DePaul University

From the SelectedWorks of Ali M Fatemi

February, 2008

Complexity of Information and Trading Behavior: The Case of Dividend Increase Announcements

Ali M Fatemi, *DePaul University*
Sanjay Deshmukh, *DePaul University*
Iraj Fooladi, *Dalhousie University*

Available at: https://works.bepress.com/alifatemi/1/

bepress™

COMPLEXITY OF INFORMATION AND TRADING BEHAVIOR: The Case of Dividend Increase Announcements

Sanjay Deshmukh,[a] Ali Fatemi,[a,*] and Iraj J. Fooladi[b]

[a] Department of Finance, DePaul University, Chicago, IL 60604.
[b] School of Business Admin., Dalhousie University, Halifax, Nova Scotia, B3H 3J5.

Abstract

We examine the intraday trading response of participants in the common stock market and in the preferred stock market to announcements of dividend increases on common stock. We find that participants in the preferred stock market respond more slowly to the announcement than those in the common stock market. Our results are consistent with the implications of Heiner's model of behavior under uncertainty, which suggest that investors who face a more complicated environment respond more slowly to new information. Participants in the preferred stock market face a more complicated environment because they have to determine the source of financing of the dividend increase, which can either increase or decrease the value of these securities. In contrast, regardless of how it is financed, a dividend increase has an unambiguous positive effect on the value of common shares. Therefore, the participants in the common stock market do not need to make the additional determination that preferred shareholders do, and, thus, need less time to analyze the information.

JEL classification: D81, G14
Keywords: Heiner's model, investor behavior, dividend increases, trading response

*Corresponding author: Ali Fatemi, Department of Finance, DePaul University, 1 East Jackson Blvd., Chicago, IL 60604. Tel: (312) 362-8826. Fax: (312) 362-6566. E-mail: afatemi@depaul.edu

COMPLEXITY OF INFORMATION AND TRADING BEHAVIOR: The Case of Dividend Increase Announcements

I. Introduction

Examining the reaction of financial markets to various micro and macro events has been the subject of numerous studies. The main purpose of these studies is to investigate the degree of market efficiency by measuring how quickly and accurately do prices respond to new information.

The vast bulk of empirical studies provides support for the efficient market hypothesis (EMH[1]), and suggests that "on average stock prices adjust quickly to information about investment decisions, dividend changes, changes in capital structure, and corporate control transactions."[2] Some studies report evidence in support of an almost instantaneous reaction to new information. For example, Patell and Wolfson (1984) report that a significant part of the price reaction to announcements of earnings or changes in dividends takes place within ten minutes of the announcement.[3]

Whenever empirical findings run counter to the predictions of the efficient market hypothesis, many researchers attribute their results to market imperfections (or frictions) such as regulations, taxes, or transaction costs, and introduce the phenomenon as an anomaly.[4] A common element in many of these studies, whether they provide evidence supporting market efficiency or otherwise, is the implication that the market consists of homogenous investors with similar abilities to decipher information. These studies typically do not consider differences in the abilities

---

[1] The EMH (or the Efficient Market Hypothesis) postulates that security prices reflect all available information about a company. If markets are efficient, then prices must be fairly set (given all available information), and they must change only in response to new information.

[2] Fama, E. F. "Efficient Capital Markets: II," *Journal of Finance*, 1991, 46, 1575 – 1617.

[3] Some researchers, however, report anomalous evidence, such as the post-earnings announcement drift, the small firm effect, and the January effect, which contradicts the predictions of the EMH.

[4] Information acquisition costs and the well-known "joint hypothesis problem" would complicate both the tests and the interpretation of these results. If one uses an asset-pricing model to estimate the price of a security based on available information, and the result is different from the observed market price, then the prediction would be that the market price will have to change to adapt to the price estimate from the asset-pricing model. When this price adjustment does not happen quickly, one may conclude that the market is not efficient. An alternative conclusion would be that the asset-pricing model is not valid. Thus, testing the EMH is a joint test of market efficiency and the validity of the underlying asset-pricing model. When the test fails, it is not clear which part has caused the failure. This reasoning is referred to as the "joint hypothesis problem."

of investors to understand their investment environment. In other words, the role played by the "imperfect investors" is not considered. Yet, anecdotal evidence and logic suggest that investors cannot always perfectly understand a news release at the first instant and quickly act upon it. Furthermore, investors differ in their abilities to understand and/or process the information contained in such news releases. These differences in the abilities can arise from differences in the information-processing skills of investors, or from differences in the positioning of investors with respect to the news release, which requires a more detailed (or thorough) analysis from one group than the other. For example, and due to the reasons expounded in Section III, participants in the preferred stock market may need to undertake a more detailed analysis of the news regarding an increase in dividends to common shareholders than would the participants in the common stock market.[5] Cet. par., a more detailed analysis would require more time, resulting in a delay in responding to the news release.

In this paper, we examine the difference in the abilities of two groups of investors in understanding their investment environments. We do so by investigating the trading response of participants in both the preferred stock market and the common stock market to announcements of dividend increases on common stock.[6] We design a test to measure how quickly each of the two groups of participants reacts to the dividend increase announcement. Our analysis is motivated by the implications of a behavioral model developed by Heiner (1983, 1985), which suggest that

[5] Fooladi and Roberts (1988) investigate the price reaction of preferred stock to announcements of dividends on common stock in both the US and Canada. They find stronger support for the "information hypothesis" of dividends in Canada than in the United States, implying a more efficient security market in the U.S. They also find a stronger reaction to announcements of dividend cuts than to those about dividend increases. Conrad, Cornell, and Landsman (2002) examine the relation between market conditions and the price reaction to good news and bad news. They also find that stock prices respond more strongly to negative than positive earning surprises, and that the difference is greater in good markets (defined as one with a high difference between the current market P/E and the average market P/E during the preceding twelve months). The results of these two and many similar studies imply that there is a bigger element of surprise in bad news than in good news. However, none of these studies refers to the abilities of investors (and the differences among them) in understanding different investment environments.

