate reference price using the stock's historical series of prices and turnover. Intuitively, the measure suggests 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 number of shares purchased at date *t-n* that are still held by their original purchasers on date *t*, as

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

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

$$RP_t = \phi^{-1}\sum_{n=0}^{t}\tilde{V}_{t,t-n}P_{t-n} \tag{2}$$

where 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*. 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.[3]

Given the aggregate reference price, the capital gains overhang (*CGO*) can be defined for firm *i* at any given time *t* as

$$CGO_{it} = \frac{P_{it} - RP_{it}}{P_{it}} \tag{3}$$

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 an aggregate proxy for the reference price based on turnover. While it is not possible to obtain holdings data for all shareholders, prior literature

[3] 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.

finds that analyses employing CGO_{it} are consistent with those using investor holdings data (Frazzini 2006). Any measurement error in CGO_{it} from using a turnover-based reference price should generate noise and bias against finding significant results. Thus, regression coefficients estimated using CGO_{it} represent conservative estimates of the relation between investors' capital gains and abnormal trading volume/returns.

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 measure of CGO_{it}, further indicating that my reported results represent a conservative estimate of the impact of the disposition effect on aggregate investor behavior.

3.1.2. Abnormal Trading Volume and Cumulative Abnormal Returns

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

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

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

[4] This coding includes a small number of observations (113) for which CGO=0 in the unrealized loss sample. Inferences are identical if these observations are instead deleted.

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*. 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 the Appendix.

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 a common non-announcement window found in prior literature examining 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.

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*.

3.2. 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:

$$\begin{aligned} AVOL_{ijt} = {} & \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 SIZE_{it} + \alpha_4 DISPERSION_{it} + \alpha_5 ABS\_RETURN_{it} \\ & + \alpha_6 MKT\_TURN_{it} + \alpha_7 PRICE_{it} + \alpha_8 AVG\_TURN_{it} + \alpha_9 MOMENTUM_{it} + \varepsilon_{it} \end{aligned} \quad (4)$$

where $AVOL_{ijt}$ is abnormal trading volume as defined in Section 3.1, 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 examining the determinants of abnormal trading volume around earnings announcements 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 effects of earnings announcements on trading activity. 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 heaving 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 trade 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 (4) 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:

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

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 (4) and equation (5). 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 (5) 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 (5), 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 (5) are as defined in equation (4).

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 aspects of earnings announcements generate trade. Accordingly, to test *H2* I re-estimate equation (4) including interactions between *CGO_DUMMY* and the three information-related determinants of abnormal trading volume included in the model:

$$\begin{aligned} AVOL_{TOTAL\_TRADES} = {} & \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 CGO\_DUMMY_{it} * ABS\_UE_{it} + \alpha_4 SIZE_{it} \\ & + \alpha_5 CGO\_DUMMY_{it} * SIZE_{it} + \alpha_6 DISPERSION_{it} + \alpha_7 CGO\_DUMMY_{it} * DISPERSION_{it} \\ & + \alpha_8 ABS\_RETURN_{it} + \alpha_9 MKT\_TURN_{it} + \alpha_{10} PRICE_{it} + \alpha_{11} AVG\_TURN_{it} + \alpha_{12} MOMENTUM_{it} + \varepsilon_{it} \end{aligned} \quad (6)$$

where all variables are as defined in equation (4) 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} (α_3>0) and CGO_DUMMY_{it}*$DISPERSION_{it}$ (α_7 > 0), and a negative coefficient on the interactive term CGO_DUMMY_{it}*$SIZE_{it}$ (α_5 < 0).

