Hiding "Bad" News on Fridays? Not Such a Good Idea!

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Abstract

Previous studies reported firms’ management to release more "bad" news on Fridays compared to the rest of weekdays, potentially exploiting investors’ limited attention. In this study we examine whether this strategy was detected by investors. Our key findings are as follows. First, consistent with previous studies, we find that over the last two decades firms consistently reported more "bad" news on Friday than during the rest of trading days. Second, we report a structural shift in the earnings-return relation with stock returns becoming more sensitive to the Friday negative earnings news compared to similar announcements released during the rest of the week. Finally, we find this structural shift to be particularly pronounced for the firms with high financial visibility. Overall, our findings suggest that investors have learned about the firms’ management strategy to report "bad" news on Fridays. As a result, the benefits from following this strategy have disappeared over time.

Key Words: Earnings news, Friday earnings announcements, Investors’ limited attention

Data Availability: All data are available from public sources.
I Introduction

Strategic timing of earnings announcements is a widely discussed issue in both the finance and accounting literature (see Begley and Fischer, 1998 and Doyle and Magilke, 2009, among others). Understanding the links between the timing and the nature of an earnings announcements is of great importance, both for analysts as a means of improving their forecasts and for investors in making their investment decisions. Another related but no less important issue is the link between the timing of the earnings announcement and stock prices. Understanding this link is particularly important for the firm's management who would prefer to moderate the impact of "bad" news on the value of the firm.

There is a rapidly growing body of evidence that firms' management strategically choose the time to release earnings news. In particular, a number of studies find that firms tend to release more bad news on Fridays and during the weekend (see Damodaran, 1989; Della Vigna and Pollet, 2005; Bagnoli, Clement and Watts, 2006 among others). This alleged tendency of releasing bad news on Fridays, which appears to be persistent over the last two decades, leads to the main question of this study

Have investors become aware of this strategy and, if so, what are the implications for the earnings-return relation and the benefits from following this strategy?

These issues are particularly important in light of a rapid increase in the information coverage over the last three decades. Increased coverage allows investors to learn of the tendency of firms to release "bad’ news on Fridays, making it more difficult for firms to benefit from this strategy. Therefore, if investors have become aware of this strategy we may expect the benefits from shifting "bad" news releases close to the weekends to disappear over time.

Our findings suggest that over the period of the years 1989-2006 firms have systematically reported more "bad" news on Fridays compared to other trading days. More importantly, we find that the earnings-returns relation has undergone a structural shift over time. More specifically, the impact of Friday earnings announcements on stock returns was
weaker than during the rest of the week for the period 1989 to 1997. However, the relation reversed during the last ten years, with stock returns becoming more sensitive to Friday announcements. Curiously, the shift is more pronounced for negative earnings surprises. A further analysis indicates that the overreaction to Friday negative earnings announcements is more pronounced for the firms with high financial visibility. Overall, based on our findings we conclude that over the last two decades investors have learned about the tendency of firms’ management to release "bad" news on Fridays, reducing the benefits to firms from following this strategy.

The contribution of this paper is twofold. First, we extend the existing earnings-returns relation literature. In particular, this paper makes a contribution to a rapidly growing strand of literature studying the time evolution of the earnings surprise and the links between the earnings news and stock prices. These studies include, among others, Brown (2001), Landsman and Maydew (2002), and Collins, Li, and Xie (2005). However, none of these studies conducts a temporal analysis of the "Friday effect". Thus, the first purpose of this paper is to fill this gap in the earnings-returns relation literature.

Second, our paper contributes to the discussion regarding potential benefits from strategic timing of earnings announcements. The conventional wisdom suggests that managers are opportunistically timing the announcement of "bad" earnings news to take advantage of reduced media coverage and investor attention on the weekend (Penman, 1987; Damodaran, 1989). This, in turn, leads to a lower quality of decision making and an immediate impact of earnings surprises on stock returns on Fridays becoming less pronounced. This idea has been formalized by Hong and Stein (1999), who suggest that individuals are able to "process" only some subset of the available public information.\(^1\) On the other hand, an increased intensity of the media coverage as well as the academic literature are likely to draw investors’ attention to this kind of opportunistic behavior. As a result, investors may gradually learn about firms’ announcement strategies which, in turn, may cause the underreaction to "bad’

\(^1\)A recent study by Doyle and Magilke (2009) challenges the strategic disclosure hypothesis. They suggest that the concentration of "bad" news on Fridays reflects a strategic decision by management to more broadly disseminate the information.
news released on Fridays to disappear, as it happened to other market "anomalies" (Schwert, 2002). But then the benefits from shifting the announcement of "bad" news to Fridays are likely to dissipate over time, a conjecture which is strongly supported by the findings of our study. Therefore, understanding the dynamics of the "Friday effect" over time yields important practical implications for the announcement policies of firms.

II Literature Review

A substantial body of literature on earnings announcements documents that there exists a relationship between the timing of an earnings report and the nature of the news released in that report. Givoly and Palmon (1982), Chambers and Penman (1984), and Kross and Schroeder (1984), using a sample of earnings announcements drawn from the 1970's, find that if a firm releases its earnings report earlier than expected its stock price rises, on average, while if the report is released with delay, the stock price declines. These findings are supported by Begley and Fischer (1998) for the period of 1983 to 1992.

There is also an increasing body of evidence concerning the relation between the day of the week and the nature of the earnings announcements. In particular, a number of studies find that the firms tend to release more bad news close to and during the weekend. Penman (1987), who uses a sample of earnings reports for the period of 1971-1982, finds some evidence that reports released during the middle of the week are more likely to yield significantly more positive returns compared to those released on Friday or Monday. Using a sample of earnings and dividend announcements over the period 1981-1985, Damodaran (1989) finds that the reports released on Fridays are more likely to contain "bad" news and to be associated with negative abnormal returns, than those on other weekdays. Della, Vigna, and Pollet (2005) use a sample of earnings announcements for the period 1995-2004 to study the behavior of earnings announcements and the response of returns to the earnings surprises on Friday and other weekdays. They report Friday announcements being associated with a 45 percent higher probability of a negative earnings surprise and a 50
basis points lower abnormal returns. Also, they find that Friday announcements have less immediate and a more delayed stock return response. A continued dominance of "bad" news on Fridays is reported by Bagnoli, Clement, and Watts (2006) for the period 2000-2003.