[6] Common stock represents ownership in a corporation. Each share of common stock is entitled to a right to vote (on matters of governance) and to a share of the financial benefits (dividends). It represents a residual claim on the assets/income of the corporation and has limited liability, which implies that the most shareholders can lose is their original investment in case the corporation fails. On the other hand, preferred stock represents a hybrid between debt and common stock. Similar to debt, it provides fixed cash flows (dividends) each period and usually has no voting

economic agents who face a more complicated decision environment (at a given point in time) respond more slowly to new information.[7] In our study, participants (or investors) in the preferred stock market face a more complicated decision environment in the context of an announcement of a dividend increase on common stock. Before they act on this information, they must determine the source of financing of the dividend increase as the manner in which the dividend increase is financed can either increase or decrease the true value of preferred shares. In contrast, participants in the common stock market do not need to make this determination. Cet. par., the dividend increase, regardless of how it is financed, has an unambiguous positive effect on their wealth, and, therefore they need less time to analyze and act on this information.

Our overall results are consistent with the implications of Heiner's model and suggest that market participants (or investors) who face a more complicated investment environment react more slowly to a news release than those who face a less complicated environment. Our results also provide further support for the literature that documents a significant drift in prices following announcements of important corporate events such as earnings, dividend initiations, and share repurchases, among others. Some researchers (e.g., Bernard and Thomas (1989)) argue that the drift in prices following corporate events is consistent with a delayed response to information. Our results, which are consistent with the implications of Heiner's model, suggest that the delay is longer for investors who need to decipher more information and, thus facing a more complicated environment, need more time to analyze the information.

We have organized the paper in the following manner. We explain the essence of Heiner's model in Section II. Section III provides a description of our test design. Section IV describes the data and Section V discusses the empirical results. Section VI concludes the paper with a discussion of the findings. We provide a formal statement of the problem in the appendix.

II. Heiner's Model of Behavior under Uncertainty

---

power. The similarity to common stock stems from its infinite maturity and the fact that failure to pay dividends does not result in bankruptcy.

The behavioral model that underlies our empirical analysis is developed by Heiner (1983, 1985), who questions the ability of mainstream neoclassical optimization models to explain an economic agent's behavior under uncertainty. Heiner argues that "to understand the 'real' dynamic process that actually generates observed behavior," one must depart from the "false assumptions about agents' capacity to maximize." The main assumption underlying standard optimization models is the unquestionable ability of economic agents to select the most preferred behavior under any circumstances and without any uncertainty in distinguishing it from a less preferred action. Heiner finds this "rarely justified as an empirically realistic assumption." He believes that the origin of predictable behavior is the agents' uncertainty in differentiating between correct and incorrect decisions and their limited ability to optimize in complex environments.

When economic agents operate in a special world with perfect information and full ability to optimize (and, therefore, have no uncertainty about the correctness of their decisions), they will have complete flexibility in responding to every perturbation in their environment. Heiner argues that in such cases, the agents' behavior "would not produce easily recognizable patterns, but rather would be extremely difficult to predict." Therefore, it is the uncertainty in distinguishing between "right" and "wrong" decisions that induces agents to undertake a rule-governed, a less flexible, and a less complex behavioral pattern that is more easily recognizable and predictable.[8] When agents need to make decisions in environments with complex information, the *difficulty* of the problem to be solved often exceeds the agents' abilities to understand the available information and respond to it in an "optimal" fashion. Therefore, there is often a gap between an individual's ability to make decisions in a complex environment, and the degree of difficulty involved in the decision process. Heiner's model of predictable behavior under uncertainty is based on understanding and measuring this gap, which he terms the "C - D gap." Here C represents *competence* and D represents the *difficulty* of the decision process. When an agent's ability to

[7] In Section II, we provide a detailed explanation of Heiner's model of behavior under uncertainty.

understand the true nature of the available information is not sufficient to make an optimum decision, because of the uncertainty about the correctness the decision, the agent becomes reluctant to react to the information,. This uncertainty, which is an increasing function of the *C* - *D* gap, becomes "the basic source of predictable behavior" (Heiner, 1983, p. 585).

As the *C* - *D* gap widens and the uncertainty in making an appropriate decision increases, the decision-maker becomes more hesitant to respond to new information. Instead, the decision-maker relies on a rule-governed behavior, which s/he could easily handle. This rule-governed behavior is often sub-optimal, and the decision-maker must deviate from it to make an optimal decision.[9] However, all possible deviations are often ignored "because of uncertainty about when to deviate from these regulations" (Heiner 1983, p. 585).[10] As decision-makers interact with one another and with their complex environments, their understanding of these environments improves and the complexity of the decision process decreases. This improved understanding, in turn, leads to a narrowing of the *C –D* gap. In some cases, the narrowing of the gap is not sufficient to induce any behavioral change. In other cases, the gap narrows sufficiently to induce a sudden change in behavior, i.e., a persistent move in another direction. In this framework, decision models that assume that individuals are capable of acting perfectly (and quickly) can only explain the exceptional cases, i.e., those not subject to uncertainties in deciphering the information.

Heiner considers several applications of this behavioral model [Heiner (1983, 1985, 1988, and 1989)]. Other applications include tests of market efficiency for individual securities (Kaen and Rosenman, 1986) and for classes of securities (Fooladi, McInish, and Wood, 1991), the analysis of firm behavior under uncertainty as it enters or exits a competitive industry (Fooladi and

---

[8] In his original article, Heiner (1983) refers to a large body of research in the field of behavioral psychology that questions the ability of the standard maximization theory to explain behavior under uncertainty.

[9] To support his argument regarding the frequency with which suboptimal decisions are made, Heiner refers to the literature on the "prisoner's dilemma", the history of publishing books on strategies to win blackjack, and on approaches to solve the Rubik's cube, and provides examples of suboptimal solutions.

[10] Evans (2004) reports that although individuals are well aware of the trade-off between risk and return, the information about raw return plays the most important role in their retail investment decisions. This behavior, in our opinion, is a clear example of the fact that uncertainty results in choosing a sub-optimal, rule-governed behavior that is more manageable than a complicated optimizing rule.

Kayhani, 2003), and the behavior of firms operating in concentrated markets (Gowdy and Yesilada, 1988). McInish and Wood (1989) use Heiner's model to show that, given the decision-makers' imperfect understanding and response to information, investor behavior is a more important determinant of the first-order autocorrelation of return in indices than the traditional suspect, i.e., market frictions.[11]

Heiner's model provides important implications for the interpretation of the efficient market hypothesis and for many of the event studies designed to test it. The conventional definition of the EMH, which suggests that security prices incorporate all available information, implies that market participants react to information surprises instantaneously. If Heiner's explanation of behavior under uncertainty is correct, then the logically expected reaction may never occur or, more realistically, occur with a delay. Thus, in some instances, a relevant piece of information may be available but not yet incorporated in security prices. This reasoning implies that when the information is too difficult to interpret, event studies may not find the expected empirical result based on an assumption of optimizing behavior and may lead to a wrong conclusion with regard to the EMH.