3.3. 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:

$$CAR_{(-1,+1)} = \beta_0 + \beta_1 CGO\_DUMMY_{it} + \beta_1 UE_{it} + \beta_2 NONLINEAR_{it} + \beta_3 LOSS_{it} + \beta_4 ROA_{it} + \beta_5 DISPERSION_{it} + \beta_6 PRICE_{it} + \beta_7 AVG\_TURN_{it} + \varepsilon_{it} \quad (7)$$

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} (β_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 also 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).[5]

4. Data and Results

4.1. Sample Selection

I obtain daily stock price and aggregate share volume from CRSP. I also obtain stock quotes and investor trade data from the NYSE's Trade and Quote (TAQ) database. Accounting data is obtained from Compustat, and analyst forecast data is from I/B/E/S. I examine quarterly earnings announcements for NYSE/AMEX listed firms with available data for the years 1993, the year the TAQ database begins, through 2007.[6] Following prior literature (Lee 1992, Bhattacharya 2001), this study includes trades with a condition code of "regular sale" between 9:30 AM and 4:15 PM EST, excluding each day's opening trade. I obtain earnings announcement dates from the Compustat quarterly file, and require each firm-quarter observation to have sufficient data to calculate $AVOL_{TOTAL\_TRADES}$, CGO_{it}, and the control variables defined in equation (5). These sample selection criteria result in an initial sample of 89,011 firm-quarters with available data. For analyses incorporating I/B/E/S forecast data, I require a minimum of three analysts to be included in the most recent consensus forecast of quarterly earnings, which

[5] 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.
[6] TAQ data collection is ongoing.

further limits the sample to 46,476 firm-quarter observations. All continuous independent variables are winsorized at 1% and 99% to mitigate the impact of outliers.

4.2. Descriptive Statistics

Table 1 presents descriptive statistics for the variables included in equation (4), both for the full sample (N=89,011), and separately for the unrealized gain (N=54,385) and loss (N=34,626) samples. Note that many of the variables have been log transformed. For the measures of $AVOL_{ijt,}$ the log transformation allows the means to be roughly interpreted as the percentage increase in announcement-window trading for investor group *j* relative to median non-announcement trading for investor group *j*. For example, the sample mean of 0.423 for $AVOL_{TOTAL\ TRADES}$ can be interpreted as indicating that the total number of announcement-window trades is, on average, roughly 42.3% greater than the median number of total non-announcement three-day trades. The one caveat to this interpretation is that the log-transformed approximation of underlying percentage differences is understated for large percentages. Consistent with prior literature, there are sizeable average increases in trading volume around earnings announcements, relative to non-announcement periods, across all measures of $AVOL_{ijt}$.

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 1 are significantly different across unrealized gain and loss observations ($p < .01$). 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 1 support their inclusion in the multivariate analysis. Confirming the univariate results presented in Table 1, 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 ($p < .01$) for each year in the sample period, and consistently larger for $AVOL_{SELLER\text{-}INITIATED\ TRADES}$.

Table 2 presents Pearson correlations among the variables included in equation (4). All of the correlations presented in Table 2 are statistically significant ($p < .01$) given the fairly large sample size, and some of the correlations are large in magnitude. There are fairly high correlations among the various measures of AVOL (ranging from 0.737 to 0.930), as well as between *SIZE* and *PRICE* (0.744), which is expected given the nature of these variables. Consistent with *H1* and *H1a*, *CGO* is positively correlated with all measures of *AVOL,* and the largest correlation is with $AVOL_{SELLER\text{-}INITIATED\ TRADES}$ (0.171). Of the control variables, *ABS_RETURN* is the most highly correlated with *AVOL*, which is consistent with the well documented contemporaneous relation between price 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*.

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

Table 3 presents the results of OLS regressions of Equation (4). Each column in Table 3 presents the results of estimating equation (4) 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).

As predicted, the coefficients on *CGO_DUMMY* are positive and significant (p <.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. The coefficient of 0.043 on *CGO_DUMMY* indicates that, *ceteris paribus*, abnormal trading volume is roughly 4.3% higher around earnings announcements when shareholders are in an aggregate unrealized gain versus unrealized loss position at the time of the earnings announcement. 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 < .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 *DISPERSION* which is negative and significant, contrary to the predicted positive relation.[7]

