Measuring Investors' Opinion Divergence

by

Jon A. Garfinkel*
Henry B. Tippie College of Business
University of Iowa

April, 2005

*Jon A. Garfinkel, 108 PBB, Henry B. Tippie College of Business, University of Iowa, Iowa City, Iowa, 52242, ph: 319-335-0943, fax: 319-335-3690, email: jon-garfinkel@uiowa.edu

I thank Matt Billett, Shane Corwin, Bart Danielson, Todd Houge, Tom Rietz, and Anand Vijh for helpful discussions. I also thank Paul Bennett and the New York Stock Exchange for allowing me to use the order data in this study. I am especially indebted to Marc Lipson for extensive help through both data provision and discussions. All remaining errors are my own.

Measuring Investors' Opinion Divergence

ABSTRACT

Numerous proxies for divergence of investors' opinions have been suggested in the empirical finance literature. I offer a new proxy constructed from proprietary limit order data, which allows me to capture additional information on investors' private valuations. Proxies from the extant literature, based on publicly available data, do not contain such information. Given my new measure, I ask which of the extant proxies correlates best with it. My results suggest that only unexplained volume reliably correlates with my new measure constructed from proprietary data. I conclude that the best proxy for investor opinion divergence using publicly available data is unexplained volume.

I.

The standard assumption of investor homogeneity in classical asset pricing work has given way to the view that investors' opinions may diverge. Numerous theories exploit this development to offer alternative characterizations of stock returns, but their conclusions vary.[1] Empirical tests fail to provide unanimous support for any of the theories. The lack of consensus in the empirical literature is largely driven by a lack of consensus on how to measure opinion divergence. Existing tests use a wide variety of empirical proxies, including bid-ask spread (Houge, Loughran, Suchanek and Yan (2001)), unexplained volume (Garfinkel and Sokobin (2005)), analysts' forecast variability (Diether, Malloy and Scherbina (2002)), and stock return volatility (Boehme, Danielson and Sorescu (2005)). Part of the difficulty is the requisite use of publicly available data, none of which directly conveys investors' private valuations of assets. This paper offers a comparative assessment of the above four proxies, by relying on proprietary data that offers a more direct view into investor private valuations.

To compare proxies for investor opinion divergence I follow a two-step process. First, I offer a new measure of opinion divergence that explicitly considers indications of investors' private values *via their limit orders*. Critically, the limit orders contain requested prices, whereas prior proxies do not. Moreover, Harris and Hasbrouck (1996) show that limit orders are a viable order strategy for individual investors compared to market orders, while Kaniel and Liu (2004) show that even informed traders appear to prefer them. Thus, my new measure would seem to capture indications of interest from a broad variety of investors. I obtain the proprietary investor limit order data necessary to construct the new measure of opinion divergence from the New York Stock Exchange (hereafter NYSE). In the second step, I assess which extant proxy based on *publicly available* data most closely aligns with it.[2]

---

[1] See for example, Miller (1977), Williams (1977), Jarrow (1980), Mayshar (1982), Varian (1985), Harris and Raviv (1993), and Hong and Stein (1999).

[2] Obviously, this presumes that my new measure is a better measure of opinion divergence than extant proxies. Section II details the advantages of the new measure relative to prior proxies. Another question is

My new measure for investor opinion divergence is the standard deviation (across orders) of the distance between each limit order's price and the most recent trade price preceding the limit order. If the most recent trade price was $50 and a limit buy order for $48 arrives, the limit order investor's opinion apparently diverges from the opinion embodied in the most recent trade.[3]

My second innovation is to look for opinion divergence where it is hypothesized to be significant. My main tests focus on orders submitted around news related trading halts. News related halts are typically called for significant corporate announcements. Theories by Holthausen and Verrecchia (1990) and Kim and Verrecchia (1994) suggest the possibility of more widely divergent opinions directly after such events. Evidence from trading activity following *unanticipated* dividend announcements is somewhat consistent with these theories (Graham, Koski, and Loewenstein (2003)).[4] My focus on orders around news related halts also allows me to examine changes in opinion divergence from before to after the news halt. This analysis offers a time series perspective to complement my cross-sectional work, and consequently serves as a robustness check.

My primary results are as follows. First, news related trading halts appear to be a good place to look for opinion divergence. Investors' valuations, as indicated by their limit orders, are more variable when the news is bigger; i.e. when the price move associated with the trading halt is larger in magnitude. This evidence is consistent with the theories offered by Holthausen and Verrecchia (1990) and Kim and Verrecchia (1994). Second, opinion divergence also appears to be larger among smaller firms. This has potential implications for the study of asset prices in a more general setting, since numerous studies treat firm size as a risk factor and opinion

---

why researchers can't simply use my new approach to always measure divergent opinions. The primary reason is that until recently the necessary data was not readily obtainable. The NYSE now offers such data via OpenBook, but it is still very expensive to obtain.

[3] Clearly there are market order options available to an investor whose private valuation differs from the current market price. Below, I discuss two alternative measures of variability in private valuations that use market order data. The two approaches are diametrically opposed in their presumptions of private valuations. Nevertheless, my final conclusions regarding the empirical validity of extant proxies are supported by both sets of results.

[4] Suggestive evidence is also presented in Fleming and Remolona (1999).

divergence is also hypothesized to affect asset returns. Third, for the overall sample, all four of the proxies common to the extant literature appear to correlate positively with my new measure for opinion divergence built on investors' stated opinions through limit orders.

However, these primary results mask interesting marginal effects. I conduct regressions with all four proxies as explainers of investor opinion divergence. Essentially I run a horse race between proxies to ascertain which is best. The regression results suggest that bid-ask spread and unexplained volume appear to be the most robust determinants. Neither forecast variability nor stock return volatility correlate significantly with opinion divergence when the other proxies are included in the regressions.

My time series evidence corroborates the above conclusions. In fact, these tests indicate that changes in opinion divergence are *declining* in changes in analysts' forecast variability. This suggests that events which lead to increases in forecast variability lead to declines in investors' opinion divergence. If my new measure for opinion divergence is sound, my results call into question the large literature that proxies investor opinions with analysts' forecasts.

Finally, I re-examine the relationship between my new measure for opinion divergence and the proxies under two alternative views. First, I use data from before the news halts for my sample firms. If news halts are unusual then my results may not generalize to more "normal" trading periods. In fact, my results using data from prior to the trading halt periods suggest that unexplained volume may be a better proxy for opinion divergence than bid-ask spread.

Second, I re-estimate my measure of opinion divergence when treating market orders as a potential indicator of varying investor private valuation. This analysis is motivated by the model and empirical work of Hollifield, Miller, Sandas and Slive (2004). They show that market buy and sell orders are *more* likely when trader private values are more extreme. This interpretation is markedly different from the one maintained throughout the remainder of the paper, and therefore represents a robustness check on my main conclusions. I find that the alternative measure of opinion divergence, treating market orders as indicators of extreme private values, is significantly

positively related to only the unexplained volume proxy. Taken together, my results suggest that unexplained volume is the most robust proxy for opinion divergence of the four examined in this paper.

The remainder of this research is organized as follows. Section II motivates my use of limit order data to create a new measure for investor opinion divergence. Section III describes the data used in this study. Section IV presents the methodology for measuring both opinion divergence and the typical proxies for it. Results are discussed in section V. Section VI concludes.

II. Motivation

There are several concerns with using extant proxies of opinion divergence to measure varying investor private valuations. The work of Scherbina (2004) and Michaely and Womack casts doubt on the employ of analysts' forecast variability to proxy opinion divergence. In both papers, analysts' *expressed* opinions may be biased. One explanation offered for this bias is that analysts' wealth may actually benefit, through generated investment banking business and higher ex-post compensation, rather than suffer from false expressions. Taken together, their results suggest that proxies for investor opinion divergence should rely on variables tied specifically to investor behavior, and that the opinion should be expressed by putting wealth at risk.

There are several extant proxies for divergent opinions that are tied to investor actions: bid-ask spreads, volume and stock return volatility. Unfortunately, these proxies may have built in biases as well. For example, volume and stock return volatility carry additional interpretations besides opinion divergence. Volume may reflect liquidity and return volatility may proxy for risk. Moreover, volume and stock return volatility are both measured on the basis of *executed* trades. In some cases, investor valuations may cause orders without executions. In these cases, volume and stock return volatility are measured based on an attenuated sample of private valuations.

Thirdly, this attenuation bias is exacerbated by the use of transaction prices. If an investor's order is not executed, it is arguably because they were unwilling to accept the market price. Thus, execution prices do not accurately reflect all investors' private valuations.

Bid-ask spreads may also suffer from an attenuation bias. While market makers ostensibly see all submitted orders, their duty is to ensure the orderly operation of the market by standing ready to buy or sell on demand. Since limit orders do not require immediate execution, bid-ask spreads may reflect market order requests, rather more than limit order requests. If limit order likelihood is a function of opinions divergence, then spreads may not fully reflect such divergence in opinions.