When faced with uncertainty about how to correctly interpret the news, market participants may not necessarily take any action even when (based on an optimizing behavior) it is the right time to do so. The higher the uncertainty, the lower is the probability of taking the "right action." Even when the market reaction to the arrival of complex information is in the right direction, it may occur at a much slower pace than can rationally be expected.

One possibility is that, immediately after the release of new information, we may observe a small portion of the market (the segment with a smaller than average C - D gap) move in the "right direction" while the rest of the market remains noticeably inactive. The leading group's action sends more information to the market, hence narrowing the C - D gap for other participants. Accordingly, the "reliability condition" will be satisfied for some of these participants who will

[11] For further details on first-order autocorrelation, see Schwartz and Whitcomb (1977).

then take action. (See the Appendix for a formal statement of the problem and the definition of the reliability condition.) Therefore, it can be argued that the speed of price adjustment to the announcement of an event is a function of the complexity of the underlying event.

It is important to note that, differences in reaction to the news are observed even when there is no asymmetry in the availability of information. Such differences are driven by an asymmetry in the distribution of information-processing skill. While some investors opt to trade, others remain inactive. The leading investors are usually those who have better ability to decipher the information. The distribution of information-processing skill depends on the positioning of investors with respect to information at a given point in time, and therefore varies from time to time [Kaen and Rosenman (1986, fn.4)]. Consequently, investors cannot identify leaders in order to follow their action in every circumstance.

III. The Test Design

One method of testing the predictions of Heiner's model is to find two events that are distinctly different in their complexity, and then compare the speed and magnitude of the market adjustment to these events. However, it is quite difficult to define two such events that could be distinctly ranked, *a priori*, by their complexity. An alternative approach would be to identify two groups, which would have different $C - D$ gaps *in the context of an event*, and then compare their responses to this event. We choose the latter approach in this paper. The event is the announcement of an increase in dividends to common shareholders and the two groups are the participants (or investors) in the common stock market and in the preferred stock market. In this paper, the term "participants (or investors)" refers to both current investors and prospective investors in the common stock and the preferred stock markets. The prospective investor group would include other relevant constituents such as financial analysts, who analyze securities for potential inclusion in a portfolio or to provide a buy/sell recommendation to concerned parties.

Hereafter, we use the terms "participants" and "investors" interchangeably to refer to all such constituents.

The effect of an announcement of a dividend change on the price of common stock is examined by various researchers in the context of two competing hypotheses; "the information-content hypothesis" and the "wealth-redistribution hypothesis" (see Handjinicolaou and Kalay (1984), and Dhillon and Johnson (1994)). The information-content hypothesis suggests that increases in the common stock dividends are generally attributable to improved prosperity of the paying company. Therefore, an announcement of a dividend increase on common stock conveys the message to investors that the managers are confident about the future of the firm and are, therefore, increasing the common stock dividends. This underlying reason for the dividend increase, generally, helps all securities of the firm including its bonds and preferred stock. The wealth-redistribution hypothesis, on the other hand, suggests that increases in common stock dividends are financed by assets that are generally needed to support the claims of fixed-income securities (bonds and preferred stock) and thus increase the firm's leverage. As such, the increase in dividends is financed (partially or totally) by transferring wealth from the owners of fixed-income securities to common stockholders. Consequently, common stockholders benefit from such increases in leverage and both bonds and preferred stock experience a wealth loss. Therefore, both hypotheses predict a positive relation between dividend changes for common stock and the price of common stock. For preferred stock, the information-content hypothesis predicts a positive price response to announcements of dividend increases (on common stock) and a negative price response to announcements of dividend decreases. In contrast, the wealth-redistribution hypothesis predicts the opposite price response for preferred stock, i.e., a negative price reaction to announcements of common dividend increases and a positive reaction to announcements of dividend decreases.

In the context of a dividend change on common stock, participants in the market for common shares have an easier decision rule (with regard to how to react to the announcement of a

change) than do the participants in the market for preferred shares. For example, whether an increase in dividends is the manifestation of management confidence in the company's future, or an attempt to increase leverage (and hence transfer wealth from the owners of fixed-income securities to common shareholders), there is a positive effect on the value of common shares. Thus, investors in the common stock market do not have to make any effort to distinguish between the two possible reasons for a dividend increase. However, the same does not hold true for investors in the preferred stock market. They need to engage in a more detailed analysis, as they have to examine the announcement and its driving motive, and make a determination as to how the dividend increase for common shareholders is financed. Naturally, a more detailed analysis requires more time, and thus a longer delay in responding to the announcement.

Thus, the same event (i.e., the announcement of an increase in dividends to common shareholders) contains two different types of information with two different levels of complexity for the two groups. Given that it is more difficult for the investors in the market for preferred shares to decipher the information regarding the dividend increase than it is for those in the common stock market, the implication is that the investors in the preferred shares have a wider *C* - *D* gap than do the investors in the market for common shares. Note that this assertion (or implication) holds true only in the context of a dividend announcement. We do not make (nor assume) any statements regarding the general nature of the relative C – D gaps for these two groups. Given this difference in the "C – D gaps" of the two groups in the context of a dividend increase announcement, investors in the preferred stock market are predicted to react to the announcement at a slower pace.

Alternatively, the implications of the dividend increase announcement are unambiguously positive for investors in the common stock market but not so for investors in the preferred stock market. Thus, the investors in the preferred stock market must expend additional effort (and time)

to resolve this ambiguity. In this sense, the announced piece of information is more complex (for the preferred stock market) as it requires additional processing (and time) to unravel.[12]

We test the null hypothesis that there is no difference in the trading responses of the two groups of investors to the announcement of an increase in common dividends against the alternative hypothesis that there is a differential reaction.[13] We use the volume of transactions, during the 40-minute period surrounding the dividend increase announcement, to measure the speed of adjustment for investors in both the common stock market and the preferred stock market.[14]

Walther's (1997) findings suggest that investor sophistication might be correlated with the level of information usage across firms.[15] In our study, investor sophistication, per se, is not likely to be an issue for investors in the common and preferred share markets. However, given their different positioning vis-à-vis the dividend increase announcement, investors in the preferred stock market face a more difficult decision (in our study) and are predicted to be slower in reacting to the information.