A number of theories have been proposed to rationalize the observed pattern of the earnings announcements’ timing. Trueman (1990) studies the optimal timing of the information release in a two-period model with many firms and risk-neutral investors. The firms are assumed to be owned by the managers during the first period, who then sell shares in their firms to the investors before the end of the second period. The managers are assumed to have flexibility to shift the recognition of economic earnings as accounting income form the second period to the first. Trueman (1990) shows that the delay in reporting the "bad" news can be due to either earnings management or managements’ desire to first observe other firms’ earnings. Gennotte and Trueman (1996) study the optimal intraday timing of earnings announcements. They propose a two-period model where a distinction is made between noise traders and informed traders. The latter are better able to make predictions regarding the future profitability of the firm than the former and submit their orders immediately after an announcement is released. A basic result of this model is that the impact of a disclosure is expected to be stronger if it occurs during trading hours than after the market is closed.

This paper can be viewed as a contribution to empirical strand of literature studying the relation between the timing of the earnings announcements and the impact of the earnings news on stock prices. More specifically, we conduct a temporal analysis of the properties of the earnings-stock returns relation over the last two decades. Importantly, we make a distinction between the announcements released on Fridays and those released on other weekdays. By means of both a model-free (nonparametric) and parametric analysis we study and compare the response of stock returns to Friday versus non-Friday earnings announcements, and how they evolved time. We hypothesize that the firms’ management policy of consistently releasing more "bad" earnings news on Fridays, as reported by previous studies, has been detected by investors. As a result, the extent to which investors underreact
to "bad" news released on Fridays may have declined or even disappeared over time.

Our empirical findings suggest that the impact of the earnings news released on Fridays on the stock prices has gradually increased compared to those released during other weekdays. Moreover, it appears that over the last couple of years "bad" Friday earnings announcements led to stronger investors' response than the "bad" earnings news reported during other days. We interpret this finding as the evidence of investors considering negative news released on Fridays as a negative signal about integrity and transparency of firm's management and, thus, requiring higher risk premium on firm's shares. Furthermore, we find the evolution of "Friday effect" to be different for the firms with high versus low financial visibility, as proxied by the analysts' coverage. More specifically, we find that investors' overreaction to the Friday "bad" earnings news is substantially more pronounced for the firms with high financial visibility, that is, firms that attract more investors' attention. This finding is consistent with our conjecture that a shift from under-to-overreaction of stock prices to the Friday negative earnings announcements can be attributed to investors' "learning curve" about firms' management opportunistic behavior.

The remainder of this paper is organized as follows. In Section III we describe and conduct a preliminary analysis of our data. In Section IV we discuss the methodology. In Sections V and VI we report and discuss our empirical findings. Finally, in Section VII we present our concluding remarks and discuss some directions for further research.

III Data Description

A Sample Selection

We collect quarterly earnings announcements for all firms listed on the US stock market over the period of 1989-2006. Each firm-quarter observation includes actual earnings, median analysts' forecast (both in terms of the US dollars per share), earnings announcement date, and the number of analysts' forecasts submitted. This data has been obtained from the Institutional Brokerage Estimate System (I/B/E/S). Next, for each firm-quarter observation
we match the stock return at the announcement day, the return on the equally-weighted market portfolio the day the announcement was made, and the closing stock price from the day before the earnings announcement. This data has been obtained from the Center for Research in Security Prices (CRSP) database. Our initial sample consists of 262,823 firm-quarter observations, with a minimum of 5,856 observations for 1989 and a maximum of 18,390 observations for 1998.

We calculate the forecast error as the actual earnings minus the median analysts' forecast (Lim, 2001). Next, we define the unexpected earnings (or the earnings surprise) as the forecast error scaled by the stock price from the pre-announcement day. In this way both the stock returns and unexpected earnings are measured in a common scale—US dollars per dollar of investment. Following Lim (2001) we exclude all observations for which the stock price from the pre-announcement day was less than 5 US dollars to avoid "stale" prices. Also, we exclude all observations for which the forecast error is larger (in absolute value) than 10 US dollars, which are likely to be due to data input errors (Lim, 2001). Finally, to reduce the potential impact of outliers, we exclude all observations in the 2.5 percent tail of the earnings innovation variable. These sample selection procedures result in a final sample of 212,000 firm-quarter observations. Descriptive statistics of the unexpected earnings series will be discussed in details in the following subsection.

A note should be made on the definition of actual earnings. Following Bradshaw and Sloan (2002) we use I/B/E/S reported earnings as the measure of actual earnings. Bradshaw and Sloan (2002) report stock returns being more closely related to Street earnings reported by I/B/E/S than to the GAAP earnings reported by Compustat. Similar findings are reported by a more recent study by Collins, Li, and Xie (2005).

B Preliminary Analysis

In order to proceed with the main research question of our study, namely, whether the opportunistic behavior of firms' management has been detected by investors, clearly it is necessary to test whether firms have consistently released more "bad" earnings news on
Fridays during the time span covered in our study. First, we divide our total sample into eight subperiods as shown in Table I below. Next, for each subsample we compare the distributions of the Friday and non-Friday earnings surprises.

We start with a simple exploratory analysis of the Friday versus non-Friday earnings announcements. For each subsample we plot a quantile-quantile plot of the Friday versus the non-Friday unexpected earnings. Superimposed is the straight line which passes through the first and the third empirical quartiles of both samples. Under the null hypothesis that both the Friday and non-Friday unexpected earnings come from the same distribution the quantile-quantile plots should be located close to this straight line. However, a visual inspection of Figures 1 and 2 suggests that there exist severe deviations from the hypothetical linear relationship between the quantiles of both variables. In particular, two important findings should be mentioned. First, the difference between the distributions of the Friday and the non-Friday unexpected earnings appears to persist over time, and appears to be substantial over the whole time period examined in our study. Second, the deviations appear to be substantially more severe in the negative part of the earnings innovations domain. This observation is consistent with previous studies that report that firms tend to release "bad news" on Fridays.

We use the Kolmogorov-Smirnov test to test the null hypothesis that both Friday and the non-Friday unexpected earnings come from the same distribution. The resulting statistics and the corresponding p-values are reported in Figures 1 and 2 below the quantile-quantile plots for each sub-period. The results of the Kolmogorov-Smirnov test support the visual inspection of the quantile-quantile plots. The null hypothesis of both the Friday and the non-Friday earnings innovations coming from the same distribution is strongly rejected for all sub-periods. Interestingly, the difference between the distributions of the Friday and the non-Friday earnings innovations appears to be more pronounced in the 1990-s and somewhat more moderate, though still substantial, after the year 2000, at least based on a visual inspection of the quantile-quantile plots.

Figures 1 and 2 approximately here
To gain further insight, we estimate the mean earnings innovation and the proportion of the "bad news" for each trading day. We classify earnings announcement with negative earnings surprises as "bad news" announcements.