In sum, when constructing an improved measure for opinion divergence, investor limit order data appears to offer several advantages. Limit orders contain definitive price requests, offering a view into the investor's private valuation. None of the extant literature's proxies contain such information. Moreover, investor orders place their own wealth at risk, while analysts' expressed opinions do not necessarily involve a risk to their wealth. Finally, a limit order probably reflects an opinion that differs from that of marginal investors, otherwise a market order should suffice.[5] Given these advantages, I construct my new measure for investor opinion divergence using proprietary limit order data from the NYSE. I then use my measure to evaluate the incremental explanatory power of proxies that can be constructed using more *readily available* data.

III. Data

I begin with a sample of news related trading halts drawn from the NYSE's trading halt files for the calendar years 1995 and 1996. I select only those halts that meet the following criteria: (i) no opening delays, (ii) no halts prior to 10:00 am, (iii) no halts that remain unresolved

[5] Below, I conduct robustness checks under an alternative characterization of opinion divergence; one that recognizes when market orders may indicate varying private investor valuations.

by the close of trade that day, (iv) no halts where there is another halt within ten trading days on either side, (v) no halts with insufficient data to calculate my measure of opinion divergence (which I discuss in more detail below), and (vi) no halts with less than 30 transactions in the pre-halt control period (used to calculate unexplained volume – see below). The first four restrictions are similar to those found in Corwin and Lipson (2000). The final two restrictions are specific to this study.

The choice of time period (1995 and 1996) deserves discussion. Market mechanisms have changed since then; notably limit orders are now transparent. At first blush, this would seem to reduce the applicability of older data to the study of opinion divergence. However, visibility of limit orders adds an element of strategy to order submissions. More recent data on limit orders reflect both opinions and preferences about how much to reveal regarding those opinions. Distinguishing the two seems difficult at best (Bloomfield, O'Hara and Saar (2003)). Therefore, data prior to disclosure of the limit order book offers advantages.

I construct my measure for opinion divergence using limit orders submitted by individual and institutional traders. The order data includes information on order submission date and time, the number of shares submitted, whether the order is a buy or a sell, the order type, account type (for example, index arbitrage or member trade) and limit order price. Since I am interested in measuring investor opinions, I do not include index arbitrages in the analysis. I also do not use market orders to construct the new measure for investor opinion divergence.[6]

My primary sample includes 150 news related trading halts that meet the above halt criteria. Table 1 presents descriptive statistics on these trading halts. Average halt length is just under 220 minutes, while the median is 210 minutes. Average volume at the re-opening of trade following the halt is 71,509 shares, while the median is 28,850 shares. Finally, the halt engenders

[6] In my robustness checks, I present several alternative perspectives on market orders and private investor valuations. My primary conclusion that unexplained volume is the most robust extant proxy for opinion divergence remains unchanged.

percentage price moves, in absolute value, with a mean of 4.22% and a median of 1.58%. These patterns are broadly consistent with those presented in Corwin and Lipson (2000).

My halt sample is comprised of firms of average size. The mean and median market capitalization decile rankings, based on NYSE cutoffs at the beginning of the halt month, are 6. In other words, the typical firm in my sample is in the 60th percentile of firm size.

Data necessary to construct the usual proxies for opinion divergence (percentage bid-ask spread, forecast variability, unexplained volume, and stock return variability) come from the NYSE's TAQ data and from I/B/E/S. From TAQ I obtain quote data and individual transaction data for the 11 trading day window leading up to and including the halt ([t-10, t] where t is the halt day), including transaction price and number of shares traded. From I/B/E/S I obtain forecasts of annual earnings issued by individual analysts during the calendar days window [t, t+30], where t is the halt day.

It is noteworthy that I do not use analyst forecasts issued prior to the halt, even if it is the latest forecast by a particular analyst, and might therefore be interpreted as "in force" at the time of the halt (and over the next 30 days or until the next forecast). I choose not to include such stale forecasts because of the evidence in McNichols and O'Brien (1997) that analysts tend to drop firms (avoid updating their forecasts), when the new forecast may be lower due to recently revealed information. Since such behavior would mitigate the expression of negative opinions, analyst-based proxies for opinion divergence would be biased if stale forecasts were included in the calculations.[7]

IV. Methods

This section describes the calculation of my measure for opinion divergence and of the extant proxies for it. A common thread runs through the construction of both my measure and the

[7] In my robustness checks, I discuss the effects of including these stale forecasts.

proxies. Specifically, all of my calculations use data that is subsequent to the reopening of trade after the halt. I focus on post-reopening data because I am unable to determine the exact time that the news is revealed during the halt. Therefore, I do not wish to contaminate the new measure or the proxies, with data based on pre-news information, since the news will presumably affect investors' opinions.

A. Measuring Divergence of Investors' Opinions

If investors differ in their opinions about an asset's value, this may manifest itself in varying prices requested in their orders.[8] This line of thinking suggests a simple standard deviation of limit order prices calculation. However, I must control for scale differences[9] and for possible shifts in consensus over time. For example, if I use limit orders posted at 2pm and at 3pm in my calculation, the prices may differ simply because additional information arrived in the market during this intervening hour and shifted consensus. Since I seek deviations in opinion from consensus, I use the percentage difference between the limit order price and the closest *prior* transaction price, as long as they occur within one minute of each other.

$$\%\text{Distance} = \frac{\left(\text{LimitPrice} - \text{PriorTradePrice}\right)}{\text{PriorTradePrice}} \tag{1}$$

Opinion divergence is then the standard deviation (across orders) of %Distance:

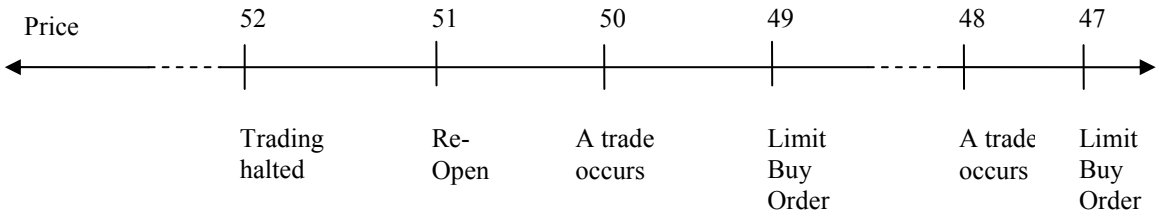
$$\text{DIVOP} = \left[\sum_{i=1}^{N} \frac{(\%\text{Distance}_i - \overline{\%\text{Distance}})^2}{N-1}\right]^{\frac{1}{2}}_{\text{post-halt}} \tag{2}$$

[8] Again, the focus on limit orders is useful here, as they include requested prices whereas market orders do not.

[9] Higher priced stocks with similar opinion divergence in percentage terms would exhibit higher opinion divergence without scaling.

where N is the number of limit orders between the end of the halt and the close of trading that day. I require a minimum of 10 orders to calculate DIVOP. Finally, if %Distance is larger than 25%, suggesting an outlier, I ignore that order in my calculation of DIVOP. [10]

An example using the following time line may be illustrative.



According to the time line, a stock halts for news and the last price before the halt was $52. The stock reopens trade after the halt and the auction at the reopen yields a price of $51. Orders submitted during the halt have an effect on the reopen auction price, but since I cannot discern whether an order occurs before or after the news, I ignore them. After the reopening, orders start arriving. Suppose the next trade is at a price of $50. The following limit order of $49 implies a value of %Distance equal to –2%. Perhaps an hour later, many transactions and orders have occurred and the latest transaction was at $48. A limit order requesting to trade at $47 after this transaction, implies a value of %Distance equal to –2.08%. This is much smaller (in absolute value) than the implied percentage distance from the earlier transaction price of $50, precisely because consensus has apparently shifted over the intervening hour.[11] Given many limit orders between the reopening of trade after the halt and the close of trading that day, I calculate the standard deviation across all limit orders' values of %Distance.

A point about this calculation is noteworthy. I do not include the number of shares ordered in my measure of opinion divergence. This is primarily because I correlate opinion

[10] Indeed, there are several obvious coding errors in the order data. Moreover, Bloomfield, O'Hara and Saar (2003) suggest that some limit orders by informed traders may be far away from the market price, in order to mislead other investors. I choose my rather coarse screen to be conservative. My results are robust to much less restrictive cutoffs such as 100% and 200%.

[11] In my robustness checks, I find that basing %Distance off of the reopening price at the end of the halt has very little effect on my results.

divergence with a volume-based proxy, and I do not wish to risk inducing a false positive correlation between the two. Nevertheless, in my robustness checks, I recognize that larger orders may indeed reflect stronger investor convictions about their personal asset valuation, and I re-calculate the new measure for opinion divergence while weighting larger orders more heavily. My results do not change substantively (see below).

