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What Should We Expect When Testing for Price Response to News in Securities Litigation?



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Introduction

The frequency with which a stock price is expected to respond to news is an important issue in securities litigation. As one example, price response to news is an important factor in the consideration of market efficiency. If a stock trades in an efficient market, there is generally a presumption, under *Basic Inc. v. Levinson*, 485 U.S. 224, 108 S. Ct. 978, 99 L. Ed. 2d 194 (1988), that investors can rely on the market price of the stock to reflect the effects of any material misrepresentation or omission.

Among the various tests employed to assess market efficiency, whether a stock, or other security, responds to news has emerged as the key consideration. In part, this relates back to the seminal *Cammer v. Bloom* case that set forth five factors that many courts have adopted as part of their consideration of market efficiency. The *Cammer* Court noted, "Finally, it would be helpful to a plaintiff seeking to allege an efficient market to allege empirical facts showing a cause and effect relationship between unexpected corporate events or financial releases and an immediate response in the stock price. This, after all, is the essence of an efficient market and the foundation for the fraud on the market theory."[1]

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The Proof-By-Example Approach

Following *Cammer*, there has been an evolving history of how experts and lawyers presented empirical facts that might have been deemed to show a cause-and-effect relationship between news and stock-price movements. An initially popular approach might be termed "Proof by Example." In this method, an expert or counsel for plaintiffs would present a handful of days with news followed by a stock-price movement.[2] A serious, and in fact, fatal, problem with this approach is that one would expect to see such results if stock-price movements were completely random and had no average correlation with news events. One can, for example, look at a calendar and provide examples to "demonstrate" that Mondays are correlated with even-numbered days of the month, or that Mondays are correlated with odd-numbered days of the month. Similarly, in most securities-litigation cases, there are likely to be days with news ("news days") associated with large stock-price movements and news days associated with typical or even small stock-price movements. Similarly, we would expect to see days without news ("non-news days") associated with both large and small stock-price movements.

The Proof-by-Example approach was forcefully rebutted in *In re PolyMedica Corp. Securities Litigation*, 453 F. Supp. 2d 260 (D. Mass. 2006). In this case, the expert for plaintiffs presented five days where there was news and what he claimed was an associated stock-price response. The expert for defendants countered with an explanation of the reasoning described above. The court agreed with the defense expert, and found that the plaintiffs' expert's "mere listing of five days on which news was released and which exhibited large price fluctuations proves nothing."[3]

The FDT Test and Its Successes

The failures of the Proof-by-Example approach, at least by practitioners and courts that recognize those failures, raise the question of what a proper alternative should be. In 2004, a law review article (co-authored by the author of this paper) and a submission by an expert for defendants in a securities litigation advocated very similar, if not functionally identical, approaches. "The 'Less Than' Efficient Capital Markets Hypothesis: Requiring More Proof from Plaintiffs in Fraud-on-the-Market Cases" proposed a test that has since been referred to as the "FDT Test."[4] The FDT Test can be conceptualized similarly to a medical study in which a researcher wishes to determine if a drug is effective. To do so, the medical researcher runs a study with two groups. One group, the control group, is either given no drug or is given a placebo, while the other group, the treatment group, is given the drug in question. Results between the two groups are then examined to see if they are different. In the FDT Test, stock-price movements on news days (the treatment group) are compared to stock-price movements on non-news days (the control group) to see if they are different. In particular, the FDT Test runs an event study for each day in the period being examined and then uses the results of those event studies to compare the fraction of news days with a statistically significant stock-price movement to the fraction of non-news days with a statistically significant stock-price movement to see if there is a difference between the two fractions. It further asks whether the difference between the two fractions is itself statistically significant and is higher on news days.[5]

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The 2004 case alluded to above is *Lehocky v. Tidel Tech., Inc.*, 220 F.R.D. 491 (S.D. Tex. 2004). In this matter, the court found as follows (emphasis added):