IV. Data

We obtain our original sample of announcements of dividend increases on common stock, for the 1992-2003 period, from the CRSP database.[16] We require that the announced dividend

---

[12] The hypothesis we test is independent of the perceived nature (good or bad) of the announcement as the investors in the preferred share market have to make this determination (good or bad) before they trade, and the investors in the common share market need not do so. In addition, our experiment does not require us to make any statements about, or test, the eventual impact of the announcement on the prices and we do not do so.

[13] Our hypothesis holds true when additional factors, that might motivate a dividend increase, are considered. Assuming equal C – D gaps (or complexity) for these additional factors across common and preferred share markets, the weighted complexity of the dividend increase announcement should still be greater for the investors in the preferred share market.

[14] The volume refers to the number of shares traded for a given trade.

[15] Walther (1997) finds that sophisticated investors appear to rely more on analysts forecasts than on time-series model forecasts in forming earnings expectations. Thus, sophisticated investors are more likely to have accurate expectations because analyst forecasts tend to be more accurate than time-series model forecasts.

[16] The empirical evidence (on dividend policy) suggests that dividend increases are significantly more frequent than dividend decreases as firms are usually reluctant to decrease dividends. Based on the data in Allen and Michaely (2003), the median (annual) number of dividend increases, between 1992 and 2001, is 1763 and the median (annual) number of dividend decreases is 65. Over this period, the minimum (maximum) number of dividend increases is 1244 (2171) and the minimum (maximum) number of dividend decreases is 46 (131). Given our many data requirements, it would have been very difficult for us to obtain a reasonable sample of dividend decreases. Hence, our choice of (and focus on) the sample of dividend increases.

increase is at least 10%. We also require the announcing firm to have preferred stock outstanding. These data filters yield an initial sample of 556 announcements. For each announcement, we obtain the corresponding "time stamp" from *Factiva*, a service provided by the *Dow Jones Company*. The "time stamp" identifies the exact time at which the dividend increase announcement is released to the press. We are unable to identify the time stamp for 71 announcements, which reduces our sample to 485 announcements. We also require that the announcement be made between the trading hours of 10 AM and 3:30 PM EST. This requirement allows us to collect the relevant trading data for our empirical analysis. This last data filter yielded a final sample of 312 announcements.

Most of the announcements (254) in the sample are made by firms that trade on the NYSE. There are five announcements made by firms that trade on the ASE and 43 announcements made by those that trade on NASDAQ. For the remaining nine announcements, the exchange listing from Compustat classifies one firm as over-the-counter and eight firms as non-NASDAQ or subsidiary. About half of the announcements (164) are made by firms that belong to the S&P 500 index. The mean (median) book value of assets of the announcing firms is $28.9 ($7.24) billion and these relatively large values reflect the predominance of NYSE firms in our sample.

In Table 1, we provide further details on our final sample. In Panel A, we present a distribution of the announcements by year. Even though there are more announcements in some years than in others, they do not appear to be clustered in any given year. For example, the largest number of announcements is 44 in 1995, which represents about 14% of the sample. In Panel B, we provide a distribution of the announcing firms (across industries) based on the two-digit SIC code. The data indicate that there is some clustering in utility industries (SIC code 49) and among financial firms (SIC codes 60 to 67). This is not surprising as preferred stock is more commonly issued by utility and financial firms. However, manufacturing firms (SIC codes 20 to 39) are also

well represented in the sample with 136 firms. Overall, our sample of dividend increase announcements represents a broad cross-section of industries.[17]

We acknowledge that the dividend announcements contain both an "expected" and an "unexpected" component, and that we are unable to separate the two components. Analysts typically make forecasts for earnings per share that are made widely available. Dividend forecasts, on the other hand, are not as common and hence not typically available. However, to increase the likelihood of including announcements with an unexpected component, we only include those of dividend increases of at least 10%. This lower bound of 10% also ensures that we include only economically significant dividend increases. This approach is consistent with the extant body of research on dividend changes. For instance, Grullon, Michaely, and Swaminathan (2002) use dividend changes of at least 12.5% in their comprehensive study of dividend changes. Their results remain robust when they consider dividend changes of at least 10%. The authors examine the frequency distribution of dividend changes and argue that the lower bound of 12.5% (or 10%) seems to be the best in terms of including big dividend changes. They also argue that dividend changes of at least 12.5% (or 10%) are likely to be categorized as surprises (or unexpected changes) regardless of the underlying dividend expectation model. To the extent that our lower bound of 10% does not solely include unexpected dividend increases, we introduce a bias against finding support for our hypothesis.

V. Empirical Results

To test the predictions implied by Heiner's model, we examine the trading activity of both common stock and preferred stock. Specifically, we examine the trading volume for common and preferred stock both before and after the dividend increase announcement. We obtain data on

[17] By focusing on the trading response of investors in common and preferred shares of a given firm, we implicitly control for cross-sectional variations in firm-specific attributes such as cash flow, growth opportunities, and industrial classification, among others. In other words, the two groups of investors (for a given firm) are analyzing the exact same piece of information, which indicates that the various factors underlying the piece of information are identical

trading volumes from the TAQ (Trade and Quote) database available from the NYSE. The TAQ database contains trade and quote data for all the trades associated with a given security and each data point includes a "time stamp." For each announcement in our sample, we collect trading data for a 40-minute window that brackets the time stamp for the announcement. The 40-minute window, thus, comprises twenty minutes before and twenty minutes after the announcement. When no trade occurs, we assign a trading volume of zero for that minute. We aggregate the trading volume for each minute, relative to the announcement time, for a given announcement and then aggregate the trading volume (for each minute) across all the announcements.[18]

Table 2 provides a summary of the trading activity over the 40-minute window that surrounds the dividend increase announcement. The results indicate that the trading activity for common stock intensifies in the post-announcement period. For instance, the average "total volume per minute" for common stock is 430,965 in the pre-announcement period and 589,045 in the post-announcement period. In contrast, the average trading volume per minute for preferred stock decreases from 2043.50 in the pre-announcement period to 1336 in the post-announcement period. These results represent the first sign of different reactions by participants in the common stock market and in the preferred stock market.

Next, we examine the cumulative volume of trades to further understand the levels of activities for both common stock and preferred stock. Figure 1 shows a plot of the cumulative volume of shares traded from minute -20, relative to the dividend increase announcement, to minute +20. To facilitate comparison on the same graph, we divide the cumulative volume on common stock by a factor (of 210) that equals the ratio of average volume (per minute) for common stock to average volume (per minute) for preferred stock in the pre-announcement (twenty-minute) period. The plot indicates that there is close tracking in the trading for common stock and preferred stock prior to the dividend increase announcement. However, in the post-

(across the two groups). The difference in their reaction arises because they do *not* respond to the same information with exactly the same speed.