B. Volume-Based Proxy for Opinion Divergence

Numerous papers treat high trading volume as an indicator of divergent investor opinions. Bamber (1987) and Bamber, Barron and Stober (1997, 1999) find that total trading volume is higher around earnings events that are more likely associated with more divergent investor opinions. Ajinkya, Atiase and Gift (2001) document a positive correlation between trading activity and analysts' forecast variability. Kandel and Pearson (1995) find that earnings events that generate no price change, suggesting little reason to trade for information reasons, still cause abnormally large trading volume. They interpret this result as evidence that volume reflects diverging opinions about the value implications of earnings news. Finally, Fleming and Remolona (1999) find that trading volume surges while price volatility and spreads remain wide, as investors in Treasury securities trade to reconcile differential interpretations of macroeconomic information releases.

However, trading volume may proxy for more than just opinion divergence. For example, Benston and Hagerman (1974), Branch and Freed (1977) and Petersen and Fialkowski (1994) all use volume to proxy for liquidity. In other words, high volume after a trading halt may simply be due to the fact that a stock always exhibits large volume. I control for this possibility by subtracting control period volume from volume directly after the halt (see below). If control period volume is a good proxy for liquidity trading, then the difference between volume after the

halt and control period volume should better isolate the volume attributable to divergent opinions.[12]

I measure the change in trading volume as turnover after the halt, minus past average turnover. I use turnover as opposed to raw volume because the latter is correlated with firm size, whereas the former is not (see Gebhardt, Lee and Swaminathan (2001)). I also recognize that longer time periods may be associated with greater volume. Thus, I use volume per unit of time (minutes) in my change in turnover calculation.[13] I label the volume-based proxy for opinion divergence as Unexvol, to reflect its unexplained (by prior trading activity) component.

$$\text{Unexvol} = \left[\frac{\left(\sum_{i=1}^{N} \frac{\text{Vol}_i}{\text{Mins}_i} \right) / \text{N}}{\text{SharesOut}} \right]_{\text{post-halt}} - \left[\frac{\sum_{t=-10}^{-6} \left(\sum_{i=1}^{N} \frac{\text{Vol}_i}{\text{Mins}_i} / \text{N} \right) / 5}{\text{SharesOut}} \right]_{\text{control}} \qquad (3)$$

The post-halt window is from the reopening of trade after the halt to the end of the trading day, to maintain comparability with the new measure for opinion divergence. The control window comprises trading days [t-10, t-6] where t is the halt day. Vol_i is the number of shares traded in transaction i., Mins_i is the number of minutes between the previous trade and this one. N is the number of transactions during either the window from halt-end to end of trading, or during any particular control day. SharesOut is the quantity of shares outstanding on the halt day. If Unexvol is positive, this indicates greater stock turnover than usual.

The control period choice [t-10, t-6] deserves some discussion. I eschew days closer to the halt because many of my halt sample observations are associated with earnings events. Earnings announcement dates are often predictable and typically see a reduction in trading activity just prior to them (see Affleck-Graves, Callahan and Chipalkatti (2002)). Thus, using days closer to the halt as a proxy for typical trading activity may introduce a bias towards

[12] My results are robust if I do not control for prior volume.
[13] In all volume per time calculations, I take the natural log to mitigate concerns about skewness. For ease of exposition, I suppress the log term in my formulae.

abnormally large changes in volume attributed to the halt. I also require at least 30 trades during the entire control period. Given five trading days in this window, fewer than 30 trades to calculate average (typical) trading activity raises concerns about the representativeness of the mean control period volume.

C. Analyst-Based Proxy for Opinion Divergence

Numerous papers use dispersion in analysts' forecasts as a proxy for investor opinion divergence (e.g. Ajinkya, Atiase and Gift (2001), Diether, Malloy and Scherbina (2002)). The presumption is that analysts express their unbiased opinion in their earnings forecasts, and that investors' opinions follow analysts'. I measure analyst forecast dispersion after the trading halt as follows:

$$\sigma_{frcst} = \left\{ \left[\sum_{k=1}^{K} \frac{(Frcst_k - \overline{Frcst})^2}{K-1} \right]_{post\text{-}halt}^{\frac{1}{2}} \right\} / \left| \overline{Frcst} \right| \qquad (4)$$

where $Frcst_k$ is the k'th analyst's forecast of annual earnings per share and $\left|\overline{Frcst}\right|$ is the absolute value of the mean analyst's forecast. Forecasts used are the most recently issued by an analyst within the first 30 days following (and including) the halt day (see data section for details). The 30 day window is consistent with Ajinkya, Atiase and Gift (2001).

One potential concern with forecast variability calculated as in (4) is that mean forecasts near zero generate very large σ_{frcst} measures. To address this concern, I also calculate a second measure of forecast variability by scaling the standard deviation of forecasts by the post-halt (re-opening) stock price. This alternative is labeled σ_{frcst_2}.

D. Stock Return Variability Proxy for Opinion Divergence

Another commonly used proxy for opinion divergence is stock return variability (e.g. Boehme, Danielsen and (2005) and Chen and Cheng (2003)). Also, Harris and Raviv (1993) model the effects of belief dispersion on volume and stock volatility. I calculate a simple measure of return volatility after the halt as follows:

$$\sigma_{\text{returns}} = \left[\sum_{k=1}^{K} \frac{(\text{Ret}_k - \overline{\text{Ret}})^2}{K-1} \right]^{\frac{1}{2}}_{\text{post-halt}} \qquad (5)$$

where k indexes the transactions during the post-halt window (from halt end to end of trading day). The returns used in (5) are transaction to transaction returns.

E. Percentage Bid-Ask Spread Proxy for Opinion Divergence

Houge, Loughran, Suchanek and Yan (2001) suggest that diverging opinions about an IPO may be captured by the percentage opening bid-ask spread. Intuitively, one could argue that if the spread is wide, market makers are indicating greater uncertainty about firm value. If investors exercise more caution in these circumstances, they may prefer submitting limit orders at prices that are more favorable to them than market prices. An alternative view, wherein the direction of causality is reversed, is that greater variation in limit orders (which raises DIVOP) suggests different processing of the news in the halt. Under Kim and Verrecchia (1994), this suggests more informed trader risk and there is a vast market microstructure literature that emphasizes the link between bid-ask spread and adverse selection risk.

There are caveats to the above lines of thought. Wider spreads may encourage individual investors to submit limit orders that are closer to the current market price, in an attempt to pick off trades ahead of the market maker. This would reduce the value of DIVOP (the new measure for opinion divergence) and suggest a negative correlation with spreads. An alternative view (again reversing the direction of causality) is that a preponderance of limit orders far away from

the current price forces the market maker to narrow the spread in an effort to supply liquidity that is not provided by limit orders. Ultimately, it is an empirical question, whether spreads and opinion divergence are positively, negatively or not correlated at all.

My spread based proxy for opinion divergence is based on the percentage bid-ask spread.

$$\%\text{Spread} = \frac{\sum_{i=1}^{N} \frac{(\text{Ask}_i - \text{Bid}_i)}{(\text{Ask}_i + \text{Bid}_i)/2}}{N} \qquad (6)$$

where i indexes the quotes. Thus, %Spread is simply bid-ask spread scaled by the mid-point of the two quotes that define the spread, averaged across all quotes from the end of the halt through the end of the trading day.

F. Descriptive Statistics for Opinion Divergence and Proxies

Table 2 presents mean and median values for the new measure of opinion divergence and the proxies that I relate it to. Most proxies are available for the full sample of 150 observations. However, sufficient analyst data to calculate forecast variability after the halt is only available for 84 observations.

Table 2 indicates that average opinion divergence is 1.58% with a median of 1.15%. This compares with a median (across halt observations) absolute price change during the halt of 1.60%. Table 2 also illustrates that forecast variability measures are much more volatile when scaled by the absolute value of the mean forecast, rather than by the post-halt reopening stock price. Finally, the volume-based proxy for opinion divergence indicates that volume is higher after the halt than during the control period.

V. Results

This section presents my primary results. I begin with raw correlations between my new measure of opinion divergence and the extant proxies. I follow with results on the magnitude of

differences in opinion divergence for high versus low levels of the proxies. This allows an economic interpretation of the relation between opinion divergence and the usual proxies for it. Finally, I present regression results that illustrate the marginal effects of each proxy on opinion divergence.

A. Correlations

Table 3 presents correlations between my new measure of opinion divergence, the extant proxies and two other variables that may affect opinion divergence. These other variables are the magnitude (absolute value) of the news halt return and firm size. The news halt return is the percentage return between the last price preceding the halt and the re-opening price (at the end of the halt). Larger absolute value returns suggest a more significant news event. Firm size is proxied by the decile portfolio that a firm's market value of equity falls within, using cutoffs based on NYSE firm market values at the beginning of the halt month.