> Plaintiffs' expert[] conducted an event study using Tidel's trading data. He identified two-day periods in which information pertaining to Tidel was released to the public and separated those two day[] [periods] from other two day periods in which there was no public information pertaining to Tidel. The periods were classified into "information" versus "non-information days" …. ***[Plaintiffs' expert] concluded that the price changes on information days versus non-information days was statistically significant, meaning there was a related cause and effect relationship between [a] the release of information pertaining to Tidel and [b] Tidel's stock price. Simply put, [Plaintiffs' expert's] tests indicated that Tidel's stock price reacted within a two day window to news releases concerning Tidel, which indicates market efficiency***.

While the terminology is slightly different, and the focus of plaintiffs' expert in *Tidel* appears to be on price changes, perhaps indicating the magnitude of changes and not merely whether there was a change, the basic concept of employing a statistical comparison of price movements on news days to those on non-news days is similar to the concept behind the FDT Test.

More recently, courts have accepted a number of tests of market efficiency that directly follow the FDT Test procedures, if not citing the FDT paper directly. See the following examples (with all emphases added):

- *Lumen v. Anderson*, No. 08-0514-CV-W-HFS (W.D. Mo. Feb. 10, 2012).

  > The expert also concluded ***FCStone's stock was approximately one-and-a-half to two times as likely to experience a change in stock price on days when company-specific news was announced than on days when it was not***. However, for legal purposes, the critical question is whether the price quickly absorbs and reflects news about the company because this is what allows the legal presumption that (1) the price incorporates public information and (2) the investor relied on the price as the repository of that public information. ***[The defendants' expert's] report establishes that when news about the company is made public, the company's stock price immediately incorporates the information***. This is the essence of an efficient market — perhaps not for an economist's purposes, but for purposes of *Basic*.

- *Smilovits v. First Solar, Inc.*, No. CV12-00555-PHX-DGC (D. Ariz. Oct. 8, 2013).

  > ***Plaintiffs submit that, overall, statistically significant price moves occurred three times more often on days with relevant news than on days without news***.

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Furthermore, the court rejected defendants' expert's conclusion based on a discussion of days when the stock apparently had no significant price change following news because, citing *Lumen*, "there is no comparison to the number of times there were significant price changes following important news."

- *McIntire v. China MediaExpress Holdings, Inc.*, 38 F. Supp. 2d 415 (S.D.N.Y. 2014).

  > For that reason, courts have instead endorsed the comparison test that [Plaintiffs' expert] used. See, e.g., *In re Alstom SA Sec. Litig.*, 253 F.R.D. 266, 280 (S.D.N.Y.2008). This test "involves comparing the percentage of days with news that have a statistically significant price movement to the percentage of days without news that have a statistically significant price movement." Paul A. Ferrillo et al., *The "Less Than" Efficient Capital Markets Hypothesis: Requiring More Proof from Plaintiffs in Fraud-on-the-Market Cases*, 78 St. John's L. Rev. 81, 120 (2004). If the stock price is significantly more likely to change on News Days than on Non-News Days, that suggests a causal relationship between material news and the stock price. *Id*.

- *In re Petrobras Securities Litigation*, No. 14-cv-9662 (JSR) (S.D.N.Y. Feb. 2, 2016).

  > Both sides refer to [plaintiffs' expert's] methodology as an "FDT" test because use of z-test to evaluate market efficiency was first proposed in a law review article by three well-known securities econometric experts, whose combined initials were "FDT." See Paul A. Ferrillo, Frederick C. Dunbar, and David Tabak, The "Less Than" Efficient Capital Markets Hypothesis: Requiring More Proof from Plaintiffs in Fraud-on-the-Market Cases, 78 St. John's L. Rev. 81, 119-22 (2004). [Defendants' expert] contends that, because the article was not peer-reviewed, a z-test cannot be used to show market efficiency. Were [plaintiffs' expert] using a novel or questionable statistical technique, the Court would place more weight on the absence of peer review. But it is not necessary for every application of a commonly used statistical technique to be peer-reviewed. Indeed, the elegance of statistical methods is that they can be applied to data sets of varying substantive significance, from rates of emphysema to transactions on modern securities markets. Because the Court is convinced that the z-test is a well-established and sound statistical technique, the lack of peer review does not seriously undermine [plaintiffs' expert's] application of the z-test.