Table 4 presents the results of OLS regressions of equation (5), which is the model used to test for the December seasonality in the disposition effect predicted by *H1b*. The dependent measure in equation (5) is $AVOL_{TOTAL\ TRADES}$. As in Table 3, *t*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and quarter. In Column 1, I estimate equation (5) for the full sample. Consistent with *H1b*, there is a negative and significant ($p < .01$) coefficient on *CGO*DECEMBER*. The coefficient on *CGO*DECEMBER* is -0.244, while the coefficient on *CGO* is 0.251. Untabulated Wald tests indicate 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 and (CGO > 0) and unrealized loss (CGO < 0) observations, respectively. Consistent with December serving as a perceived deadline to realize capital losses for tax purposes, I find that the coefficient on *CGO*DECEMBER* is only significant for the sample of unrealized losses. All of the control variables are significant as predicted, with the exception of *PRICE* in column 2 and *AVG_TURN* in column 3, which are insignificant.

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

[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.

historical levels. While these results confirm the findings from prior literature that capital gains tax incentives mitigate the disposition effect and are a secondary determinant of the trading volume around earnings announcements, the overall set of results presented in the paper suggest that, except in December, tax incentives are not a primary determinant of aggregate trading volume.

Moving on to tests of the impact of the disposition effect on the market's response to earnings information, Table 5 presents the results of OLS regressions of equation (6). As in Table 4, the dependent measure in equation (6) is $AVOL_{TOTAL\ TRADES}$ and *t*-statistics reported in parenthesis are calculated using two-way clustered standard errors, clustered by firm and quarter. Table 5 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 significant as predicted ($p < .01$), suggesting that these proxies for earnings-related disagreement are stronger determinants of trading behavior when stockholders are in a capital gains position, and thus more willing to trade, than when stockholders are in a capital loss position and reluctant to trade due to their disposition effect preferences. For example, in column 1, the coefficient on *CGO_DUMMY*ABS_UE* is 0.024, while the coefficient on *ABS_UE* is 0.004 and statistically insignificant, suggesting that, *ceteris paribus*, an increase in the magnitude of earnings surprise will generate substantially more announcement-window trading volume if stockholders are in an unrealized gain position versus an unrealized loss position at the time of the earnings announcement (and that investors in a loss position may not respond to earnings surprise at all).

In column 3, the coefficient on *DISPERSION* is -0.026 (p<.01), while the coefficient on *CGO_DUMMY*DISPERSION* is 0.028 (*p*<.01), indicating that the negative coefficient on *DISPERSION* may only hold for firms whose stockholders are in an unrealized loss position. Given the unexpected coefficient on *DISPERSION* in Table 3, the significant interaction on *CGO_DUMMY*DISPERSION* in Table 5, and untabulated indications that the correlation between *DISPERSION* and abnormal trading volume varies over time, further research on *DISPERSION* as a proxy for earnings-related disagreement, and its relation with abnormal trading volume, may be called for.

In column 4, all of the interaction terms, while diminished in magnitude, remain statistically significant in the predicted directions (p <.05, p.<.01, and p<.10 for the interactions with *ABS_UE*, *SIZE*, and *DISPERSION*, respectively). Thus, consistent with *H2*, the results in Table 5 provide evidence that proxies for earnings-related disagreement are more (less) likely to generate trade around earnings announcements when stockholders are in an aggregate unrealized gain (loss) position.

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

H3 predicts that stockholders' eagerness to sell around earnings announcements when they are in an aggregate unrealized gain position will generate downward pressure on price in the announcement-window. 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 ($p < .01$) for all but the bottom two (bad news) deciles of unexpected earnings.

To provide multivariate evidence on *H3*, Table 6 presents the results of OLS regressions of equation (7). The dependent measure in equation (7) 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 quarter. Column 1 presents the results of estimating equation (7) on the full sample. Consistent with *H3*, the coefficient of -.006 on *CGO_DUMMY* indicates that, *ceteris paribus*, abnormal returns are 0.6% 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*, which is 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 ($p<.01$) 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.

5. 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.

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, and if necessary, develop decision aids to assist disposition-prone investors in evaluating earnings information.[8]

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[8] For example, in an experimental setting, Weber and Camerer (1998) identify interventions that greatly reduce the disposition effect among their subjects. Their experiment does not incorporate capital gains taxes or information signals about the value of the asset that participants are trading.