Opinion divergence is increasing in all the typical proxies for it. The Pearson correlations are significant with at least 90% confidence. This suggests that there is some support for the use of any of the typical proxies for investor opinion divergence in the empirical returns literature. However as I show below, some proxies are clearly more robust explainers of my new measure for opinion divergence.

I also find that opinion divergence is positively correlated with the absolute value of the return over the news halt, with 99% confidence. Halts with apparently more significant news lead to more divergent investor opinions. This substantiates the focus on trading halts since news halts are often called when the news is substantial, and focusing on high opinion divergence events is akin to looking where the light is good. This result also provides evidence consistent with the theories by Holthausen and Verrecchia (1990) and Kim and Verrecchia (1994).

Finally, investors' opinions appear to be more divergent among smaller stocks. The correlation is negative with 99% confidence. This result may have implications for our understanding of the firm size effect in stock returns. If opinion divergence and ex-post returns are positively related (see Varian (1985)), then the small firm effect may be partially attributable to the association with larger opinion divergence. Clearly, this possibility requires more research, but the initial evidence suggests that such research may be fruitful.

B. Univariate Results on Opinion Divergence Proxy Effectiveness

My univariate tests are conducted separately for each proxy discussed above. Specifically, I partition the sample based on whether the observation is associated with a high or low value of the proxy (above or below the median proxy value for the whole sample), and examine whether mean and median opinion divergence differ significantly across the two sub-samples. Table 4 presents the results.

Opinion divergence is increasing in the change in volume (Unexvol). The mean and median values for the high Unexvol sample are 1.9% and 1.5% respectively, while they are 1.3% and 0.8% respectively for the low Unexvol sample. Greater changes in volume are associated with nearly 50% greater opinion divergence, suggesting a strong economic link between the two. Tests of the null of no difference in the means and medians are rejected at the 1% level.

Opinion divergence is similar across high and low analysts' forecast variability samples, when I measure forecast variability using σ_{frcst}. I cannot reject the null of no difference in opinion divergence between high and low forecast variability groups at the 10% level or better. However, when I measure forecast variability using σ_{frcst_2}, opinion divergence is larger among high forecast variability observations with 95% confidence. Economically, the difference in mean (median) values of opinion divergence between high and low forecast variability samples is about 30% (50%). There appear to be important economic differences in opinion divergence for high versus low analyst forecast variability samples.

Opinion divergence does not appear to vary systematically with stock return variability. Mean and median opinion divergence measures are insignificantly different across the two groups defined by stock return variability (F = 1.7 and $\chi^2 = 0.01$).

Finally, opinion divergence is larger in the sample with high percentage bid-ask spread (%Spread) than in the sample with low %Spread. The differences across groups in both means and medians are over 100%. The tests for differences in central tendency are significant at the 1% levels.

Taken together, the univariate results support the use of percentage bid-ask spread and unexpected volume as proxies for divergent investor opinions. Analyst forecast based proxies perform better when scaled by stock price as opposed to prior mean forecast. The standard deviation of transaction based returns does not perform well.

C. Multivariate Results on Opinion Divergence Proxy Effectiveness

The above results on proxy effectiveness are based on rather coarse classifications of opinion divergence. They also do not control for differences across observations in the length of time investors have to digest the news (before the end of trading that day), nor do they control for the magnitude of the news during the halt or firm size. Table 5 presents OLS regression results illustrating the link between opinion divergence and the standard proxies.[14] I include variables for all three controls mentioned above. The length of the window over which I measure opinion divergence is the number of minutes from the end of the halt to the end of the trading day. The magnitude of news and firm size controls were discussed earlier.[15]

The dependent variable in each regression is my new measure for opinion divergence based on limit orders (DIVOP). Models I and II present regressions with all four typical proxies as regressors. The difference between the two models is the choice of proxy for analyst forecast

[14] T-statistics are calculated using White's (1980) heteroskedasticity corrected standard errors.
[15] My results do not change significantly if I remove these controls.

variability. Model III does not include an explanatory variable for variability in forecasts. This is because data to calculate this regressor is not available for all 150 observations in my sample.

Models I and II offer results essentially confirming the evidence in Table 4. Unexplained volume (Unexvol) is positively correlated with opinion divergence, at the 10% level. The coefficients on Unexvol (0.0386 and 0.0389) carry t-statistics of 1.82 and 1.81. The hypothesis that high volume around news events suggests diverging opinions about firm value continues to receive empirical support. Intuitively, more trading suggests that more investors believe firm value is not accurately reflected in current price, and they trade to take advantage of this discrepancy. The larger number of investors with this view, and/or the greater trading by them, is consistent with greater variation in their opinions.

Models I and II also indicate that opinion divergence is increasing in the average percentage bid-ask spread over the remainder of the day. The coefficients on %Spread (0.38 in both models) are significant at the 1% level (t-statistics = 5.67 and 5.69). Apparently, as opinions diverge among investors, specialists widen the proportional bid-ask spread. This too is intuitively appealing. If investors' opinions are varying, the true value of the asset may be more uncertain. Market makers respond to uncertainty by widening their spread. Viewed from another perspective, wider opinion divergence is also consistent with more informed trades under the model by Kim and Verrecchia (1994). Market makers face greater adverse selection risk in these circumstances and a standard response is to widen the spread.

There is a potential concern with the strength of the relation between percentage bid-ask spread and the new measure for opinion divergence. In particular, both the market maker and other investors are putting out orders based on the current market price, and both DIVOP and percentage bid-ask spread measure the percentage distance between these orders and current price. One way to mitigate this concern is to calculate opinion divergence as the percentage distance between limit order prices and the reopening price at the end of the halt. In this case, the market maker sets spread off of the current market price but DIVOP is "set" off of a different

price. The robustness section contains results based on this new calculation of DIVOP. My conclusions are similar.

The effects of analyst forecast variability proxies (both σ_{frcst} and σ_{frcst_2}) on opinion divergence are not significant. The coefficients on σ_{frcst} (0.0019) and on σ_{frcst_2} (0.0090) both carry t-statistics very close to 1.0. Finally, the regressions in models I and II indicate no significant relation between DIVOP and the standard deviation of stock returns.

Taken together, the results from conducting a "horse race" between proxies for opinion divergence suggest that unexplained volume and bid-ask spread improve upon other proxies. They also suggest that the larger opinion divergence among smaller firms and bigger news events is captured by the usual proxies. The coefficients on both of these controls are insignificant. Finally, the length of time from the halt's end to the end of the trading day does not appear to be a significant determinant of opinion divergence.

The last specification in table 5 does not include analyst forecast variability measures since I do not have sufficient data to calculate these measures for all 150 observations. However, the results are qualitatively similar. Opinion divergence is increasing in percentage bid-ask spread and unexplained volume. It is not significantly correlated with stock return variability. Given the similarity in results, I conduct my robustness checks on the tests in models I and II. This allows me to speak to the large literature that treats analyst forecast variability as a proxy for divergent investor opinions.

D. Robustness

I evaluate the robustness of the results in table 5, to various sample and methodology changes. Sample changes are discussed first. I follow with a discussion of the effects of changes in methodology. Not all of the results discussed below are presented in tabular format. Tables are available from the author on request.

1. Sample Changes.

Some of the trading halts end very close to the end of the trading day. This may not allow much time for orders to be submitted and transactions (which affect volume and returns) to be consummated. I therefore rerun the regressions (models I and II) in table 5, selecting only those halts that end before 3:30pm EDT.[16] The results mirror those documented in table 5. Opinion divergence is increasing in unexplained volume and bid-ask spread, and it is unrelated to forecast variability and stock return volatility. I also select halts that end before 3:00pm EDT with no qualitative change in the results.

I also change the sample of orders used to construct the new measure for opinion divergence. Specifically, I include market orders in the calculation of DIVOP to assess the robustness of the results from models I and II in table 5. In order to calculate opinion divergence using market orders, I make a conservative assumption about the deviation of the order price from the market's consensus price as indicated by the most recent transaction. In particular, I assume that market orders imply opinions which do not differ from the one embodied in the latest trade.[17] In other words, I assume the percentage distance from the previous trade price is zero, which should bias down my measure of opinion divergence relative to the measure when only limit orders are used. My conclusions are unchanged. Opinion divergence is increasing in unexplained volume and bid-ask spread. It is not significantly related to forecast variability or stock return volatility.

I also change the sample that I use to build the two measures of forecast variability (σ_{frcst} and σ_{frcst_2}). Instead of requiring that the forecast be issued after the halt within 30 calendar days, I also include forecasts issued prior to the halt (the latest by each analyst that did not issue within 30 days after the halt). Again, opinion divergence is increasing in unexpected volume and bid-ask spread. It is unrelated to variability in analysts' forecasts and stock returns.