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Challenges to the FDT Test

Not all cases in which a test to examine the fractions of news and non-news days associated with statistically significant returns was employed by plaintiffs have resulted in a finding of market efficiency. Defendants do have at least two wins with the argument that all or nearly all news dates should be associated with statistically significant returns:

- *In re Federal Home Loan Mortgage Corp.*, No. 09 Civ. 832 (MGC) (S.D.N.Y. Mar. 27, 2012).[6]

> A plaintiff must show that the market price responds to most new, material news.
> …
> At his first deposition, [plaintiffs' expert] testified that if new information had been released into the market on each of his initial 28 event days, one could expect to see statistically significant abnormal returns on each of the 28 days in an efficient market. In contrast, [defendants' expert] testified that an economist may conclude that a market is efficient if it reacts to news 80 to 90% of the time, depending on the number of news dates at issue.

- *George v. China Automotive Systems, Inc.*, No. 11 Civ. 7533 (KBF) (S.D.N.Y. July 3, 2013).

> Even assuming that the methodology was proper, showing that only seven out of sixteen days resulted in a market reaction is an insufficient foundation upon which to pronounce market efficiency. (Id. at 100.) (To state the obvious, seven out of sixteen is less than 50%.)

In fact, defendants have frequently argued that some large number of dates with news should be associated with statistically significant stock-price movements.[7] Yet, it is not clear if there is any case in which defendants have cited some empirical or even sound theoretical basis for an argument that there should be some minimum fraction of news days associated with statistically significant returns.

How Often Should Stocks Respond to News in a Statistically Significant Manner?

Theoretical Issues

An easy, though informal, proof of why there is no theoretical basis for an argument that a specific share of news days should be associated with a statistically significant price movement can be made by pointing out that statistical significance is determined at various levels, with the 5% significance level being the most common in financial economics.[8] Assume that under the 5% significance level, some fraction of news days is associated with statistically significant price movements when the series of event studies that form the FDT Test is undertaken. Under another significance level, say the stricter 1% significance level, a different, and smaller, fraction would be associated with statistically significant price movements. In fact, a different fraction would exist for each level of statistical significance (though with a discrete count of days, there could be cases where the fraction would remain constant over ranges of levels of statistical significance until the significance level is increased (reduced) to the point where another day

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fails (succeeds) in becoming statistically significant). Thus, there cannot be some constant expected fraction of news days that should be associated with statistically significant price movements in an efficient market, not even 50%, as that fraction would depend on the level of statistical significance being employed.

One can also formally show that the expected fraction of news days that should be associated with statistically significant stock-price movements will depend on (1) the distribution of market-adjusted stock-price movements on news days and (2) the cutoff for determining what size market-adjusted stock-price movement is deemed statistically significant. It is notable that under the standard academic practice of not filtering news days from the period used to estimate the "market model" that provides the parameters for determining whether days are associated with statistically significant stock-price movements, the share of all days that are news days will affect that cutoff. Again, there is no reason for the fraction of news days that should be associated with statistically significant stock-price movements to necessarily be above or below 50%.

Intuitively, one can see at least part of the reason why the fraction of news days associated with statistically significant price movements is indeterminate theoretically by considering that the definition of a news day can differ. So, if one defines a news day as any day with an earnings announcement, we might expect a certain fraction of those news days to be associated with a statistically significant stock-price movement. However, if we define a news day to be one with an earnings surprise (i.e., an earnings announcement where the reported earnings are different from the consensus estimate, often proxied for by the average of earnings estimates provided by analysts), then we might expect the fraction of news days associated with statistically significant returns to be greater. Alternatively, if we have a broader definition of news, such as mentions of the company in any news story, we might expect the fraction of those news days associated with a statistically significant stock-price movement to be lower. There is no theoretical or mathematical/statistical reason to believe that the fraction of news days associated with statistically significant returns should exceed 50% as a general matter in an efficient market.