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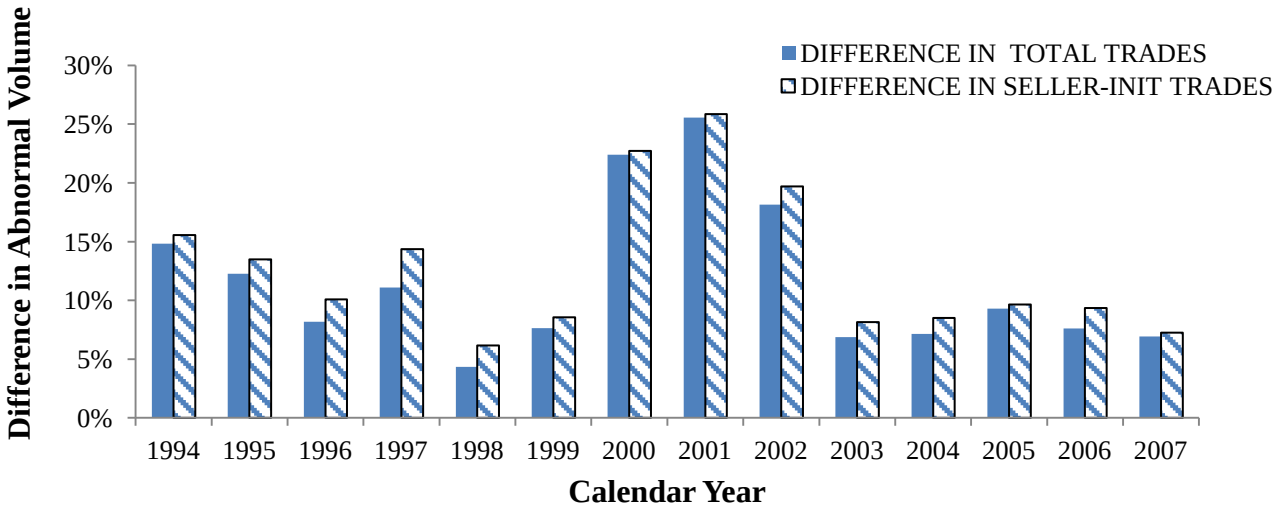
Appendix
Variable Definitions

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 (1992) algorithm SELLER-INIT TRADES= Seller-Initiated Trades, classified using the Lee (1992) 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 $RP_t = \phi^{-1}\sum_{n=0}^{t}\tilde{V}_{t,t-n}P_{t-n}$, where $\tilde{V}_{t,t-n} = TO_{t-n}\left[\prod_{\tau=1}^{n-1}\left(1-TO_{t-n+\tau}\right)\right]$ and TO_t is turnover, defined as monthly volume divided by shares outstanding for 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).