[18] Trading volume for each minute equals the total number of shares traded over the 60-second interval.

announcement period, the path of preferred stock is both lower and flatter than that of common stock. This increasing difference in the trading response of common and preferred shareholders, in the post-announcement period, is depicted more clearly in Figure 2, which considers only the twenty-minute period after the announcement.

We expand on the results in Figures 1 and 2 and test for a statistical difference in the paths of cumulative volume for both preferred stock and common stock by estimating the following linear regression model:

$$CUMVOL_t = b_0 + b_1\ MINUTE_t + b_2\ PREF + b_3\ (MINUTE_t*PREF) + \varepsilon_t \qquad (1)$$

Where,

$CUMVOL_t$ is the cumulative (total) volume from minute -20 to minute 't'
$MINUTE_t$ is the minute relative to the dividend increase announcement
PREF is a dummy variable that equals one for preferred stock and zero otherwise
$(MINUTE_t*PREF)$ is an interactive dummy variable that equals $MINUTE_t$ for preferred stock and zero otherwise
ε_t is a random error term, and b_0 to b_3 are parameters to be estimated

The results from the regression analysis, presented in Table 3, confirm the visual observations from Figures 1 and 2. The coefficient on MINUTE is positive and the coefficient on MINUTE*PREF is negative both before and after the announcement. These results are statistically significant at the 1% level. In addition, the magnitude of the coefficients on both MINUTE and MINUTE*PREF are higher in the post-announcement period. These results indicate that the coefficient (b_1) on MINUTE for common stock is higher after the announcement (546414.10 vs. 421208) and suggests that the trading activity for common stock intensifies following the announcement. In contrast, the coefficient ($b_1 + b_3$) on MINUTE for preferred stock of 1980.50 before the announcement is higher than the coefficient of 1614 after the announcement. This result indicates that the trading activity in preferred stock subsides after the announcement and suggests that the path of cumulative volume flattens for preferred stock after the announcement.

To further confirm our observations from Figures 1 and 2 and from Table 3, we estimate the following regression model for both common stock and preferred stock:

$$CUMVOL_t = b_0 + b_1\ MINUTE_t + b_2\ (MINUTE_t*AFTERDUM) + \varepsilon_t \quad (2)$$

Where,

$CUMVOL_t$ is the cumulative (total) volume from minute -20 to minute 't'
$MINUTE_t$ is the minute relative to the event
AFTERDUM is a dummy variable that equals 1 for trading data after the announcement and zero otherwise
($MINUTE_t$*AFTERDUM) is an interactive dummy variable that equals $MINUTE_t$ for trades after the announcement and zero otherwise
ε_t is a random error term , and b_0 to b_2 are regression coefficients to be estimated

The results, presented in Table 4, confirm our conclusion from Table 3 that the path of cumulative volume for preferred stock becomes flatter after the announcement. The slope of the cumulative volume path for common stock increases after the announcement as indicated by the positive and significant coefficient of 125,206 on MINUTE*AFTERDUM. In contrast, the path for preferred stock flattens as indicated by the negative and significant coefficient of -366.99 (*p-value* = 0.058) on MINUTE*AFTERDUM. This finding is consistent with the prediction that preferred shareholders respond to the news release more slowly as they require more time to analyze the announcement of increase in common dividends.[19] This can be attributable to a wider *C – D* gap for preferred shareholders, which results from their need for further information that common shareholders do not require (i.e., the source of financing of the dividend increase). This systematic behavioral difference between the participants in the two markets is consistent with Heiner's view

[19] The data in Table 2 indicate the presence of some large values for total volume for preferred stock. For example, within a ten-minute window surrounding the announcement, there are large values for minute "-4" and minute "10." These large values stem from a trade of 10,000 for minute "-4" and a trade of 8,000 for minute "10". Infrequent and large volume trades (by institutional investors) are one common feature of the preferred stock market. We drop these trades and reestimate the model in Table 4 for preferred stock. Our results (not shown in the paper) remain robust and indicate that the coefficient on MINUTE*AFTERDUM is negative and highly significant (*p*-value = 0.000). In addition to the above two trades, we drop the single trade of 7,600 at minute "-17" and estimate the model in Table 4. Again, our results remain robust and the coefficient on MINUTE*AFTERDUM is negative and significant (*p*-value = 0.078). These robustness checks suggest that our overall results are not driven by the presence of outliers in the data.

of behavior under uncertainty. Since our experiment focuses on trading volumes rather than prices, statistical significance implies a notable (or significant) change in activity, which is what we seek to test.

Our overall results are also consistent with the implications of the literature that documents a significant drift in prices following announcements of important corporate events. The events studied in the literature include earnings [Bernard and Thomas (1989, 1990)], share repurchases [Ikenberry, Lakonishok, and Vermaelen (1995)], dividend initiations and omissions [Michaely, Thaler, and Womack (1995)], and seasoned equity offerings [Loughran and Ritter (1995)], among others. For instance, Bernard and Thomas (1989) argue that the drift in prices following earnings surprises is consistent with a delayed response to information. Similarly, researchers attribute the price drift following share repurchases, dividend initiations/omissions, and seasoned equity offerings to underreaction, which suggests that all information is not reflected in the price at the announcement. This evidence indicates that there is a noticeable delay before the information is reflected in the stock price and investors as a group take longer to process the information. Heiner's predictions go a step further and suggest that investors that have a wider *C-D* gap will respond more slowly to a given piece of information such as a dividend increase announcement.

VII. Concluding Remarks

In this paper, we examine the effect of announcements of increases in common stock dividends on the intraday trading behavior of (current and prospective) investors in both common stock and preferred stock. We find that there is a systematic difference in the behavior of investors in the two markets. Participants in the common stock market react to the news more quickly than do the participants in the preferred stock market. The latter group has to make a determination as to whether the announced dividend increase is a result of management's confidence in the company's future, or whether it serves as a means to increase leverage, thereby transferring wealth from the owners of fixed-income securities to the common shareholders. In contrast, participants

in the common stock market are not concerned with the underlying motive for the dividend increase and need not wait for further clarification. Thus, it is more difficult for investors in the preferred stock market to decipher the information content of the news release and react quickly to the dividend increase announcement than it is for investors in the common stock market.