The estimates are reported in Table I. For each sub-period and for each trading day we estimate the mean earnings innovation, $\mu$, and the proportion of "bad news", $\pi$. For each sub-period the following hypotheses are tested

$$H_0 : \mu_{Monday} = \ldots = \mu_{Friday};$$

$$H_0 : \pi_{Monday} = \ldots = \pi_{Friday}.$$

The first hypothesis states that the mean earnings innovation is the same across all trading days of the week, while the second one states the same for the proportion of the "bad news". The resulting $p$-values of the Wald statistics are reported for each sub-period separately in the columns with headings $\mu$ and $\pi$, respectively. Starting with the analysis of the estimates of $\mu$, for all sub-periods the mean of the earnings innovations reported on Friday appears to be substantially lower than during the rest of trading days. Even during the last two sub-periods when for the rest of the days the estimated mean earnings surprise was significantly positive, the estimate of the Friday mean earnings innovation was still negative. A formal Wald test for the equality of the means indicates that the null hypothesis is rejected at any reasonable significance level, suggesting that the "day-of-the week" effect in the earnings innovations is also statistically significant.

Table I approximately here

The analysis of the estimated proportion of the "bad news" yields similar results. For all sub-periods the estimates of $\pi$ are significantly larger for the Friday earnings announcements. Though the difference between the Friday and the non-Friday estimates of $\pi$ seems to decline during the last two periods, compared to the one during the 1990-s, it still remains
quite substantial. This finding is supported by the Wald test, which suggests that the null hypothesis of equal proportion of "bad news" should be rejected.\(^2\)

Overall, our preliminary analysis supports the results of the previous studies, such as Damodaran (1989), that suggest that firms tend to report "bad news" on Fridays. More importantly for the context of this paper, our findings suggest that this announcement strategy has been persistent over the last two decades. Then the natural question that arises is whether stock market investors learned about this strategy. In particular, if investors have detected the tendency of firms to report "bad news" on Friday, then we would expect to see a gradual increase in the magnitude of a reaction by investors to Friday news, which will be reflected in a gradual change in the earnings-returns relation. This will be the issue of the following sections.

IV Methodology

A Nonparametric Analysis

To set forth notations, let \( r_{i,t} \) denote the excess return on the stock of the firm \( i \) at the day of the earnings announcement for the period \( t \), which we measure as the return on the stock minus the return on the equally weighted CRSP portfolio.\(^3\) Also, let \( UE_{i,t} \) denote the unexpected earnings (the earnings surprise) of the firm \( i \) for the period \( t \). We measure \( UE_{i,t} \) as the difference between actual earnings and the consensus forecast scaled by a stock price from the last trading day before the announcement, as discussed in Section 3. Furthermore, let the subscripts \( fr \) and \( nfr \) denote "Friday" and "non-Friday", respectively.

\(^2\)As a robustness check we conducted the same tests but this time excluding Friday announcements. When the Friday earnings announcements are excluded, the null hypotheses cannot be rejected for most of subperiods.

\(^3\)As a robustness check we conduct the same analysis with the size-adjusted returns (Garfinkel and Sokobin, 2006). The results are available from the author upon request.
Then, the following model is considered

\[ r_{i,t} = F(UE_{i,t}, I_{fr,i,t}) + \epsilon_{i,t} \]  

(1)

\[ E(\epsilon_{i,t}|UE_{i,t}, I_{fr,i,t}) = 0 \]

Here \( I_{fr,i,t} \) is the indicator function which takes the value 1 if the announcement has been during a Friday trading session and 0 otherwise, \( F(\cdot, \cdot) \) is the earnings response function, and \( \epsilon_{i,t} \) is the noise which is assumed to have zero mean conditional upon the earnings innovation and the Friday dummy variable. Then the question of whether investors respond differently to Friday versus non-Friday announcements can be transformed into testing the following null hypothesis

\[ H_0 : F(\cdot, 1) = F(\cdot, 0) \]

Clearly, a correct specification of the earning response function plays a crucial role in our analysis. Therefore, to test this hypothesis we start with a model-free (nonparametric) approach by using a test proposed by Yatchew (2003).

Let us divide our sample into two samples, where the sample \( A \) includes all earnings announcements made on Friday while the sample \( B \) includes all the non-Friday announcements. Next, within each sample let us reorder the data so that the earnings innovations \( UE_{i,t} \)'s are in increasing order. The following consistent "within" estimators of the variance are considered.

\[ s^2_A = \frac{1}{2n_A} \sum_{i=2}^{n_A} (r_{A,i} - r_{A,i-1})^2 \]

\[ s^2_B = \frac{1}{2n_B} \sum_{i=2}^{n_B} (r_{B,i} - r_{B,i-1})^2 \]

Next, let us pool all the data and reorder so that the pooled \( UE_{i,t} \)'s are in increasing order
and define the pooled estimator of the variance

\[ s^2_P = \frac{1}{2(n_A + n_B)} \sum_{i=2}^{n_{A+B}} (r_i - r_{i-1})^2 \]

Our testing procedure is based on the following statistic

\[ \Upsilon = (n_A + n_B)^{1/2} \left( s^2_P - \frac{n_A}{n_A + n_B} s^2_A - \frac{n_B}{n_A + n_B} s^2_B \right) \tag{2} \]

If \( F(\cdot, 1) = F(\cdot, 0) \) then both within and pooled estimators are consistent and should yield similar estimates. On the other hand, if the null hypothesis does not hold, the "within" estimators are still consistent, while the pooled estimator is not. Furthermore, it can be shown that under the null the limiting distribution of this statistic is normal with zero mean and the variance being equal to \( 2\pi^*\sigma^4 \) where \( \pi^* \) is the probability that consecutive observations in the pooled reordered data set come from different populations.\(^4\)

B Parametric Analysis

In addition to a nonparametric test we also conduct a parametric (regression) analysis. We assume that the relationship between the excess stock returns and the earnings innovations can be described by the following regression model

\[ r_{i,t} = \alpha + F(U E_{i,t}, I_{fr,i,t}) + \epsilon_{i,t} \tag{3} \]

\[ E(\epsilon_{i,t}|U E_{i,t}, I_{fr,i,t}) = 0 \]

\[ F(U E_{i,t}, 1) = \beta^+_{fr} \arctan (\gamma^+ U E_{i,t}) I^+ + \beta^-_{fr} \arctan (\gamma^- U E_{i,t}) I^- \]

\[ F(U E_{i,t}, 0) = \beta^+_{nfr} \arctan (\gamma^+ U E_{i,t}) I^+ + \beta^-_{nfr} \arctan (\gamma^- U E_{i,t}) I^- \]

Here, \( I^+(I^-) \) is the indicator function which takes the value 1 if the earnings announcement is nonnegative (negative). Also, \( I_{fr} \) is the indicator function which takes the value 1 (0) if

\(^4\)For further details a reader is referred to Yatchew (2003).
the announcement has been made during a Friday (non-Friday) trading session as discussed
before, and $\alpha$, $\beta$’s and $\gamma$’s are the parameters to be estimated. This model is an extended
version of the S-shape earnings response function proposed by Freeman and Tse (1992). They show that this model is superior compared to a standard linear earnings-returns models and that it can accommodate varying degrees of non-linearity, from approximately linear to highly nonlinear.