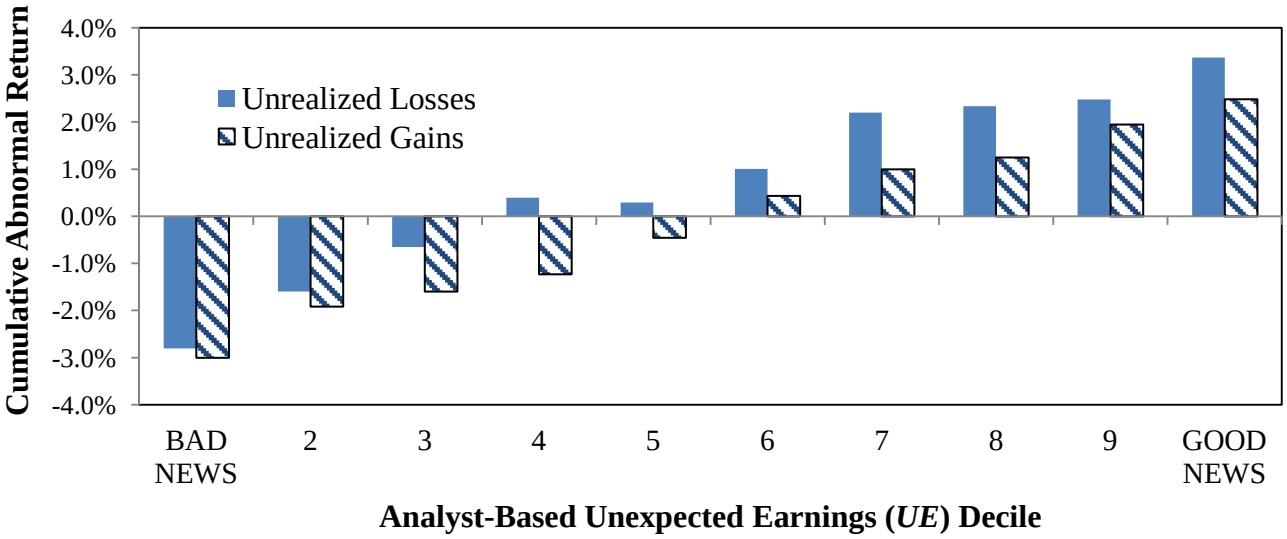
SIZE	The natural log of market value of equity at the beginning of quarter *t*.
DISPERSION	The natural log of preannouncement dispersion, measured as the standard deviation of the most recent I/B/E/S consensus EPS forecast for quarter *t* prior to the earnings announcement scaled by beginning of quarter *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.
$\boldsymbol{CAR_{(-1,+1)}}$	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.

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 $AVOL_{TOTAL\ TRADES}$, while the striped bar depicts differences in $AVOL_{SELLER\text{-}INIT\ TRADES}$. CGO, $AVOL_{TOTAL\ TRADES}$, and $AVOL_{SELLER\text{-}INIT\ TRADES}$ are defined in the Appendix. All annual volume differences are statistically significnat at the 1% level based on (two-tailed) Satterthwaite *t*-statistics for groups with unequal variances.

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 the Appendix. The mean cumulative abnormal returns for each decile of unexpected earnings are significantly different for unrealized gains vs unrealized losses ($p < .01$) for all but the first two (bad news) deciles of unexpected earnings based on (two-tailed) Satterthwaite *t*-statistics for groups with unequal variances.

Table 1
Descriptive Statistics

Variable	Statistic	Full Sample (N=89,011)	Unrealized Loss Sample (N=34,626)	Unrealized Gain Sample (N=54,385)
$AVOL_{TOTAL\ TRADES}$	Mean	0.423	0.335	0.478
	Median	0.383	0.304	0.428
	St. Dev.	0.538	0.554	0.520
$AVOL_{SHARE\ TURNOVER}$	Mean	0.446	0.406	0.471
	Median	0.412	0.378	0.430
	St. Dev.	0.686	0.734	0.653
$AVOL_{BUYER\text{-}INITIATED\ TRADES}$	Mean	0.431	0.348	0.484
	Median	0.407	0.338	0.451
	St. Dev.	0.602	0.633	0.576
$AVOL_{SELLER\text{-}INITIATED\ TRADES}$	Mean	0.408	0.311	0.470
	Median	0.375	0.288	0.427
	St. Dev.	0.564	0.582	0.543
CGO	Mean	-0.035	-0.318	0.145
	Median	0.049	-0.148	0.126
	St. Dev.	0.375	0.464	0.100
ABS_UE	Mean	0.298	0.490	0.195
	Median	0.075	0.110	0.062
	St. Dev.	1.032	1.498	0.634
SIZE	Mean	6.807	6.261	7.155
	Median	6.841	6.257	7.149
	St. Dev.	1.866	1.906	1.754
DISPERSION	Mean	-7.112	-6.738	-7.324
	Median	-7.253	-6.874	-7.453
	St. Dev.	1.091	1.169	0.983
ABS_RET	Mean	0.045	0.054	0.039
	Median	0.029	0.036	0.026
	St. Dev.	0.049	0.058	0.041
MKT_TURN	Mean	-4.310	-4.320	-4.304
	Median	-4.306	-4.323	-4.289
	St. Dev.	0.318	0.314	0.320
PRICE	Mean	3.014	2.601	3.276
	Median	3.185	2.788	3.365
	St. Dev.	0.931	1.030	0.752
AVG_TURN	Mean	-2.703	-2.679	-2.718
	Median	-2.659	-2.650	-2.666
	St. Dev.	0.855	0.879	0.839
MOM	Mean	0.149	-0.097	0.305
	Median	0.109	-0.116	0.227
	St. Dev.	0.415	0.351	0.375