[16] Results available from author on request.
[17] Below, I offer an alternative view of market orders, consistent with Hollifield, Miller, Sandas and Slive (2004), that suggests more extreme private valuations when market orders are used.

2. Methodological Changes.

2.1. Changes in Opinion Divergence and Changes in Proxies.

An alternative view of the relation between opinion divergence and proxies for it may be offered from a time series perspective. Good proxies will see increases in their measure when opinion divergence rises. Using the data in this study, if opinion divergence rises from before to after the halt, proxies should also rise over this window if they are suitable proxies. Table 6 exploits this line of thinking, presenting regressions of changes in opinion divergence on changes in the proxies. There are potential concerns about reduced cross-sectional variation in the dependent variable. Indeed, the adjusted r-squares are lower in these specifications. Nevertheless, my inferences are similar to those based on earlier tests.

I measure change in opinion divergence as the difference between the opinion divergence measured as usual (after the halt until the end of the trading day), and opinion divergence measured during the control period [t-10, t-6]. The change in unexplained volume (dUnexvol) is Unexvol from equation (3) minus Unexvol between the control period [t-10, t-6] and an equal sized window preceding it [t-15, t-11]. The change in forecast variability ($\Delta\sigma_{frcst}$) is the standard deviation of forecasts scaled by the absolute value of the mean forecast from the I/B/E/S month most recently following the halt, minus the same measure calculated from the latest month preceding the halt. $\Delta\sigma_{frcst\_2}$ is the same measure, except standard deviation of forecasts is scaled by the stock's last price before the halt. In models I and II, forecast variability is based on the latest analysts' forecasts that are made or modified in the month following the halt. In models III and IV, forecast variability uses all the latest analysts' forecasts, regardless of whether they were updated in the month following the halt. The change in stock return volatility ($\Delta\sigma_{returns}$) is the standard deviation of returns from the end of the halt to the end of the trading day, minus stock return volatility over the control period [t-10, t-6]. The change in %Spread (d%Spread) is the

average %Spread from the end of the halt to the end of the trading day, minus the same measure associated with the control period.

The inferences that I draw from table 6 are very similar to those based on earlier results. Opinion divergence changes are increasing in changes in unexplained volume and changes in bid-ask spread. In other words, when opinion divergence rises relative to its control period value, unexplained volume and bid-ask spreads are also larger than their control period values. Too, changes in stock return volatility are uncorrelated with changes in opinion divergence. Finally, positive changes in opinion divergence are associated with *negative* changes in forecast variability in models II and III. Again, this raises serious questions about the suitability of forecast variability to proxy for opinion divergence.

2.2. Weighted Measurement of Opinion Divergence.

As noted earlier, my main tests do not include the number of shares in the limit order as part of the calculation of the new measure for opinion divergence. I do this because the limit order size will affect volume if the order is executed, and I do not wish to impart a false positive relation between opinion divergence and unexplained volume. Nevertheless, there is some merit to considering the size of an order as an indication of the strength of the investor's opinion, and so it might justifiably be included in the new measure for opinion divergence. Therefore, as a robustness check, I weight each order in the calculation of DIVOP by the number of shares in the order as a percentage of the total shares in all orders submitted during the calculation window. The weights necessarily sum to one.

Table 7 models I and II, present the results using this shares-weighted measure of opinion divergence. The results are similar to those in table 5. Opinion divergence is increasing in unexplained volume and percentage bid-ask spread. It is unrelated to stock return variability, when I weight larger orders more. In model II (where forecast variability is scaled by pre-halt stock price), opinion divergence is negatively related to analyst forecast variation.

Finally, I offer an alternative to the new measure for opinion divergence, based on the percentage distance of limit order prices from the *reopening* price at the end of the trading halt. Corwin and Lipson (2000) suggest that this reopening price proxies well for consensus as the market clearing price directly after the halt. A potential advantage of this methodology is that opinion divergence is no longer calculated as distance from the current market price, whereas percentage bid-ask spread is. The tradeoff is the possibility that consensus changes over time and thus later limit orders may be closer to consensus than the distance from re-opening price suggests. I attempt to roughly control for this possibility by under-weighting orders that are further away in time from the reopening.

The results from regressions using this new calculation of opinion divergence are presented as models III and IV in table 7. I continue to find that opinion divergence is larger when percentage bid-ask spread is larger. This suggests that investor opinion divergence is well proxied by spreads and that this relation is not likely to be "hard-wired" in the main tests. I also continue to see a positive relation between opinion divergence and unexplained volume. Stock return volatility and analyst forecast variability are now negatively related to opinion divergence.

E. Two Alternative Views

1. Non Halt Results

A potential concern about the conclusions presented thus far is that my tests are based on opinion divergence immediately after news related trading halts. This raises questions about whether the proxies perform similarly in explaining opinion divergence at times without a news related halt. I address this question in table 8.

The table presents results from regressions of my new measure of opinion divergence on the extant, where the dependent and independent variables are all taken from *prior to* the trading halt, specifically days [t-10, t-6] where t is the halt day. Presumably, these days are rather closer

to the average day for an average stock, enhancing our confidence about generalizing the results to all stocks. The specifications mimic those in table 5, except there is no information about the length of the halt nor about the return over the trading halt.

The results continue to indicate that opinion divergence and unexplained volume are positively correlated. We also see that opinion divergence and analysts' forecast variability continue to be uncorrelated in a multivariate setting. Two new results emerge as well. Opinion divergence and stock return volatility are positively correlated during the control period. However, opinion divergence and %Spread are no longer significantly related to each other.

Taken together, the results in table 8 affirm the conclusion that unexplained volume is a good proxy for opinion divergence, even when there has not been a news related halt. They also support the contention that analysts' forecast variability is a weaker proxy for opinion divergence when other proxies are available. At the same time, table 8's results call into question the conclusion that percentage bid-ask spread is a good proxy for opinion divergence at times other than after news related trading halts. Finally, it appears that stock return volatility may be a good proxy for opinion divergence when there has not been a news related trading halt.

2. Market Orders as Extreme Private Valuations

Up to now, I have treated limit orders as indications of more extreme private valuations than market orders. However, a credible case can be made for reversing this assumption. Hollifield, Miller, Sandas and Slive (2004) offer a model wherein extreme private valuations are more likely to engender market orders than limit orders. They argue that orders reflect concerns with execution risk that must be balanced with private valuations. If an investor believes that the stock is significantly misvalued, they may choose to submit a market order since a limit order may not always get executed.

Consistent with Hollifield et al. (2004), I construct an alternative to my measure of opinion divergence, by setting %Distance (equation 1) equal to –25% (+25%) for market sell (buy) orders, and recalculating my metric. The choice of 25% as the absolute value of %Distance

is based on my cutoffs for extreme limit orders described in section IV.A. My results are very similar, and my conclusions unchanged, if I set %Distance equal to 10% (in absolute value) for market orders.

Using this alternative characterization of market orders, I re-run the regressions presented in table 5. My results continue to indicate that unexplained volume is positively related to opinion divergence (with 99% confidence). However, I now find that none of the other extant proxies is positively related to opinion divergence. This suggests that unexplained volume is the most robust indicator of opinion divergence *using readily available data*.

VI. Conclusions

This paper examines the empirical validity of extant proxies for opinion divergence. I derive a new measure for opinion divergence using investors' expressions of interest in stocks through their limit orders. Opinion divergence appears to be increasing in the magnitude of the news released during the halt and decreasing in firm size. These results are consistent with theoretical work on heterogeneous opinions and buttress the contention that my new measure is sound. In simple tests of correlation my new measure is positively related to all four of the following proxies: percentage bid-ask spread, unexplained volume, stock return volatility, and variability in analysts' forecasts. However, this result obscures the more interesting evidence comparing the marginal explanatory power of each proxy for the new measure.

In multivariate regressions designed to ascertain which of the four proxies performs best, only spreads and unexplained volume carry incremental explanatory power. These tests suggest that variability in stock returns and analysts' forecasts are weaker proxies. Time series based tests support the concern with analyst forecast variability as a proxy for opinion divergence; changes in the new measure of opinion divergence are *declining* in changes in the standard deviation of analysts' forecasts.

Ancillary tests using data from prior to the news related halt, affirm the conclusions that unexplained volume is a strong proxy and that analysts' forecasts are weaker proxies. These same tests also suggest that stock return volatility may be a good proxy for opinion divergence at more normal times, and that bid-ask spreads may be a poor proxy during normal trading windows. Finally, tests treating market orders as indicators of extreme private valuations (following Hollifield et al. (2004)) suggest again that unexplained volume is the most robust extant proxy for opinion divergence.

My results have implications for the study of asset returns. The negative relationship between firm size and opinion divergence, and the small firm effect in stock returns, suggests a positive link between opinion divergence and ex-post returns. Other studies document evidence consistent with this. Garfinkel and Sokobin (2005) find that post-earnings announcement returns are increasing in the unexplained volume proxy for opinion divergence at the earnings event. Boehme, Danielson and Sorescu (2005) show that when stocks are not short-sale constrained, ex-post returns appear to be increasing in a portmanteau proxy for opinion divergence. Clearly more work is necessary before stronger interpretations are possible, but these results suggest that such work could be fruitful.