Two important differences between the original model and the one we use in this paper
should be mentioned. First, we introduce an additional degree of freedom to the origi-
nal model of Freeman and Tse (1992) by allowing the relation between stock returns and
earnings innovations to be dependent on whether "good" or "bad" news is released. Some
evidence that security returns have a different degree of sensitivity to positive and neg-
ative earnings innovations has been reported by a number of the previous studies (see,
for instance, Abdel-khalik, 1990). The distinction between positive and negative earnings
innovations is particularly important in the context of this study, since Friday earnings
announcements appear to be characterized by a substantially higher proportion of "bad"
news, as we have already discussed above. Second, as this is one of the two main issues
studied in this paper, we allow the earnings response function to differ between Friday and
Non-Friday announcements via $\beta_f^+$ versus $\beta_n^+$, and $\beta_r^+$ versus $\beta_n^-$, parameters. Thus, we
shall examine the question of whether there exists a "Friday effect" in the earnings response
function by separately testing the following hypotheses

\[ H_0 : \beta_f^+ = \beta_n^+ \]

\[ H_0 : \beta_r^- = \beta_n^- \]

by using Wald test.
V Empirical Results

A Nonparametric Analysis

We start with the results of the Yatchew (2003) nonparametric test, which we report in Table II. First, a visual inspection of both the "within" and the pooled variance estimates suggests that at the announcement date the stock returns are characterized by an unusually high volatility. For instance, if we consider the pooled variance estimate from the 1989-1991 period, it translates into a 35 percent variance or about 60 percent standard deviation in annual terms. These estimates are becoming even larger and reach their maximum during the 2000-2001 period, which can be due to the collapse of the "dot.com" bubble, as well as the series of corporate scandals which took place by the end of 2001. These findings are consistent with other studies which report the abnormal stock return volatility around the earnings announcement days (see Ball and Kothari, 1991, Landsman and Maydew, 2002, and Collins, Zi and Xie, 2005, among others). Moreover, it appears that the stock return volatility at the announcement day has increased over the last two decades. This observation is in line with the results reported by Ladsman and Maydew (2002).

Table II approximately here

Next, we turn to the evaluation of the results of the Yatchew (2003) test with the test statistic denoted by \( \tilde{Y} \), whose asymptotic distribution should be standard normal under the null hypothesis of no "Friday effect" in the earnings response function. Recall that if the earnings response functions during Friday and non-Friday trading days are the same, then we would expect both "within" and pooled variance estimates to be similar, which would cause \( \tilde{Y} \) to be small. However, our results suggest that this is clearly not the case. The test statistic \( \tilde{Y} \) is highly statistically significant for all but one sub-period. The only exception is the 1996-1997 period, where \( \tilde{Y} \) is marginally significant with a \( p \)-value being equal to 0.11.

To provide a first impression about whether and how the Friday and the non-Friday earnings-returns relations evolved over time for each sub-period we estimate the nonpara-
metric (model-free) regression of excess stock returns on the earnings surprises. The estimates are depicted in Figures 3 and 4 where the estimated Friday (non-Friday) earnings-returns regression is denoted by the dashed (solid) line. A visual inspection of the earnings response functions suggests that the earnings-return relationship is nonlinear. More specifically, the estimated earnings-returns relation exhibits more or less the S-shape pattern, with stock returns being more sensitive to earnings surprises in the moderate (around zero) region, while turning almost flat for large earnings innovations. This observation supports the results of Freeman and Tse (1992), and Das and Lev (1994), who report a similar pattern of the earnings-returns relationship and also justifies the choice of our parametric model, described in subsection IV.B.

Figures 3 and 4 approximately here

A comparison of the Friday versus the non-Friday estimates of the earnings response functions yields particularly intriguing results. It appears that during the years 1989-1997 the stock prices were more sensitive to the earnings announcements released during the non-Friday trading sessions, compared to those released on Fridays, with the estimate of the non-Friday earnings response function being substantially "steeper". Interestingly, the "Friday effect" appears to be more pronounced for the positive earnings innovations, or, in other word, when "good news" is released. On the other hand, no substantial difference between the Friday and the non-Friday estimates is observed for the negative earnings surprises for the first four periods. Moreover, while being especially pronounced for the first two sub-periods, the magnitude of the "Friday effect" seems to decay gradually, until 1996-1997 where both estimates almost coincide. Further, it seems that there has been a reversal in the "Friday effect" by the end of 1990-s. More specifically, starting from the year 1998 the stock returns appear to be more sensitive to the earnings announcements released during Friday trading sessions compared to those released during non-Friday trading days.

\footnote{To estimate nonparametric regressions we use a Gaussian kernel. For further details a reader is referred to Yatchew (2003).}
Overall, based on the results of a nonparametric analysis, two conclusions can be drawn. First, we find strong evidence of the earnings-returns relation being different for the Friday and the non-Friday earnings announcements, supporting the results of previous studies, such as Della Vigna and Pollet (2005). Noteworthy, in contrast to these studies we conducted our test in a nonparametric framework, which suggests that our findings are robust to different assumptions regarding the functional form of the earnings-returns relation. Second, and more importantly, we find that the difference between the response of stock returns to Friday versus non-Friday announcements is persistent over time. However, based on the results of this test we still are not able to draw formal conclusions regarding either the magnitude or the evolution over time of this difference. In addition, since Friday announcements are characterized by a significantly larger proportion of "bad news", for a further analysis of the "Friday effect" it is important to dichotomize the earnings announcements into positive and negative earnings surprises. Therefore, to gain further insight into the dynamics of the "Friday effect", we now turn to a parametric analysis.