The findings in this paper are consistent with the predictions of Heiner's model of behavior under uncertainty. Heiner maintains that the gap between the individual's *competence* in making an optimum decision and the *difficulty* of the decision process, namely the C - D gap, is the main source of predictable behavior. As the gap widens, the uncertainty in making the right decision increases and the individual becomes reluctant to react to the new information. We argue that, in the context of (and given the nature of) dividend increase announcements, the C - D gap is wider for the participants in the preferred stock market than it is for those in the common stock market. Consequently, the latter react more quickly to the dividend increase announcement than do the participants in the preferred stock market.

References

Allen, F., and R. Michaely, "Payout Policy," *Handbook of Economics*, North-Holland, 2003, 337-430.

Bernard, V. L., and J. K. Thomas, "Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium," *Journal of Accounting Research*, 1989, 27, 1-36.

_____, "Evidence That Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings," *Journal of Accounting and Economics,* 1990, 13, 305-340.

Conrad, J. B. Corner, and W. Landsman, "When Is Bad News Really Bad News?" *Journal of Finance,* 2002, 57, 2507-2532.

Dhillon, U. S., and H. Johnson, "The Effect of Dividend Changes on Stock and Bond Prices," *Journal of Finance*, 1994, 49, 281-289.

Evans, R., "Does Alpha Really Matter? Evidence from Mutual Fund Incubation, Termination and Manager Change," *Working Paper*, University of Pennsylvania, 2004.

Fama, E. F., "Efficient Capital Markets: II," *Journal of Finance*, December 1991, 46, 1575 – 1617.

Fooladi, I., and N. K. Kayhani, "Is Entrepreneurship Only About Entering A New Business," *Journal of Entrepreneurial Finance & Business Ventures*, 2003, 8, 1-11.

Fooladi, I., T. McInnish, and R. Wood, "Is the Stock Market Equally Efficient for All Securities," *Business and Education: A Partnership,* proceedings of the 21st Annual Atlantic Schools of Business Conference, 1991.

Fooladi, I., and G. S. Roberts, "Dividend Changes and Preferred Stock Returns," *International Journal of Finance*, 1988, 1, 96-112.

Gowdy, J. M. and A. Yesilada, "Decision Making Under Conditions of Turbulence and Uncertainty: The Case of The Kinked Demand Curve," *Eastern Economics Journal,* 1988, 14, 399-408.

Grullon, G., R. Michaely, and B. Swaminathan, "Are Dividend Changes a Sign of Firm Maturity?," *Journal of Business*, 2002, 75, 387-424.

Handjinicolaou, G. and A. Kalay, "Wealth Redistributions or Changes In firm Value: An Analysis of Returns to Bondholders and Stockholders around Dividend Announcements," *Journal of Financial Economics,* 1984, 13, 35-63.

Heiner, R. A., "The Origin of Predictable Behavior". *American Economic Review*, 1983, 73, 560-595.

_____, "Origin of Predictable Behavior: Further Modeling and Applications," *American Economic Review*, 1985, 75, 391-396.

_____, "The Necessity of Imperfect Decisions," *Journal of Economic Behavior and Organization*, 1988, 10, 29-55.

_____, "Necessity of Delaying Economic Adjustment," *Journal of Economic Behavior and Organization*, 1988, 10, 255-286.

_____, "The Origin of Predictable Dynamic Behavior," *Journal of Economic Behavior and Organization*, 1989, 12, 233-257.

Ikenberry, D., J. Lakonishok, and T. Vermaelen, "Market Reaction to Open Market Share Repurchases," *Journal of Financial Economics.* 1995, 181-208.

Kaen, F. R. and R. E. Rosenman, "Predictable Behavior in Financial Markets: Some Evidence in Support of Heiner's Hypothesis," *American Economic Review*, 1986, 76, 212-220.

Loughran, T. and J. R. Ritter, "The New Issues Puzzle," *Journal of Finance,* 1995, 50, 23-51.

McInish, T. H. and R. A. Wood, "Market Frictions, Market Microstructure, Imperfect Decision Making and Autocorrelation of Portfolio Returns," *Working Paper*, Pennsylvania State University, 1989.

Michaely, R., R. H. Thaler, and K. L. Womack, "Price Reactions to Dividend Initiations and Omissions: Overreaction or Drift?" *Journal of Finance,* 1995, 50, 573-608.

Patell, J. A. and M. A. Wolfson, "The Intraday Speed of Adjustment of Stock Prices To Earnings and Dividends Announcements," *Journal of Financial Economics*, 1984, 13, 223-252.

Schwartz, R. A. and D. K. Whitcomb, "The Time-Variance Relationship: Evidence on Autocorrelation in Common Stock Returns," *Journal of Finance*, 1977, 32, 41-55.

Walther, B. R., "Investor Sophistication and Market Earnings Expectations," *Journal of Accounting Research,* 1997, 35, 157-179.

Appendix: A Formal Statement of the Problem

Consider a market in which all participants are identical in every respect except in their capacity to process and interpret information. This assumption of non-homogeneous interpretation skills suggests that investors may react differently to the same piece of information and thus establishes conditions under which we can analyze the behavior of these investors within the framework established in Heiner's model.

In Heiner's model, the uncertainty in making a right decision (u) is a decreasing function of the agent's "perceptual abilities" (p) and an increasing function of the complexity of the decision environment (e), which in turn is affected by new information (n). Thus, we have

(A1) $u = u(p,e(n))$

where, $u_p < 0$ and $u_e > 0$.

The new information could be on the distribution of output or input prices, or on any other factors that affect the future cash flows of a security.

Following Heiner's notation, let $\pi(e)$ $(1 - \pi(e))$ be the probability that an economic agent's action (for example, buying or selling a security) is correct (incorrect). In addition, let r(u) and w(u) denote the conditional probability of taking an action when it should be taken, and the conditional probability of taking an action when it should not be taken, respectively. Assume $r'(u)<0$ and $w'(u)>0$. That is, as uncertainty increases, *r* will decrease and *w* will increase, resulting in a decrease in *r/w*.

In the context of this model, a correct time for an action is when the action results in a gain (g(e)) and an incorrect time is when the action results in a loss (l(e)). Therefore, in this framework, the market participant will take an action (buy more of the security, for example) if and only if the expected gain from such an action is greater than the expected loss. Thus, we get

(A2) $g(e)\, r(u)\, \pi(e) > l(e)\, w(u)\, (1- \pi(e))$.

Rearranging equation (A2), we obtain

(A3) $r(u)/w(u) > l(e)(1- \pi(e))/g(e)\pi(e) = T(e)$.