My results suggest other opportunities for future work. One interesting question is why forecast variability performs poorly as a proxy for opinion divergence. Perhaps the well documented bias in analysts' coverage leads investors to reduce their reliance on such opinions. Alternatively, analysts' slower updating (or at least slower reporting of updated opinions) may be to blame.

Further work should also be conducted focusing on opinion divergence associated with securities traded on NASDAQ, as my results are based on a sample of NYSE stocks. In particular, the unique specialist system on NYSE may lead to faster opinion convergence than on NASDAQ (see Hasbrouck (1995) and Garfinkel and Nimalendran (2003) for studies of the effects of market structure on price discovery).

Finally, while this paper is the first to use investors' orders to derive the new measure for investors' opinion divergence, work in this area remains. For example, my data necessarily focus attention on investors who believe strongly enough to submit orders for trade. Perhaps experimental work can help us understand the strength of my new measure in this paper relative to a more complete one that employs different information sets given to different potential investors, not all of whom choose to submit orders.

REFERENCES

Affleck-Graves, J., C. Callahan and N. Chipalkati, 2002, "Earnings predictability, information asymmetry, and market liquidity," *Journal of Accounting Research*, 40, 561-583.

Ajinkya, B.B., R.K. Atiase and M. Gift, 2001, "Heterogeneous prior beliefs, differential interpretation of quarterly earnings signals and trading volume," *working paper*, University of Texas at Austin, Austin, TX.

Bamber, L., 1987, "Unexpected earnings, firm size and trading volume around quarterly earnings announcements," *The Accounting Review*, 62, 510-532.

Bamber, L., O. Barron and T. Stober, 1997, "Trading volume and different aspects of disagreement coincident with earnings announcements," *The Accounting Review*, 72, 575-597.

_____,1999, "Differential interpretations and trading volume," *Journal of Financial and Quantitative Analysis*, 34, 369-386.

Benston, G. and R. Hagerman, 1974, "Determinants of bid-ask spreads in the over-the-counter market," *Journal of Financial Economics*, 1, 353-364.

Bloomfield, R., M. O'Hara and G. Saar, 2003, "The 'make or take' decision in an electronic market: Evidence on the evolution of liquidity," forthcoming *Journal of Financial Economics*.

Boehme, R. D., B. R. Danielson, S. M. Sorescu, 2005, "Short-sale constraints, dispersion of opinion and overvaluation," forthcoming *Journal of Financial and Quantitative Analysis.*

Branch, B. and W. Freed, 1977, "Bid-asked spreads on the AMEX and the big board," *The Journal of Finance*, 32, 159-163.

Chen, X. and Q. Cheng, 2003, "What determines the market impact of stock recommendations?," *working paper*, University of Washington.

Chen, J., H. Hong and J. Stein, 2002, "Breadth of ownership and stock returns," *Journal of Financial Economics*, 66, 171-205.

Corwin, S. A. and M. L. Lipson, 2000, "Order flow and liquidity around NYSE trading halts," *The Journal of Finance*, 55, 1771-1801.

Danielson, B. and S. Sorescu, 2001, "Why do option introductions depress stock prices? A study of diminishing short sale constraints," *Journal of Financial and Quantitative Analysis*, 36, 451-484.

Deither, K.B., C.J. Malloy and A. Scherbina, 2002, "Differences of opinion and the cross-section of stock returns," *The Journal of Finance*, forthcoming October 2002.

Ellis, K., R. Michaely, M. O'Hara, 2000, "The accuracy of trade classification rules: Evidence from Nasdaq," *Journal of Financial and Quantitative Analysis*, 35, 529-551.

Fleming, M. and E. Remolona, 1999, "Price formation and liquidity in the U.S. Treasury market: the response to public information," *The Journal of Finance*, 54, 1901-15.

Garfinkel, J.A. and M. Nimalendran, 2003, "Market structure and trader anonymity: An analysis of insider trading," *Journal of Financial and Quantitative Analysis*, 38, 591-610.

Garfinkel, J.A. and J. S. Sokobin, 2005, "Volume, opinion divergence and returns: A study of post-earnings announcement drift," *working paper*, University of Iowa, Iowa City, IA.

Gebhardt, W., C. Lee, and B. Swaminathan, 2001, "Toward an implied cost of capital," *Journal of Accounting Research*, 39, 135-176.

Goetzmann, W. and M. Massa, 2001, "Dispersion of opinions and stock returns: Evidence from index mutual fund investors," *working paper*, Yale University, New Haven, CT.

Graham, J., J. Koski, and U. Loewenstein, 2005, "Information flow and liquidity around anticipated and unanticipated dividend announcements," *forthcoming Journal of Business* (2006).

Harris, L, and J. Hasbrouck, 1996, "Market vs. limit orders: The SuperDOT evidence on order submission strategy," *Journal of Financial and Quantitative Analysis*, 31, 213-231.

Harris, M. and A. Raviv, 1993, "Differences of opinion make a horse race," *Review of Financial Studies*, 6, 473-506.

Hasbrouck, J., 1995, "One security, many markets: Determining the contributions to price discovery," *The Journal of Finance*, 50, 1175-1199.

Hollifield, B., R. Miller, P. Sandas, and J. Slive, 2004, "Estimating the gains from trade in limit order markets," *working paper*, The Wharton School.

Holthausen, R. and R. Verrecchia, 1990, "The effect of informedness and consensus on price and volume behavior," *The Accounting Review*, 65, 191-208.

Hong, H. and J. Stein, 1999, "A unified theory of underreaction, momentum trading and overreaction in asset markets," *The Journal of Finance*, 54, 2143-2185.

Houge, T., T. Loughran, G. Suchanek, and X. Yan, 2001, "Divergence of opinion, uncertainty and the quality of initial public offerings," *Financial Management*, 30, 5-23.

Jarrow, R., 1980, "Heterogeneous expectations, restrictions on short sales and equilibrium asset prices," *The Journal of Finance*, 35, 1105-1114.

Kandel, E. and N. Pearson, 1995, "Differential interpretation of public signals and trade in speculative markets," *Journal of Political Economy*, 103, 831-872.

Kaniel, R., and H. Liu, 2004, "So what orders do informed traders use?," forthcoming *Journal of Business* (2006).

Karpoff, J., 1987, "The relation between price changes and trading volume: A survey," *Journal of Financial and Quantitative Analysis*, 22, 109-126.

Kim, O., and R. Verrecchia, 1994, "Market liquidity and volume around earnings announcements," *Journal of Accounting and Economics*, 17, 41-67.

Mayshar, J., 1982, "On divergence of opinion and imperfections in capital markets," *American Economic Review*, 73, 114-128.

McNichols, M. and P. O'Brien, 1997, "Self-selection and analyst coverage," *Journal of Accounting Research*, 35 supplement, 167-199.

Miller, E., 1977, "Risk, uncertainty, and divergence of opinion," *The Journal of Finance*, 32, 1151-1168.

Odders-White, E, 2000, "On the occurrence and consequences of inaccurate trade classification," *Journal of Financial Markets,* 3, 259-286.

Petersen, M.A. and D. Fialkowski, 1994, "Posted versus effective spreads: Good prices or bad quotes?," *Journal of Financial Economics*, 35, 269-292.

Scherbina, A., 2004, "Analyst disagreement, forecast bias and stock returns," *working paper*, Harvard Business School.

Varian, H., 1985, "Divergence of opinion in complete markets: A note," *The Journal of Finance*, 40, 309-317.

White, H., 1980, "A heteroskedasticity consistent covariance matrix estimator and direct test for heteroskedasticity," *Econometrica*, 48, 817-838.

Williams, J., 1977, "Capital asset prices with heterogeneous opinion," *Journal of Financial Economics*, 5, 219-241.

Table 1
Descriptive Statistics on News Related Trading Halts

The sample is all news related trading halts for NYSE-listed common stocks during 1995 and 1996 that meet the additional following criteria. No opening delays, no halts prior to 10:00 am, no halts that remain unresolved by the close of trade that day, no halts where there is another halt within ten trading days on either side, no halts with insufficient order data (less than 10 orders) to calculate opinion divergence. Halt length is defined as number of minutes from beginning of halt to the reopening trade. Reopening volume is total number of shares traded at the auction that is conducted when the stock reopens trade. Absolute percentage price change is the absolute value of the percent difference between the last trade price before the halt is called and the reopening auction price. Size portfolio is the decile portfolio that the firm falls within based on its market value of equity at the beginning of the halt month, relative to cutoffs based on the sample of NYSE stocks in that month. Market value of equity is the value at the beginning of the halt month, in 1000s.