B Parametric Analysis

Our parametric analysis is based on the extended version of the Freeman and Tse (1992) model, as described in subsection IV.B, eq.(3). It is straightforward to verify that the marginal impact of an increase in the earnings innovation on the expected excess return implied by this model equals

\[
\frac{\beta_{fr}^+ \gamma^+}{(1 + \gamma^{\pm 2} U E_{i,t}^2)} \text{ for the Friday earnings innovations}
\]

\[
\frac{\beta_{nfr}^+ \gamma^+}{(1 + \gamma^{\pm 2} U E_{i,t}^2)} \text{ for the non-Friday earnings innovations}
\]

when the earnings surprise is positive and

\[
\frac{\beta_{fr}^- \gamma^-}{(1 + \gamma^{-2} U E_{i,t}^2)} \text{ for the Friday earnings innovations}
\]
\[
\frac{\beta_{nfr}^{-\gamma^-}}{(1 + \gamma^{-2}UE_{i,t}^2)}
\]
for the non-Friday earnings innovations when the earnings surprise is negative. Thus, the analysis of the magnitude of the "Friday effect," as well as its evolution over time, can be conducted by examining the ratios \(\beta_{fr}^+\) to \(\beta_{nfr}^+\), and \(\beta_{fr}^-\) to \(\beta_{nfr}^-\).

The estimates of the extended Freeman-Tse (1992) model are reported in Table III. The model was estimated for each sub-period covered in our study using the Gauss-Newton algorithm, following related studies (Freeman and Tse, 1992; Harvey and Beneish, 1998). As already discussed above, in the extended Freeman-Tse (1992) model the "Friday effect" in the earnings response function is captured by the deviations of the \(\beta_{fr}^+ / \beta_{nfr}^+\) and \(\beta_{fr}^- / \beta_{nfr}^-\) ratios from unity. The \(\beta_{fr}^+ / \beta_{nfr}^+\) ratio measures the "Friday effect" for positive earnings innovations, while the \(\beta_{fr}^- / \beta_{nfr}^-\) ratio measures the difference between the Friday and the non-Friday earnings' response functions for the negative earnings' surprises. Ratios lower than one indicate that the stock prices' response to the earnings surprises is weaker during a Friday than during a non-Friday trading session, and vice versa. We report these ratios as well as whether the latter are significantly different from one for each sub-period examined in our study.

Starting with the analysis of the \(\beta_{fr}^+ / \beta_{nfr}^+\) ratio our findings indicate that for the period of 90s the earnings response function was characterized by a substantial "Friday effect" in the positive part of the earnings' innovations domain. The "Friday effect" is particularly strong during the first two sub-periods, that is, during the beginning of the 90s, with the estimated ratios less than 0.5. In other words, during these periods the response of the stock prices to the positive earnings surprises on Fridays was more than twice weaker than the one during the non-Friday sessions. Interestingly, the estimated \(\beta_{fr}^+ / \beta_{nfr}^+\) ratios tend to increase over time, though the increase is not monotonous. More specifically, while during the 90s the ratio was significantly smaller than one, it becomes larger than one during the last two periods with the deviation from unity being also statistically significant for the 2001-2003 period. This finding provides some preliminary statistical evidence that market
participants have learned over time about the strategic timing of information releases by the firms.

Table III approximately here

The analysis of the estimated $\beta_{fr}/\beta_{nfr}$ ratios yields particularly intriguing results. Already from the beginning of the 1990-s the estimated ratio is greater than one, though for the first sub-periods the difference is not statistically significant. This result suggests that for all the periods examined in our study the response of the stock prices to the negative earnings surprises appears to be stronger during Fridays than during non-Friday trading days. Moreover, this difference becomes statistically significant, starting from the year 1998. Also, the magnitude of the "Friday effect" is almost monotonously increasing over time. While during the 1989-1991 period the "Friday effect" could be considered as negligible, with the estimated earnings response ratio being equal to 1.03, it becomes economically significant by the end of the 1990-s with the average estimated earnings response ratio of about 1.6 for the last four sub-periods. In other words, during the last eight years the response of the stock prices to the negative earnings surprises was on average stronger by 60% during Friday than during non-Friday trading days. These findings suggest that over time the investors learned about the firms' strategy of releasing "bad news" on Fridays and started following the Friday information releases more carefully. Moreover, it appears that during the last periods investors tend to overreact to "bad news" announcements released on Fridays compared to "bad news" released during other trading days.

To gain some further insight into the dynamics of the "Friday effect," we estimate the extended Freeman-Tse (1992) model year-by-year. This way we obtain 18 estimates of the earnings response ratio, both for the positive and the negative earnings innovations. We plot these estimates in Figure 5, where the dashed line depicts the estimates of the $\beta_{fr}/\beta_{nfr}$ ratios, while the solid line depict the time path of the estimates of $\beta_{fr}/\beta_{nfr}$ ratios. The time path of the estimated earnings response ratios will serve as a crude proxy for the investors' "learning curve" about the "Friday effect". A visual inspection of the estimated
ratios suggests that both are increasing over time. Formal tests suggest that this trend is both economically and statistically significant. A simple linear regression with a time trend explains about 26% of the total variance of the estimated $\beta_{fr}^-/\beta_{nfr}^-$ ratios (slope=0.0474 with p-value=0.04, $R^2 = 0.26$). The results for the $\beta_{fr}^+/\beta_{nfr}^+$ ratios are even more impressive, where the same regression explains more than 50% of the $\beta_{fr}^+/\beta_{nfr}^+$ ratio’s total variance (slope=0.0475 with p-value<0.01, $R^2 = 0.55$).

Figure 5 approximately here

The estimate of the $\beta_{fr}^+/\beta_{nfr}^+$ ratio was about 0.5 during the year 1989, or, in other words, the response of stock prices to positive earnings announcements was about twice weaker during Friday sessions compared to non-Friday trading days. This ratio was gradually increasing until it reached the level of 1 by the year 2006, suggesting that during the recent period no "Friday effect" in the earnings response function for the positive earnings innovations is detected. Turning to the estimates of the $\beta_{fr}^-/\beta_{nfr}^-$ ratio, we find that the latter was about 0.75 during the year 1989, suggesting that the response of stock prices to negative earnings announcements released on Fridays was substantially weaker than the ones on non-Friday trading days. However, this tendency rapidly reverts and already by the beginning of the 1990-s we find the earnings response being slightly above the level of 1. Further, the earnings response ratio experienced a sharp increase with a peak of 2.2 during the year 1999. This is possibly due to the stock market investors concentrating on the firms’ losses, following the collapse of the "internet bubble". By the year 2006 the estimated earnings response ratio for the negative earnings innovations was 1.69, suggesting that recently the stock price response to the firms’ announced losses is about 70% stronger than the one during the non-Friday trading days. Overall, the analysis of the investors’ "learning curve" supports our conclusions, drawn from the extended Freeman-Tse (1992) model, that over time investors learned the firms’ announcement strategy of releasing the "bad news" on Fridays.
VI Friday Earnings Announcement and Investors’ Attention

In this section we conduct a further temporal analysis of the "Friday effect" by making a distinction between the stocks with the low and high visibility to the investors. There is a growing body of evidence that visibility of the firm has a substantial impact on stock prices (see Lee, 1992; Tetlock, 2007 and Barber and Odean, 2008, among others). We believe that it is particularly important to control for a firm’s visibility in context of our study. We hypothesize that a magnitude of a shift in stock prices’ sensitivity to the Friday announcement will be different for the stocks with low and high visibility. More specifically, if stock prices became more sensitive to Friday negative announcements due to increased investors’ awareness of firm’s management policy of "burying" bad news on Fridays, we would expect this "learning effect" to be more pronounced for the firms with high visibility, that is, the firms which are more closely followed by the investors. Thus, the following hypothesis is suggested

- The overreaction to the "bad" earnings news released on Fridays will be more pronounced for the firms with high visibility.