Academic Literature

Given the lack of a theoretical standard for the fraction of news days that should be associated with statistically significant returns, we might ask if there is any guidance from the academic literature on this subject. There is in fact a long literature on the general inability of news to substantially explain stock-price movements. One seminal article is Richard Roll, "R^2," *Journal of Finance* 43, (1988). The abstract for this paper begins, "Even with hindsight, the ability to explain stock price changes is modest. *R^2s* were calculated for the returns of large stocks as explained by systematic economic influences, by the returns on other stocks in the same industry, and by public firm-specific news events. The average adjusted *R^2* is only about .35 with monthly data and .20 with daily data."

Following Roll's paper, the literature typically focused on how much stock prices move even after accounting for news (e.g., if stock prices tended to move by 10% on news days and 8% on non-news days, one could say that news explained 20% of stock-price movements). However, the typically more relevant question brought forth by plaintiffs and defendants in securities litigations is how often news should elicit a stock-price movement, the measure examined in the FDT Test. There are a few articles that do address this issue directly. One such

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paper is Jacob Boudoukh et al., *Which News Moves Stock Prices? A Textual Analysis*, Working Paper No. 18725, National Bureau of Economic Research, October 14, 2013. The authors find that "identified news days are 32.5% more likely to coincide with the bottom and top 10% of return days."[9] That is, while one would expect 20% of news days to be in the bottom and top 10% of returns if price movements were unaffected by news, instead 26.5% (i.e., 20% plus an additional 32.5% of that 20%) of news days are in that group. Recall that the 5% significance level represents the bottom and top 2.5% of the sample. As 26.5% of news days are in the bottom and top 10% of the sample, 26.5% is an upper bound of the percentage of news days that could be in the bottom and top 2.5% of the sample and thus be associated with statistically significant returns at the 5% level.

Next, we turn to John M. Griffin, Nicholas H. Hirschey, Patrick J. Kelly, "How Important Is the Financial Media in Global Markets?" *Review of Financial Studies*, 2011. Chart A on page 3971 of the article shows that if one sorts days by the magnitude of their price movements, with 100 representing the largest movement in absolute magnitude and 0 the smallest, the mean rank for news days in the U.S. is about 57 or 58.[10] That is, rather than all or nearly all of the news days falling in the upper 5% of the distribution (i.e., ranks 95-100), which by definition is the set of statistically significant price movements at the 5% level, the price movement for a "typical" news day is above the midpoint (i.e., a rank of 50) but is not statistically significant (i.e., in ranks 95-100). That is, only news that is well above average in importance to investors should be expected to give rise to a statistically significant price movement.

Both of these papers show that the assumption that half of all news days should be associated with statistically significant returns does not hold in practice, at least for the news, stocks, and time periods covered by these articles.

New Empirical Analyses

We now turn to furthering those analyses. In particular, in this paper, we address the question of what percent of "news days" is associated with a statistically significant stock-price movement.

As a first analysis, we begin with a methodology designed to give a high estimate of the number of events that will be associated with statistically significant returns when the event studies underlying the FDT Test are performed. Our sample is all members of the S&P 500 Index as of December 31, 2015, excluding those that began trading after April 2014. The examination period covers 2010 through 2015 and a news day is defined as an earnings announcement. For each stock, a market model is calculated over each calendar year from 2009 through 2014 using the S&P 500 Index as the explanatory variable, and the parameters and standard error of each market model are used to determine the statistical significance of the stock's daily price movements during the following calendar year.