(Continued from Table 1) 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 the Appendix. 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 2
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***
$AVOL_{SHARE\ TURNOVER}$	0.798											
$AVOL_{BUYER\text{-}INITIATED\ TRADES}$	0.930	0.740										
$AVOL_{SELLER\text{-}INITIATED\ TRADES}$	0.927	0.737	0.753									
CGO	0.162	0.058	0.141	0.171								
ABS_UE	0.030	0.055	0.022	0.032	-0.246							
SIZE	0.040	0.000	0.030	0.068	0.323	-0.182						
DISPERSION	-0.054	-0.025	-0.054	-0.053	-0.338	0.462	-0.406					
ABS_RETURN	0.403	0.407	0.377	0.368	-0.222	0.127	-0.135	0.094				
MKT_TURN	0.265	0.153	0.224	0.282	0.015	0.046	0.185	0.000	0.090			
PRICE	0.057	0.007	0.041	0.079	0.504	-0.295	0.744	-0.598	-0.209	0.066		
AVG_TURN	0.176	0.127	0.147	0.193	0.024	0.103	0.206	0.122	0.175	0.347	0.150	
MOMENTUM	0.232	0.103	0.208	0.231	0.511	-0.129	0.082	-0.196	-0.034	0.041	0.194	0.092

This table presents simple Pearson correlations among key variables in the sample. All variables are defined in the Appendix. All correlations are statistically significant and the 1% level (two-tailed).

Table 3
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 1993 to 2007

$$AVOL_{ijt} = \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 SIZE_{it} + \alpha_4 DISPERSION_{it} + \alpha_5 ABS\_RETURN_{it} + \alpha_6 MKT\_TURN_{it} + \alpha_7 PRICE_{it} + \alpha_8 AVG\_TURN_{it} + \alpha_9 MOMENTUM_{it} + \varepsilon_{it} \quad (4)$$

		Measure of $AVOL_{ijt}$			
		(1)	(2)	(3)	(4)
	Pred. Sign	*TOTAL TRADES*	*SHARE TURNOVER*	*BUYER-INITIATED TRADES*	*SELLER-INITIATED TRADES*
Constant		1.994 ***	1.313 ***	1.867 ***	2.152 ***
		(11.37)	(9.84)	(11.33)	(11.14)
CGO_DUMMY	(+)	0.043 ***	0.039 ***	0.036 ***	0.049 ***
		(3.87)	(3.17)	(3.20)	(4.23)
ABS_UE	(+)	0.943 ***	2.021 ***	0.708 **	1.147 ***
		(3.13)	(5.28)	(2.12)	(3.68)
SIZE	(-)	-0.032 ***	-0.029 ***	-0.030 ***	-0.029 ***
		(-6.97)	(-7.39)	(-6.29)	(-6.34)
DISPERSION	(+)	-0.009 **	-0.024 ***	-0.010 **	-0.008 *
		(-2.19)	(-4.90)	(-2.26)	(-1.90)
ABS_RETURN	(+)	3.946 ***	5.417 ***	4.081 ***	3.812 ***
		(27.37)	(34.19)	(26.81)	(27.49)
MKT_TURN	(+)	0.434 ***	0.292 ***	0.409 ***	0.470 ***
		(10.40)	(9.56)	(10.36)	(10.28)
PRICE	(+)	0.089 ***	0.073 ***	0.087 ***	0.088 ***
		(8.96)	(7.20)	(8.58)	(8.59)
AVG_TURN	(+)	0.012 *	0.022 ***	0.009	0.021 ***
		(1.73)	(2.80)	(1.28)	(2.90)
MOMENTUM	(+)	0.207 ***	0.093 ***	0.217 ***	0.212 ***
		(11.72)	(5.97)	(11.50)	(11.88)
Observations		46,746	46,746	46,740	46,745
Adjusted R^2		0.337	0.243	0.292	0.329

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 quarter. All variables are defined in the Appendix. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.