Following Baker, Nofsinger and Weaver (2002), Aggarwal et al. (2005) and Mehran and Peristiani (2009) we choose the analysts’ coverage as a proxy for financial visibility of a firm. We proceed as follows. For each firm and for each fiscal year we calculate the average number of the analysts’ forecasts as a proxy for the analysts’ coverage. Next, for each fiscal year all firms are sorted into three groups based on the empirical quantiles of the analysts’ coverage. To examine the link between firm’s visibility and the sensitivity of it’s share price to Friday announcements we estimate the extended Freeman-Tse model (eq. 5) while augmenting the earnings response coefficients (β’s) with dummy variables for each analysts’ coverage group. That is, we allow the earnings response ratios, \( \frac{\beta_{fr}}{\beta_{nfr}} \) and \( \frac{\beta_{fr}}{\beta_{nfr}} \), to be dependent on firm’s visibility. We predict that an upward trend in the earnings response ratios for the "bad" news, that is the relative sensitivity of stock prices to the Friday versus non-Friday negative earnings surprises, will be more pronounced for the firms with high
visibility as proxied by the analysts’ coverage.

To test this prediction, we estimate the extended Freeman-Tse model augmented with visibility dummies year by year and plot the estimates of the earnings response ratios. The results are presented in Figure 6 where the estimated earnings response ratios for the "bad" ("good") news are depicted in the upper (lower) plot. Earnings response ratios plots for the low, medium, and high visibility firms are denoted with solid, dashed and dotted lines, respectively.

Figure 6 approximately here

Visual inspection of the plots suggests that the upward trend in the earnings response ratios is substantially less pronounced for the low visibility firms. This conjecture is supported by the results of the regression analysis. We find no statistical evidence of time trend in either "bad" or "good" news earnings response ratios for the low visibility firms. For the "bad" ("good") news earnings response ratios the estimated slope is 0.007 (0.0055) with the corresponding R-squared of 0.009 (0.018). In both cases the slope estimates lack statistical significance. On the contrary, time trend becomes more pronounced for the medium and, in particular, high visibility firms. For the medium visibility firms the estimated slope of the "bad" ("good") news earnings response ratio is 0.065 with the corresponding p-value of 0.06 (0.085 with the corresponding p-value of 0.008 ) and the R-squared of 0.2 (0.53). For the high visibility firms the estimated slopes are 0.14 and 0.099 for the "bad" and "good" news earnings response ratios, respectively and the corresponding R-squared of 0.24 and 0.48. Both estimates are statistically significant (p-value <0.01).

The more pronounced "learning curve" for the firms with high financial visibility suggests that the overreaction to the negative earnings news released on Fridays can be attributed to investors becoming increasingly aware of the firms’ management policy to release "bad" earnings news as the weekend approaches. To further test this conjecture we examine the dynamic relation between the overreaction the Friday negative earnings news and the timing of the earnings information release. More specifically, for each year we estimate the relative
proportion, $RP$, of negative earnings surprises released on Fridays as follows

$$RP_t = \frac{\hat{\pi}_{fr,t}}{\hat{\pi}_{nfr,t}}$$

(4)

where $\hat{\pi}_{fr} (\hat{\pi}_{nfr})$ are the estimated proportions of "bad" news released on Fridays (during other weekdays). This variable measures how intensively firms' management implemented the strategy of releasing "bad" earnings news on Fridays. Also, let $ERR_t = \beta_{fr,t}/\beta_{nfr,t}$ be the estimated 'bad' news earnings response ratio for year $t$. Next, the following system of equations is estimated

$$ERR_t = \theta_0 + \sum_{i=1}^{N} \theta_{1,i} ERR_{t-i} + \sum_{i=1}^{N} \theta_{2,i} RP_{t-i} + \epsilon_t$$

(5)

$$RP_t = \theta_0 + \sum_{i=1}^{N} \theta_{3,i} ERR_{t-i} + \sum_{i=1}^{N} \theta_{4,i} RP_{t-i} + \eta_t$$

where $\theta$'s are the parameters to be estimated, $N$ is the lag order (the number of lagged variables to be included), and $\epsilon$ and $\eta$ are the error terms. If an overreaction to negative Friday earnings news is related to investors "learning curve" then we would expect the lagged values of a relative proportion variable, $RP$, to have a statistically significant impact on (to "Granger cause") the current values of the earnings response ratios. More specifically, we would expect the overreaction to the Friday negative earnings information to be more pronounced following the periods with high relative proportion of "bad" earnings news released on Fridays. To study this question we start by testing the following hypothesis

$$H_0 : \theta_{2,1} = ... = \theta_{2,N} = 0$$

Another interrelated question is whether firms' management take into account an increased overreaction to "bad" earnings news released on Fridays by implementing the strategic timing strategy less intensively. If so, we would expect the lagged values of the earnings response variable, $ERR$, to have a statistically significant effect on the current values of the
relative proportion, RP variable. In particular, we would expect the relative proportion of the Friday "bad" earnings news to be less pronounced following the periods characterized by a substantial overreaction to the Friday negative earnings surprises. This conjecture is examined by testing the following hypothesis

\[ H_0 : \theta_{3,1} = \ldots = \theta_{3,N} = 0 \]

The results are reported in Table IV. We estimate separate systems of equations for the firms with low, medium, and high financial visibility. For each group we report the corresponding chi-squared statistics of the Wald test for each of the two hypotheses. We find no statistical evidence of ERR causing the RP variable. In other words, we find no evidence of firms' management responding to investors' overreaction to the Friday "bad" earnings news by abandoning or, at least, implementing the strategy of releasing negative earnings information on Fridays less intensively. On the other hand, we find strong evidence of the reverse causality with the lagged values of RP having a statistically significant impact on current values of the earnings response ratios. Interestingly enough, causal effect of the RP variable on the earnings response ratios is statistically significant for the firms with high and medium visibility but appears to be statistically insignificant for the low visibility firms. This findings is consistent with our prior conjecture that the "learning curve" is more pronounced for the firms which are closely followed by the investors.