Variable	Mean	Median	Std. Deviation	N
Halt Length (in minutes)	219.90	210.60	80.96	150
Reopening volume	71509.33	28850.00	128765.21	150
Absolute price change (%)	4.22	1.58	6.80	150
Size Portfolio	6.13	6.00	2.77	150
Market Value of Equity (000s)	2782.40	979.80	3951.30	150

Table 2
Opinion Divergence and Proxies

The sample is all news related trading halts for NYSE-listed common stocks during 1995 and 1996 that meet the additional following criteria. No opening delays, no halts prior to 10:00 am, no halts that remain unresolved by the close of trade that day, no halts where there is another halt within ten trading days on either side, no halts with insufficient order data (less than 10 orders) to calculate opinion divergence. Opinion divergence (DIVOP) is the standard deviation of percent difference between limit order price and latest prior transaction price. Unexplained volume (Unexvol) is turnover per unit time from halt-end to end of trading day, minus turnover per unit time calculated over the control period window [t-10, t-6]. Forecast variability (σ_{frcst}) is the standard deviation of forecasts scaled by the absolute value of the mean forecast from the I/B/E/S month most recently following the halt. σ_{frcst_2} is the same measure, except standard deviation of forecasts is scaled by the stock's last price before the halt. Standard deviation of returns ($\sigma_{returns}$) is the standard deviation of transaction-to-transaction returns from the end of the halt to the end of trading on the halt day. Percentage spread is quoted bid-ask spread scaled by quote midpoint, averaged across all quotes from the end of the halt to the end of trading on the halt day.

Variable	Mean	Median	Std Dev	N
Opinion Divergence	.01576	.01153	.01372	150
Unexplained volume (Unexvol)	.07587	.02609	.13572	150
Forecast variability: (σ_{frcst})	.14971	.07666	.25601	84
Forecast variability2: (σ_{frcst_2})	.01046	.00344	.02929	84
Standard deviation of returns: ($\sigma_{returns}$)	.12416	.06427	.16628	150
Percentage Spread: (%Spread)	.02143	.01628	.01949	150

Table 3
Correlations

Table presents Pearson correlations. The sample is all news related trading halts for NYSE-listed common stocks during 1995 and 1996 that meet the additional following criteria. No opening delays, no halts prior to 10:00 am, no halts that remain unresolved by the close of trade that day, no halts where there is another halt within ten trading days on either side, no halts with insufficient order data (less than 10 orders) to calculate opinion divergence, sufficient information to calculate unexplained volume (at least 30 trades during the control period). Opinion divergence (DIVOP) is the standard deviation of the percent difference between limit order price and latest prior transaction price. $|\text{Haltret}\%|$ is the absolute value of the return over the halt (percentage difference between last price before halt and re-open price). Unexplained volume (Unexvol) is turnover per unit time from end of halt to end of trading day, minus turnover per unit time calculated over the control period window [t-10, t-6]. Forecast variability (σ_{frcst}) is the standard deviation of forecasts scaled by the absolute value of the mean forecast from the I/B/E/S month most recently following the halt. σ_{frcst_2} is the same measure, except standard deviation of forecasts is scaled by the stock's last price before the halt. Standard deviation of returns ($\sigma_{returns}$) is the standard deviation of transaction-to-transaction returns from the end of the halt to the end of trading on the halt day. Percent spread (%Spread) is bid-ask spread scaled by quote midpoint, averaged over all quotes from the end of the halt to end of trading on the halt day. Size portfolio (SizePF) is the decile portfolio that the firm falls within based on its market value of equity at the beginning of the halt month, relative to cutoffs based on the sample of NYSE stocks in that month. [a,b,c] significant at 10%, 5%, 1% levels.

	DIVOP	$\lvert\text{Haltret}\%\rvert$	SizePF	Unexvol	σ_{frcst}	σ_{frcst_2}	$\sigma_{returns}$	%Spd
DIVOP	1	.270[c]	-.536[c]	.239[c]	.236[b]	.200[a]	.179[b]	.807[c]
$\lvert\text{Halt Re t}\%\rvert$		1	-.380[c]	.418[c]	.114	.117	-.133	.246[c]
SizePF			1	-.534[c]	-.335[c]	-.293[c]	-.073	-.598[c]
Unexvol				1	.346[c]	.390[c]	-.116	.138[a]
σ_{frcst}					1	.836[c]	-.008	.169
σ_{frcst_2}						1	-.012	.138
$\sigma_{returns}$							1	.263[c]
%Spread								1

Table 4
Univariate Results
The Relation Between Opinion Divergence and Proxies

Table presents means and medians of opinion divergence categorized by whether the proxy for opinion divergence is high or low. Categorization is based on whether the trading halt observation has a proxy value that exceeds the median proxy value. Opinion divergence (DIVOP) is the standard deviation of the percent difference between limit order price and latest prior transaction price. Unexplained volume (Unexvol) is turnover per unit time from end of halt to end of trading day, minus turnover per unit time calculated over the control period window [t-10, t-6]. Forecast variability (σ_{frcst}) is the standard deviation of forecasts scaled by the absolute value of the mean forecast from the I/B/E/S month most recently following the halt. σ_{frcst_2} is the same measure, except standard deviation of forecasts is scaled by the stock's last price before the halt. Standard deviation of returns ($\sigma_{returns}$) is the standard deviation of transaction-to-transaction returns from the end of the halt to the end of trading on the halt day. Percent spread (%Spread) is bid-ask spread scaled by quote midpoint, averaged over all quotes from the end of the halt to end of trading on the halt day. [a,b,c] significant at 10%, 5%, 1% levels.

		Proxy Level		Test of
Proxy		Low	High	Difference
Unexvol	mean opinion divergence	.01272	.01881	$F = 7.711^{c}$
	median opinion divergence	.00823	.01510	$\chi^2 = 17.90^{c}$
σ_{frcst}	mean opinion divergence	.01151	.01247	$F = 0.319$
	median opinion divergence	.00950	.01020	$\chi^2 = 0.349$
σ_{frcst_2}	mean opinion divergence	.01029	.01370	$F = 4.180^{b}$
	median opinion divergence	.00794	.01281	$\chi^2 = 5.410^{b}$
$\sigma_{returns}$	mean opinion divergence	.01429	.01724	$F = 1.741$
	median opinion divergence	.01248	.01111	$\chi^2 = 0.007$
%Spread	mean opinion divergence	.00874	.02279	$F = 53.17^{c}$
	median opinion divergence	.00735	.01736	$\chi^2 = 58.77^{c}$

Table 5
Multivariate Results
The Relation Between Opinion Divergence and Proxies

Table presents regressions of opinion divergence on control variables and proxies for opinion divergence. Opinion divergence (DIVOP) is the standard deviation of the percent difference between limit order price and latest prior transaction price. Proxies: Unexplained volume (Unexvol) is turnover per unit time from end of halt to end of trading day, minus turnover per unit time calculated over the control period window [t-10, t-6]. Forecast variability (σ_{frcst}) is the standard deviation of forecasts scaled by the absolute value of the mean forecast from the I/B/E/S month most recently following the halt. (σ_{frcst_2}) is the same measure, except standard deviation of forecasts is scaled by the stock's last price before the halt. Standard deviation of returns ($\sigma_{returns}$) is the standard deviation of transaction-to-transaction returns from the end of the halt to the end of trading on the halt day. Percent spread (%Spread) is bid-ask spread scaled by quote midpoint, averaged over all quotes from the end of the halt to end of trading on the halt day. Control variables: Halt length is the number of minutes from end of halt window to end of trading day. $|\text{Haltret\%}|$ is the absolute value of the return over the halt (percentage difference between last price before halt and re-open price). Size PF is the decile portfolio that the firm falls within based on its market value of equity at the beginning of the halt month, relative to cutoffs based on the sample of NYSE stocks in that month. [a,b,c] significant at 10%, 5%, 1% levels. T-statistics calculated with White-corrected standard errors.