Heiner refers to *r/w* as the "reliability ratio" because, in effect, it measures the reliability of decision makers in *correctly* responding to a piece of information. The inequality in (A3) suggests that an agent's *C* - *D* gap affects the relative probability of taking a correct versus an incorrect action. Heiner refers to the right hand side, T(e), as the "tolerance limit." This is the ratio of the unconditional expected loss to the unconditional expected gain from an action and determines the minimum required reliability that must be satisfied before the agent's action is beneficial. Its value increases with the complexity of the decision environment.

Unlike standard optimization theory, in which economic agents *always* respond correctly to new information and act to maximize their objective function, here, the inequality in (A3) must be satisfied (which means that the expected gain from the action must be greater than the expected loss) in order for new information to result in an action. Thus, the model allows for suboptimal decisions. Once suboptimal decisions are allowed, actions are not fully reliable and investors may take no action (i.e., no immediate response to information) although an action may potentially be beneficial. Due to the difficulty in understanding the new information, the reliability condition (r/w >T) may not be satisfied. As new information continues to arrive, the reliability ratio should increase and the tolerance limit (the term on the right hand side of A3) should decrease. This process continues until, at some point, the condition (> *T*) is satisfied for investors with the smallest *C* - *D* gap, who then take an action such as trading securities. This action then sends more information to the market, which results in a narrowing of the *C* - *D* gap for another group of investors to a point where the reliability condition in (A3) is satisfied for them and they can begin to trade.

This trend may continue until market conditions change, sending new signals to investors until trading in the above-mentioned direction is no longer an appropriate action. The time may now be right for trade in a different direction but, as long as complexity of the new information is beyond the information processing skills of all investors, no reversal action will be taken. Again, as more signals arrive, the uncertainty in making the right decision decreases, and the reliability

condition for the right action (new type of trade) will be satisfied for those investors who would then have superior information processing skills (or those with the narrowest C - D gap).

The information processing ability (p) may be distributed such that it divides investors into various groups. The first group may have the highest p, followed by the second group, and so forth. In that case investors react to information in groups, as their reliability ratios satisfy condition (A3). The group with the smallest C - D gap (and hence with the highest reliability ratio) will first recognize a need for action, followed by the group with the second smallest C - D gap, and so forth. As we move across groups from the lowest to the highest C - D gap, we observe increasing reluctance to act on early information and opting for more information to reduce the uncertainty and hence to enhance the reliability ratio. In general, we have $(r/w)_1 > (r/w)_2 > ... > (r/w)_N$ and this is the order by which market participants act on information.

Table 1
Sample Description

The sample consists of 312 announcements of dividend increases (of at least 10%) made between 1992 and 2003 and comprises firms that have preferred stock outstanding. Panel A presents the distribution of dividend announcements by year. Panel B provides the distribution of the dividend announcements (across industries) based on the two-digit SIC code.

Panel A

Year of Announcement	Number of Announcements
1992	22
1993	41
1994	34
1995	44
1996	37
1997	28
1998	18
1999	31
2000	16
2001	10
2002	12
2003	19

Panel B

Two-Digit SIC Code	Number of Announcements	Two-Digit SIC Code	Number of Announcements
10	1	47	1
13	5	48	2
20	21	49	21
24	1	51	5
25	1	52	1
26	4	53	4
27	3	54	5
28	18	55	3
29	4	57	8
30	4	58	5
32	7	60	59
33	7	61	9
34	6	62	6
35	13	63	13
36	21	64	2
37	11	67	4
38	7	72	1
39	8	73	1
40	6	75	3
42	1	78	1
44	2	99	7

Table 2

Summary of Trading Activity around Dividend Increase Announcements

This table presents the trading activity of both common stock and preferred stock around the dividend increase announcements. The sample consists of 312 announcements of dividend increases (of at least 10%) made between 1992 and 2003 and includes those firms that have preferred stock outstanding. Panel A summarizes the trading activity before the announcement and Panel B summarizes it after the announcement. FREQ is the number of trades in each minute. The trading data have been aggregated by minute for each announcement. TOTAL VOLUME refers to the total volume by minute across all announcements. CUMVOL is the cumulative total volume of trades starting from minute –20 relative to the dividend announcement.

Panel A: Trading Activity before the Dividend Increase Announcement

	COMMON STOCK			PREFERRED STOCK		
MINUTE	FREQ	TOTAL VOLUME	CUMVOL	FREQ	TOTAL VOLUME	CUMVOL
-20	91	373600	373600	0	0	0
-19	80	500300	873900	1	900	900
-18	85	615200	1489100	1	600	1500
-17	80	316900	1806000	1	7600	9100
-16	97	408800	2214800	1	300	9400
-15	87	422800	2637600	0	0	9400
-14	92	398900	3036500	2	800	10200
-13	82	512400	3548900	0	0	10200
-12	89	557600	4106500	1	200	10400
-11	80	322200	4428700	2	3600	14000
-10	82	532000	4960700	3	1650	15650
-9	85	296500	5257200	1	1000	16650
-8	86	316800	5574000	2	1400	18050
-7	78	302000	5876000	1	1000	19050
-6	88	424000	6300000	1	200	19250
-5	96	535300	6835300	1	500	19750
-4	84	349500	7184800	4	12400	32150
-3	85	448800	7633600	4	6420	38570
-2	81	515200	8148800	1	2200	40770
-1	96	470500	8619300	1	100	40870

Table 2 Continued….

Panel B: Trading Activity after the Dividend Increase Announcement

	COMMON STOCK			PREFERRED STOCK		
MINUTE	FREQ	TOTAL VOLUME	CUMVOL	FREQ	TOTAL VOLUME	CUMVOL
1	116	714800	9334100	1	800	41670
2	124	944300	10278400	0	0	41670
3	120	974900	11253300	3	560	42230
4	124	856100	12109400	0	0	42230
5	109	769800	12879200	0	0	42230
6	111	805400	13684600	1	2300	44530
7	114	638800	14323400	1	2100	46630
8	111	544100	14867500	0	0	46630
9	91	421100	15288600	2	1300	47930
10	101	358900	15647500	2	8200	56130
11	97	488100	16135600	1	400	56530
12	100	451900	16587500	1	1000	57530
13	93	492300	17079800	4	1960	59490
14	90	496600	17576400	1	1400	60890
15	98	573500	18149900	1	200	61090
16	94	563600	18713500	1	4000	65090
17	94	304900	19018400	1	100	65190
18	84	340300	19358700	0	0	65190
19	86	478200	19836900	2	1000	66190
20	96	563300	20400200	4	1400	67590