Table 4
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 1993 to 2007

$$AVOL_{TOTAL\_TRADES} = \alpha_0 + \alpha_1 CGO_{it} + \alpha_2 DECEMBER_{it} + \alpha_3 CGO_{it} * DECEMBER_{it} + \alpha_4 ABS\_SUE_{it} + \alpha_5 SIZE_{it} + \alpha_6 ABS\_RETURN_{it} + \alpha_7 MKT\_TURN_{it} + \alpha_8 PRICE_{it} + \alpha_9 AVG\_TURN_{it} + \alpha_{10} MOMENTUM_{it} + \varepsilon_{it} \quad (5)$$

	Pred. Sign	(1) All Obs.		(2) Unrealized Gains ($CGO > 0$)		(3) Unrealized Losses ($CGO < 0$)	
Constant		1.827	***	1.978	***	1.649	***
		(11.85)		(12.48)		(8.90)	
CGO	(+)	0.251	***	0.706	***	0.150	***
		(14.68)		(14.14)		(8.89)	
DECEMBER		0.056	*	0.020		0.074	
		(1.92)		(0.54)		(1.64)	
*CGO*DECEMBER*	(-)	-0.244	***	-0.091		-0.234	***
		(-4.01)		(-0.46)		(-3.97)	
ABS_RETURN	(+)	4.650	***	5.208	***	4.100	***
		(36.00)		(35.36)		(31.39)	
MKT_TURN	(+)	0.366	***	0.371	***	0.372	***
		(10.00)		(9.87)		(8.56)	
ABS_SUE	(+)	0.012	***	0.015	***	0.006	**
		(6.15)		(6.31)		(2.42)	
SIZE	(-)	-0.017	***	-0.016	***	-0.012	***
		(-4.81)		(-3.99)		(-2.98)	
PRICE	(+)	0.032	***	-0.004		0.075	***
		(3.86)		(-0.47)		(7.83)	
AVG_TURN	(+)	0.018	***	0.048	***	-0.002	
		(4.31)		(8.24)		(-0.29)	
MOMENTUM	(+)	0.186	***	0.119	***	0.141	***
		(12.34)		(7.09)		(6.93)	
Observations		89,011		54,385		34,513	
Adjusted R^2		0.297		0.312		0.271	

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 quarter. All variables are defined in the Appendix. *,**,***, 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 the Impact of Capital Gains Overhang on the Relation Between Earnings Information and Abnormal Trading Volume Around Quarterly Earnings Announcements from 1993 to 2007

$$AVOL_{TOTAL\_TRADES} = \alpha_0 + \alpha_1 CGO\_DUMMY_{it} + \alpha_2 ABS\_UE_{it} + \alpha_3 CGO\_DUMMY_{it} * ABS\_UE_{it} + \alpha_4 SIZE_{it} + \alpha_5 CGO\_DUMMY_{it} * SIZE_{it} + \alpha_6 DISPERSION_{it} + \alpha_7 CGO\_DUMMY_{it} * DISPERSION_{it} + \alpha_8 ABS\_RETURN_{it} + \alpha_9 MKT\_TURN_{it} + \alpha_{10} PRICE_{it} + \alpha_{11} AVG\_TURN_{it} + \alpha_{12} MOMENTUM_{it} + \varepsilon_{it} \quad (6)$$