	I	II	III
Intercept	.0062 (1.21)	.0067 (1.32)	.0019 (0.46)
σ_{frcst}	.0019 (1.04)	------	------
σ_{frcst_2}	------	.0090 (0.86)	------
Unexvol	.0335[a] (1.82)	.0337[a] (1.81)	.0100[a] (1.79)
$\sigma_{returns}$	-.0055 (-1.49)	-.0055 (-1.49)	-.0002 (-0.04)
%Spread	.3839[c] (5.67)	.3827[c] (5.69)	.5449[c] (10.51)
Halt Length	-.000002 (-0.20)	-.000002 (-0.20)	.000001 (0.81)
$\lvert\text{Halt Ret\%}\rvert$	-.0324[a] (-1.69)	-.0325[a] (-1.67)	.0098 (0.69)
Size PF	-.0001 (-0.13)	-.0001 (-0.22)	-.0001 (-0.37)
N	84	84	150
Adj. R^2	.4732	.4705	.6585
F-statistic	11.65[c]	11.53[c]	48.88[c]

Table 6
Multivariate Results
The Relation Between Changes in Opinion Divergence and Changes in Proxies

Table presents regressions of changes in opinion divergence on control variables and changes in proxies for opinion divergence. Change in opinion divergence is the difference between opinion divergence measured after the halt (until the end of the trading day) and opinion divergence measured during the control period [t-10, t-6]. Opinion divergence (DIVOP) is the standard deviation of the percent difference between limit order price and latest prior transaction price. Proxies: dUnexvol (change in unexplained volume) is ΔVol from equation (3) minus ΔVol between the control period [t-10, t-6] and an equal sized window preceding it [t-15, t-11]. Change in Forecast variability ($\Delta\sigma_{frcst}$) is the standard deviation of forecasts scaled by the absolute value of the mean forecast from the I/B/E/S month most recently following the halt, minus the same measure calculated from the latest month preceding the halt. $\Delta\sigma_{frcst\_2}$ is the same measure, except standard deviation of forecasts is scaled by the stock's last price before the halt. In models I and II, forecast variability is based on latest analysts' forecasts that are made or modified in the month following the halt. In models III and IV, forecast variability uses all the latest analysts' forecasts, regardless of whether they were updated in the month following the halt. Change in Standard deviation of returns ($\Delta\sigma_{returns}$) is the standard deviation of transaction-to-transaction returns from end of halt to end of trading day, minus the same measure associated with the control period. Change in %Spread (d%Spread) is the average %Spread from end of halt to end of trading day, minus the same measure associated with the control period. Control variables: Halt length is the number of minutes from end of halt window to end of trading day. $|\text{Haltret\%}|$ is the absolute value of the return over the halt (percentage difference between last price before halt and re-open price). Size PF is the decile portfolio that the firm falls within based on its market value of equity at the beginning of the halt month, relative to cutoffs based on the sample of NYSE stocks in that month. [a,b,c] significant at 10%, 5%, 1% levels. T-statistics calculated with White-corrected standard errors.

	I	II	III	IV
Intercept	-.0081 (-1.48)	-.0073 (-1.30)	-.0007 (-0.16)	-.0016 (-0.35)
$\Delta\sigma_{frcst}$	-.0049 (-1.47)	-------	-.0043[c] (-2.85)	-------
$\Delta\sigma_{frcst\_2}$	-------	-.0903[c] (-11.31)	-------	-.0087 (-0.14)
dUnexvol	.0523[b] (2.62)	.0538[c] (2.72)	.0276[b] (2.50)	.0239[b] (2.34)
$\Delta\sigma_{returns}$	.0026 (0.59)	.0036 (0.85)	-.0010 (-0.26)	-.0001 (-0.03)
d(%Spread)	.2837[c] (4.51)	.2580[c] (3.55)	.4091[c] (3.38)	.4178[c] (3.11)
Halt Length	.00002[a] (1.95)	.00002[b] (2.20)	.00001 (0.53)	.00001 (0.62)
$\lvert\text{Halt Ret\%}\rvert$	-.0506 (-1.40)	-.0207 (-0.77)	-.0251 (-1.60)	-.0082 (-0.50)
Size PF	.0002 (0.36)	-.00001 (-0.01)	-.0003 (-0.67)	-.0003 (-0.62)
N	50	50	114	114
Adj. R^2	.2161	.3767	.2378	.1861
F-statistic	2.93[b]	5.23[c]	6.04[c]	4.69[c]

Table 7
Multivariate Results
The Relation Between Opinion Divergence and Proxies
(Opinion Divergence Weighted by Shares Traded or Time from Re-Open)

Table presents regressions of opinion divergence on control variables and proxies for opinion divergence. In models I and II, opinion divergence (DIVOP) is the standard deviation of the percent difference between limit order price and latest prior transaction price, weighted by number of shares requested in the limit order. In models III and IV, opinion divergence (DIVOP) is the standard deviation of the percent difference between limit order price and re-open price at end of halt, weighted by the number of minutes between the order time and the re-opening of trade after the halt. (The weight is actually the inverse of, the number of minutes from halt-end to order, scaled by the sum of this measure across all orders in that stock on that day). Proxies: Unexplained volume (Unexvol) is turnover per unit time from end of halt to end of trading day, minus turnover per unit time calculated over the control period window [t-10, t-6]. Forecast variability (σ_{frcst}) is the standard deviation of forecasts scaled by the absolute value of the mean forecast from the I/B/E/S month most recently following the halt. (σ_{frcst_2}) is the same measure, except standard deviation of forecasts is scaled by the stock's last price before the halt. Standard deviation of returns ($\sigma_{returns}$) is the standard deviation of transaction-to-transaction returns from the end of the halt to the end of trading on the halt day. Percent spread (%Spread) is bid-ask spread scaled by quote midpoint, averaged over all quotes from the end of the halt to end of trading on the halt day. Control variables: Halt length is the number of minutes from end of halt window to end of trading day. $|\text{Haltret\%}|$ is the absolute value of the return over the halt (percentage difference between last price before halt and re-open price). Size PF is the decile portfolio that the firm falls within based on its market value of equity at the beginning of the halt month, relative to cutoffs based on the sample of NYSE stocks in that month. [a,b,c] significant at 10%, 5%, 1% levels. T-statistics calculated with White-corrected standard errors.

	I	II	III	IV
Intercept	.0082 (1.37)	.0080 (1.32)	.0081 (1.50)	.0072 (1.34)
σ_{frcst}	-.0013 (-0.53)	-------	-.0035[b] (-2.09)	-------
σ_{frcst_2}	-------	-.0275[b] (-2.59)	-------	-.0336[c] (-2.69)
Unexvol	.0354[a] (1.67)	.0399[a] (1.89)	.0497[b] (2.08)	.0532[b] (2.22)
$\sigma_{returns}$	-.0031 (-0.64)	-.0030 (-0.63)	-.0094[b] (-2.44)	-.0094[b] (-2.44)
%Spread	.3143[c] (4.37)	.3137[c] (4.29)	.3803[c] (6.43)	.3813[c] (6.36)
Halt Length	-.00001 (-0.62)	-.00001 (-0.60)	.000001 (0.08)	.000001 (0.10)
$\lvert\text{Halt Ret\%}\rvert$	-.0549[c] (-2.67)	-.0540[b] (-2.62)	-.0455[a] (-1.74)	-.0447[a] (-1.74)
Size PF	-.00001 (-0.02)	.00001 (0.01)	-.0002 (-0.45)	-.0002 (-0.33)
N	84	84	84	84
Adj. R^2	.2560	.2633	.4476	.4494
F-statistic	5.08[c]	5.24[c]	10.72[c]	10.79[c]

Table 8
Multivariate Results
The Relation Between Opinion Divergence and Proxies
Control Period [t-10, t-6] Variable Values

Table presents regressions of opinion divergence on control variables and proxies for opinion divergence. Opinion divergence (DIVOP) is the standard deviation of the percent difference between limit order price and latest prior transaction price. Proxies: Unexplained volume (Unexvol) is turnover per unit time over the control period window [t-10, t-6], minus turnover per unit time calculated over the window [t-15, t-11]. Forecast variability (σ_{frcst}) is the standard deviation of forecasts scaled by the absolute value of the mean forecast from the I/B/E/S month most recently preceding the halt. (σ_{frcst_2}) is the same measure, except standard deviation of forecasts is scaled by the stock's last price before the halt. Standard deviation of returns ($\sigma_{returns}$) is the standard deviation of transaction-to-transaction returns over the window [t-10, t-6]. Percent spread (%Spread) is bid-ask spread scaled by quote midpoint, averaged over all quotes during the window [t-10, t-6]. Size PF is the decile portfolio that the firm falls within based on its market value of equity at the beginning of the halt month, relative to cutoffs based on the sample of NYSE stocks in that month. [a,b,c] significant at 10%, 5%, 1% levels. T-statistics calculated with White-corrected standard errors.

	I	II	III
Intercept	.0091 (1.41)	.0098 (1.53)	.0067 (2.39)[b]
σ_{frcst}	.0004 (0.26)	------	------
σ_{frcst_2}	------	.0309 (0.84)	------
Unexvol	.0026 (2.37)[b]	.0026 (2.38)[b]	.0014 (2.20)[b]
$\sigma_{returns}$	1.1768 (2.29)[b]	1.0947 (2.19)[b]	1.1102 (2.88)[c]
%Spread	.1363 (0.90)	.1231 (0.81)	.1730 (1.51)
Size PF	-.0005 (-0.73)	-.0005 (-0.82)	-.0002 (-0.58)
N	66	66	150
Adj. R^2	.4560	.4594	.6500
F-statistic	11.90[c]	12.05[c]	70.17[c]