Table IV approximately here

To provide a further insight into the dynamics of investors' overreaction to Friday "bad" earnings news we plot the estimated impulse response functions of the earnings response ratio to RP variable. More specifically, we examine the cumulative impact of an increase of the RP variable by one standard deviation on the earnings response ratio over the next ten periods (10-year horizon)\(^6\). The estimated cumulative impulse-responses (solid lines) along with the 95% confidence intervals (dotted lines) are depicted in Figure 7. Starting with

\(^6\)See Luthkepol (2006) for further details.
the low visibility firms (Figure 7, upper plot) we find no evidence of the link between the relative proportion of "bad" news and the magnitude of investors' overreaction to negative earnings announcements reported on Fridays. For these firms the estimated response of the earnings response ratio to the RP variable lacks statistical as well as economic significance, a finding which is consistent with the results of causality tests reported in Table 4.

Figure 7 approximately here

On the other hand, we find a strong evidence of the earnings response ratios being affected by an increase in the relative proportion of the negative Friday earnings announcements for the medium and high visibility firms. More specifically, an increase in the RP leads to a subsequent increase in the earnings response ratios, the effect which is particularly pronounced for the high visibility firms. This finding is consistent with our hypothesis that the overreaction to Friday "bad" earnings news is due to investors learning about the tendency of firms' management to "bury" negative earnings announcements close to weekends and, thus, considering these announcements as the particularly important ones.

VII Summary and Conclusions

Previous studies reported firms' management to report more "bad" earnings news on Fridays compared to other trading days. In this study we focus on two equally important questions:

- Have investors become aware of this strategy?
- If so, how was it reflected in the earnings-returns relation and what are the implications for the firms' management earnings announcement policies?

We find strong evidence of a structural shift in the earnings-response relation. More specifically, we find a reversal in the "Friday effect" in the earnings-returns relation with stock prices becoming eventually more sensitive to Friday earnings announcements. Interestingly, the reversal appears to be substantially more pronounced when "bad" news
is released. Further analysis indicates that this shift is significantly more pronounced for
the firms with high financial visibility, that is, the companies which are closely followed by
investors.

Overall, our findings suggest that over time investors learned about the tendency of the
firms to release "bad" news on Fridays. The association between stock returns and earnings
innovations released on Fridays became stronger over time. Moreover, our findings suggest
that for the last ten years the investors systematically overreact to the "bad" earnings an-
nouncements released on Fridays, compared to their response to the "bad" news released
during other trading days. A potential explanation of this finding is that investors, who
learned about the firms’ strategy to report "bad" news on Fridays, consider negative earn-
ings announcements released on Fridays as the particularly important ones which firms are
attempting to "hide".

Our findings suggest a number of important implications. First, our results shed an
additional light on stock market efficiency, by showing how the stock market participants
gather all available information to form their expectations. Second, our findings are of
particular interest to firms and, in particular, to their earnings announcement policies. The
results of our study suggest that the benefits from reporting "bad" news on Fridays have
disappeared over time. Moreover, our results suggest that since stock prices became more
sensitive to Friday negative earnings announcements, the strategy of reporting "bad" news
on Friday misses its target. In light of our findings shifting the announcement of "bad"
news from Friday to other trading days seems to be a reasonable step to follow.
References


In this Table we present the estimates of the mean earnings surprise $\mu$ and the proportion of the negative earnings surprises $\pi$ by the day of the week. Earnings surprise is calculated as the difference between the actual earnings and the median analysts’ forecast scaled by the closing stock price from the day before the announcement was released. The following null hypotheses are tested: $H_0: \mu_{Monday} = \ldots = \mu_{Friday}$ and $H_0: \mu_{Monday} = \ldots = \mu_{Friday}$. The p-values of the corresponding Wald statistics are reported below. The asterisks * or ** indicate significance at 10% and 5% levels.

### Table I

Earnings news by the day of the week

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<td>$\pi$</td>
<td>$\mu$</td>
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<td>Monday</td>
<td>-0.27**</td>
<td>0.437</td>
<td>-0.118**</td>
<td>0.364</td>
<td>-0.096**</td>
<td>0.348</td>
<td>-0.067**</td>
<td>0.299</td>
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<td>Tuesday</td>
<td>-0.289**</td>
<td>0.455</td>
<td>-0.09**</td>
<td>0.363</td>
<td>-0.083**</td>
<td>0.338</td>
<td>-0.061**</td>
<td>0.293</td>
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<td>-0.292**</td>
<td>0.442</td>
<td>-0.124**</td>
<td>0.383</td>
<td>-0.095**</td>
<td>0.351</td>
<td>-0.066**</td>
<td>0.308</td>
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<tr>
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<td>-0.298**</td>
<td>0.465</td>
<td>-0.14**</td>
<td>0.388</td>
<td>-0.091**</td>
<td>0.355</td>
<td>-0.076**</td>
<td>0.314</td>
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<td>-0.377**</td>
<td>0.486</td>
<td>-0.146**</td>
<td>0.405</td>
<td>-0.182**</td>
<td>0.452</td>
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<tr>
<td>Monday</td>
<td>-0.109**</td>
<td>0.295</td>
<td>-0.072**</td>
<td>0.292</td>
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<td>Tuesday</td>
<td>-0.074**</td>
<td>0.274</td>
<td>-0.035**</td>
<td>0.262</td>
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<td>Wednesday</td>
<td>-0.094**</td>
<td>0.289</td>
<td>-0.043**</td>
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<td>Thursday</td>
<td>-0.085**</td>
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<td>-0.065**</td>
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<td>-0.22**</td>
<td>0.396</td>
<td>-0.106**</td>
<td>0.351</td>
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<td>p-value</td>
<td>0.000</td>
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Table II

"Friday effect" - a nonparametric test

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<td>$\sigma^2$</td>
<td>N.obs</td>
<td>$\sigma^2$</td>
<td>N.obs</td>
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<td>Friday</td>
<td>0.00141</td>
<td>3953</td>
<td>0.00185</td>
<td>5485</td>
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<td>Non-Friday</td>
<td>0.00137</td>
<td>16605</td>
<td>0.00178</td>
<td>14297</td>
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<tr>
<td>Pooled</td>
<td>0.00136</td>
<td>20558</td>
<td>0.00179</td>
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<td>$\tilde{\gamma}$</td>
<td>-2.05**</td>
<td>-3.41**</td>
<td>-2.99**</td>
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<td>Friday</td>
<td>0.00361</td>
<td>2230</td>
<td>0.00384</td>
<td>1676</td>
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<td>Non-Friday</td>
<td>0.00326</td>
<td>28204</td>
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<td>30434</td>
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<td>$\tilde{\gamma}$</td>
<td>-10.86**</td>
<td>-2.37**</td>
<td>-2.77**</td>
<td>6.39**</td>
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In this Table we report the results of the Yatchew (2003) nonparametric test as discussed in section IV.A. Under the null hypothesis of no "Friday effect" $\tilde{\gamma}$ follows a standard normal distribution. The differencing estimates of the stock returns variance for the Friday, non-Friday and the whole samples are reported for each sub-period under the corresponding headings, respectively. The asterisks * or ** indicate significance at 10% and 5% levels.
Table III
Freeman-Tse (1992) extended model