	Pred. Sign	(1)		(2)		(3)		(4)	
Constant		1.985	***	1.855	***	1.869	***	1.826	***
		(11.27)		(10.44)		(10.24)		(10.00)	
CGO_DUMMY	(+)	0.036	***	0.274	***	0.241	***	0.306	***
		(3.17)		(7.21)		(6.45)		(6.38)	
ABS_UE	(+)	0.408		1.115	***	1.243	***	0.904	***
		(1.30)		(3.73)		(4.09)		(2.79)	
*CGO_DUMMY*ABS_UE*	(+)	2.357	***					1.279	**
		(3.89)						(2.04)	
SIZE	(-)	-0.032	***	-0.013	**	-0.032	***	-0.015	***
		(-6.96)		(-2.33)		(-6.97)		(-2.77)	
*CGO_DUMMY*SIZE*	(-)			-0.030	***			-0.026	***
				(-6.31)				(-5.18)	
DISPERSION	(+)	-0.011	***	-0.008	**	-0.026	***	-0.015	***
		(-2.61)		(-2.07)		(-5.24)		(-3.02)	
*CGO_DUMMY*DISPERSION*	(+)					0.028	***	0.010	*
						(5.65)		(1.72)	
ABS_RETURN	(+)	3.945	***	3.944	***	3.948	***	3.944	***
		(27.42)		(27.09)		(27.39)		(27.16)	
MKT_TURN	(+)	0.434	***	0.435	***	0.433	***	0.434	***
		(10.35)		(10.30)		(10.29)		(10.24)	
PRICE	(+)	0.088	***	0.087	***	0.088	***	0.087	***
		(8.93)		(8.75)		(8.90)		(8.74)	
AVG_TURN	(+)	0.011	*	0.010		0.011		0.009	
		(1.66)		(1.43)		(1.55)		(1.37)	
MOMENTUM	(+)	0.206	***	0.202	***	0.204	***	0.201	***
		(11.60)		(11.39)		(11.48)		(11.29)	
Observations		46,746		46,746		46,746		46,746	
Adjusted R^2		0.338		0.339		0.338		0.340	

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 quarter. All variables are defined in the Appendix. *,**,***, 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 Abnormal Returns Around Quarterly Earnings Announcements from 1993 to 2007

$$CAR_{(-1,+1)} = \beta_0 + \beta_1 CGO\_DUMMY_{it} + \beta_1 UE_{it} + \beta_2 NONLINEAR_{it} + \beta_3 LOSS_{it} + \beta_4 ROA_{it} + \beta_5 DISPERSION_{it} + \beta_6 PRICE_{it} + \beta_7 AVG\_TURN_{it} + \varepsilon_{it} \quad (7)$$

	Pred. Sign	(1) All Obs.		(2) Good News ($UE > 0$)		(3) Bad News ($UE < 0$)	
Constant		0.005		-0.019	***	0.014	**
		(1.17)		(-3.82)		(2.50)	
CGO_DUMMY	(-)	-0.006	***	-0.010	***	-0.006	***
		(-6.96)		(-10.26)		(-3.79)	
UE	(+)	0.029	***	0.055	***	0.018	***
		(17.04)		(16.33)		(7.50)	
NONLINEAR	(-)	-0.003	***	-0.014	***	-0.001	***
		(-12.52)		(-11.71)		(-5.06)	
LOSS	(-)	-0.003	**	-0.005	**	-0.003	
		(-2.11)		(-2.06)		(-1.57)	
DISPERSION	(-)	-0.001	*	-0.008	***	0.009	***
		(-1.67)		(-13.13)		(10.75)	
ROA	(+)	0.057	***	0.050		-0.053	
		(2.63)		(1.62)		(-1.36)	
PRICE	(-)	-0.002	***	-0.007	***	0.006	***
		(-2.66)		(-6.52)		(5.63)	
AVG_TURN	(-)	-0.001		0.003	***	-0.009	***
		(-1.39)		(3.79)		(-9.32)	
Observations		46,746		26,299		14,708	
Adjusted R^2		0.042		0.035		0.027	

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 quarter. All variables are defined in the Appendix. *,**,***, indicate (two-tailed) significance at the 10%, 5%, and 1% levels respectively.