Table 3
Trading Activity After the Announcement: Regression Results for the Pooled Sample

This table presents the coefficient estimates from the following regression model:

$$\text{Cumulative Total Volume}_t = b_0 + b_1 \text{MINUTE}_t + b_2 \text{PREF} + b_3 (\text{MINUTE}_t * \text{PREF}) + \varepsilon_t$$

The sample consists of 312 announcements of dividend increases (of at least 10%) made between 1992 and 2003 and includes those firms that have preferred stock outstanding. The trading data have been aggregated by minute for each announcement and the total volume is calculated by minute across all announcements. Cumulative Total Volume is measured beginning at minute "-20" relative to the announcement. MINUTE refers to the minute relative to the announcement. PREF is a dummy variable that equals one if the trade is for the preferred stock and zero otherwise. MINUTE*PREF is an interactive dummy variable that equals MINUTE for preferred stock and zero otherwise. The *p*-values are presented in parentheses below the coefficient estimates.

Variable	**Coefficient Estimates before the Announcement (*p*-value)**	**Coefficient Estimates after the Announcement (*p*-value)**
Constant	8967949	9888797
	(0.000)	(0.000)
MINUTE	421208	546414.10
	(0.000)	(0.000)
PREF	-8930361	-9851907
	(0.000)	(0.000)
MINUTE * PREF	-419227.50	-544800.50
	(0.000)	(0.000)
F Stat	18496.20	8295.98
	(0.000)	(0.000)
Number of Observations	40	40
Adjusted R^2	0.9993	0.9984

Table 4

Trading Activity for Common Stock and Preferred Stock: Before and After the Announcement

This table presents the coefficient estimates from the following regression model:

$$\text{Cumulative Total Volume}_t = b_0 + b_1 \text{MINUTE}_t + b_2 (\text{MINUTE}_t * \text{AFTERDUM}) + \varepsilon_t$$

The sample consists of 312 announcements of dividend increases (of at least 10%) made between 1992 and 2003 and includes those firms that have preferred stock outstanding. The trading data have been aggregated by minute for each announcement and the total volume is calculated by minute across all announcements. Cumulative Total Volume is measured beginning at minute "-20" relative to the announcement. MINUTE refers to the minute relative to the announcement. AFTERDUM is a dummy variable that equals 1 for trading data after the announcement and zero otherwise. MINUTE*AFTERDUM is an interactive dummy variable that equals MINUTE for trading data after the dividend announcement and zero otherwise. The *p*-values are presented in parentheses below the coefficient estimates.

Variable	**Coefficient Estimates for Common Stock (*p*-value)**	**Coefficient Estimates for Preferred Stock (*p*-value)**
Constant	9428373	37239.71
	(0.000)	(0.000)
MINUTE	454897.60	1955.01
	(0.000)	(0.000)
MINUTE * AFTERDUM	125206	-366.99
	(0.000)	(0.058)
F Stat	4780.65	770.57
	(0.000)	(0.000)
Number of Observations	40	40
Adjusted R^2	0.9959	0.9753

Figure 1
Cumulative Volume vs. Minute Relative to the Dividend Increase Announcement

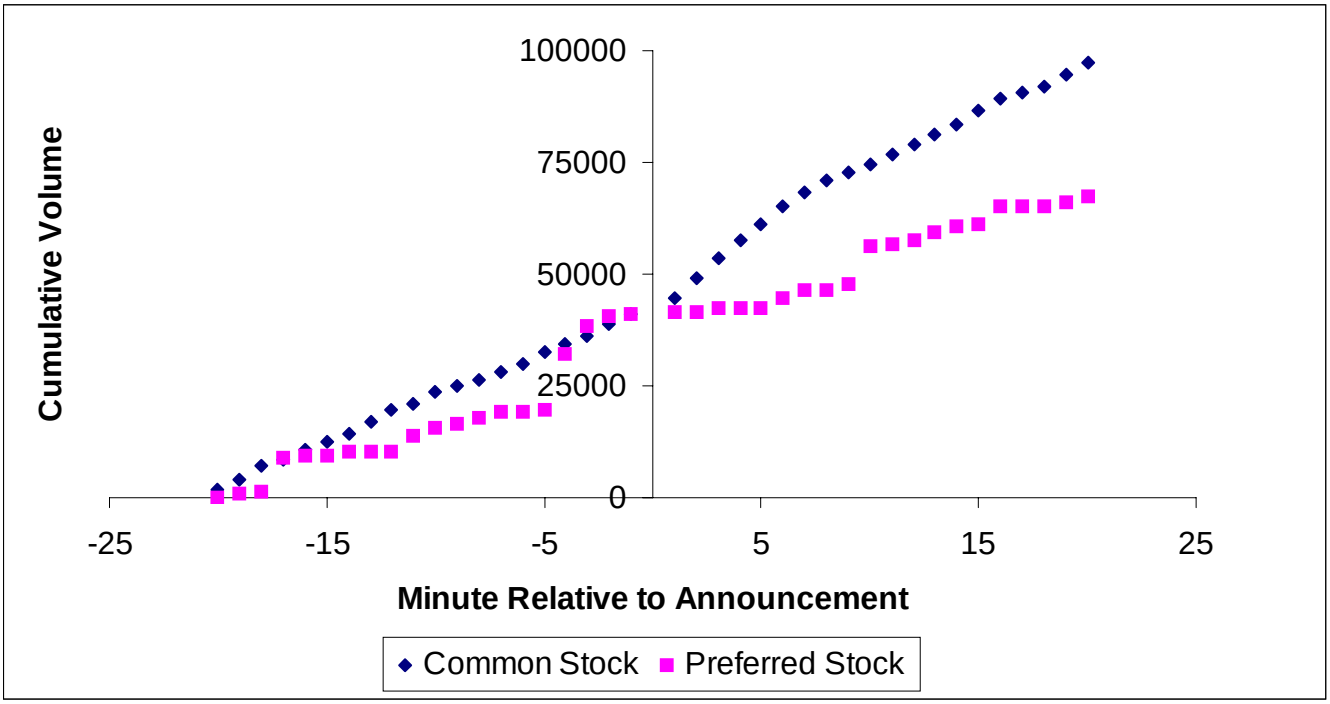

Figure 2
Post-Announcement Cumulative Volume vs. Minute Relative to the Dividend Increase Announcement