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<td>$-0.004^{*}$</td>
<td>$-0.0027^{**}$</td>
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<td>$0.0052^{*}$</td>
<td>$0.0096^{**}$</td>
<td>$0.0074^{**}$</td>
<td>$0.0081^{**}$</td>
<td>$0.011^{**}$</td>
<td>$0.018^{**}$</td>
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<td>$0.011^{**}$</td>
<td>$0.011^{**}$</td>
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<td>$0.011^{**}$</td>
<td>$0.015^{**}$</td>
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<td>$2366.7^{***}$</td>
<td>$992.1^{*}$</td>
<td>$984.6^{**}$</td>
<td>$1547.8^{**}$</td>
<td>$1580.3^{**}$</td>
<td>$853.1^{**}$</td>
<td>$957.4^{**}$</td>
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<td>(563.2)</td>
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<td>(178.9)</td>
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<td>(183.7)</td>
<td>(163.13)</td>
<td>(115.42)</td>
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<td>$777.1^{***}$</td>
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<td>$0.46^{*}$</td>
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<td>$0.7^{**}$</td>
<td>$0.65^{**}$</td>
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<tr>
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<td>$1.03$</td>
<td>$1.08$</td>
<td>$1.19$</td>
<td>$1.36$</td>
<td>$1.55^{*}$</td>
<td>$1.87^{*}$</td>
<td>$1.72^{*}$</td>
<td>$1.43^{*}$</td>
</tr>
<tr>
<td></td>
<td>(0.034)</td>
<td>(0.039)</td>
<td>(0.044)</td>
<td>(0.034)</td>
<td>(0.029)</td>
<td>(0.022)</td>
<td>(0.022)</td>
<td>(0.022)</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>$0.034$</td>
<td>$0.039$</td>
<td>$0.044$</td>
<td>$0.034$</td>
<td>$0.029$</td>
<td>$0.022$</td>
<td>$0.022$</td>
<td>$0.055$</td>
</tr>
<tr>
<td>No.obs</td>
<td>$20588$</td>
<td>$19782$</td>
<td>$25395$</td>
<td>$31374$</td>
<td>$30434$</td>
<td>$24722$</td>
<td>$22998$</td>
<td>$36377$</td>
</tr>
</tbody>
</table>

In this Table we report the estimates of the extended Freeman-Tse (1992) model as described in subsection IV.B, eq.(3).

$$r_{i,t} = \alpha + F(UE_{i,t}, I_{fr,i,t}) + \epsilon_{i,t}$$

$$F(UE_{i,t}, 1) = \beta_{fr}^+ \arctan(\gamma^+ UE_{i,t} I^+) + \beta_{fr}^- \arctan(\gamma^- UE_{i,t} I^-)$$

$$F(UE_{i,t}, 0) = \beta_{nfr}^+ \arctan(\gamma^+ UE_{i,t} I^+) + \beta_{nfr}^- \arctan(\gamma^- UE_{i,t} I^-)$$

The asterisks * or ** indicate significance at 10% and 5% levels, respectively. For the $\beta_{fr}^+/\beta_{nfr}^+$ and $\beta_{fr}^-/\beta_{nfr}^-$ ratios the asterisks * and ** indicate that the estimated ratio is different from 1 at 10% and 5% significance levels, respectively.
Table IV
Granger causality tests

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Low Visibility</th>
<th>Medium Visibility</th>
<th>High Visibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP does not Granger cause ERR</td>
<td>1.14</td>
<td>14.51**</td>
<td>35.82**</td>
</tr>
<tr>
<td>ERR does not Granger cause RP</td>
<td>1.24</td>
<td>4.5</td>
<td>2.77</td>
</tr>
</tbody>
</table>

In this Table we report the results of the Granger causality tests as discussed in Section VI. For each sub-sample (low, medium and high visibility firms) the following system of equations is estimated:

\[
ERR_t = \theta_0 + \sum_{i=1}^{N} \theta_{1,i} ERR_{t-i} + \sum_{i=1}^{N} \theta_{2,i} RP_{t-i} + \epsilon_t
\]

\[
RP_t = \theta_0 + \sum_{i=1}^{N} \theta_{3,i} ERR_{t-i} + \sum_{i=1}^{N} \theta_{4,i} RP_{t-i} + \eta_t
\]

where the ERR and RP are the estimated "bad" news earnings response ratio and the relative proportion of Friday "bad" news, as defined in Sections V and VI, respectively and \( N = 3 \). The following hypotheses are tested:

RP does not Granger cause ERR \( \rightarrow H_0: \theta_{2,1} = ... = \theta_{2,3} = 0 \)

ERR does not Granger cause RP \( \rightarrow H_0: \theta_{3,1} = ... = \theta_{3,3} = 0 \)

The resulting Wald test statistics for the low, medium and high visibility firms are reported under the corresponding headings, respectively.
Figure 1: Empirical quantile-to-quantile plots of the Friday and the non-Friday earnings surprises. The dashed line refers to a hypothetical case when both Friday and the non-Friday earnings surprises come from the same distribution. Kolmogorov-Smirnov statistics (K-S) and the corresponding $p$-values are reported below each plot.
Figure 2: Quantile-to quantile plots of the Friday versus non-Friday earnings surprises (continued)
Figure 3: Nonparametric (kernel) estimates of the earnings-returns relation for the Friday (dashed line) and the non-Friday (solid line) earnings news.
Figure 4: Nonparametric estimates of the earnings-returns relation for the Friday and non-Friday earnings news (continued)
Figure 5: Year-by-year estimated earnings response ratios from the Freeman-Tse (1992) model. Solid line- earnings response ratio for the negative earnings surprises, dotted line- earnings response ratio for the positive earnings surprises.
Figure 6: In this Figure we plot the earnings response ratios estimated separately for the low, medium and high visibility firms, as described in Section VI. The estimates of the "bad" ("good") news response ratios are depicted in the upper (lower) plot, respectively.
Figure 7: Cumulative impulse response functions of the "bad" earnings news response ratios (ERR) to an increase of one standard deviation in the relative proportion of Friday "bad" news (RP). Dotted lines depict 95% confidence bands.