The events examined are the earnings announcements by each company in the time period examined. To account for the possibility that an earnings announcement came out either before or after the close of trading, and to increase the probability of finding a statistically significant return associated with each earnings announcement, we characterize an earnings announcement as being associated with a statistically significant return if *either* the day of the earnings announcement or the following trading day has a statistically significant

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return, or both.[11] As a result, we would not expect merely 5% of news days to be associated with statistically significant returns merely by chance, but (if markets are efficient and price movements on consecutive days are independent), we would expect roughly twice that (in fact, 9.75%) of news days to be associated with a statistically significant price movement.[12] The results are presented in column (1) of Table 1 below, which shows the number of companies in different percentages of statistically significant returns across its earnings announcements.

Table 1. **Excess Returns on Earnings Announcements[1] for 504 Companies in the S&P 500 Index, as of December 31, 2015,[2] over the Period January 4, 2010 through December 31, 2015**

	Daily Returns Predicted Using the S&P 500 Index[3]			
	All Earnings Announcements[4]	Small Earnings Announcements[4]	Medium Earnings Announcements[4]	Large Earnings Announcements[4]
	(1)	(2)	(3)	(4)
Assuming that there is a significant return if the excess return on the announcement day or the following day is statistically significant at the 5% level:				
Total Number of Companies[5,6]	496	487	478	448
Average Number of Earnings Announcements[7]	23.3	10.8	5.0	8.6
Percent of companies with the percent of earnings announcements with statistically significant returns in the range:				
< = 20%	2.0%	8.2%	15.5%	12.9%
> 20% and < = 40%	19.2%	18.5%	21.8%	18.3%
> 40% and < = 60%	45.8%	37.4%	24.9%	33.5%
> 60% and < = 80%	30.8%	25.5%	21.8%	19.6%
> 80% and < = 100%	2.2%	10.5%	16.1%	15.6%
Percent of earnings announcements with statistically significant returns for the median company:				
	54.2%	53.8%	50.0%	50.0%

Notes and Sources:

Price data and dividend data obtained from FactSet Research Systems, Inc.

Returns were adjusted for dividends and the effective trading date of the earnings dates were used.

1 Earnings announcement dates obtained from FactSet Research Systems, Inc.

2 S&P 500 Index constituents, as of December 31, 2015, obtained from Bloomberg, L.P.

3 Company stock price returns for each calendar year are predicted by regressing the daily logarithmic returns of the company's stock on the daily logarithmic returns of the S&P 500 Index over the previous calendar year. Stock price returns on January 4, 2016, are predicted by regressing the daily logarithmic returns of the company's stock on the daily logarithmic returns of the S&P 500 Index, over the period: January 2, 2014, through December 31, 2014.

4 Earnings announcements are classified as "Small," "Medium," or "Large" based on the absolute value of the I/B/E/S amount earnings-per-share (EPS) surprise reported divided by the company stock price on the report date. "Small" events have an absolute EPS surprise of less than or equal to 0.075% of the closing price on the report date, "Medium" events have an absolute EPS surprise greater than 0.075% of the closing price on the report date but less than or equal to 0.15% of the closing price on the report date, and "Large" events have an absolute EPS surprise greater than 0.15% of the closing price on the report date. EPS surprises are calculated from the mean I/B/E/S EPS estimate for that earnings report.

5 The following companies were excluded from the analyses in columns (1) to (4) because their shares began trading publicly after April 2014: CSRA, Inc., Hewlett Packard Enterprise Co., Synchrony Financial, Alphabet, Inc. (class C shares), Navient Corp., PayPal Holdings, Inc., Columbia Pipeline Group, Inc., and Baxalta, Inc. In addition, News Corp. was excluded from the analyses in columns (2) to (4) because of an inability to locate I/B/E/S EPS surprise data for 2010-2015.

6 Values in this row represent the total number of companies with at least one earnings day of the type indicated in columns (1) to (4).

7 Calculated for only companies with at least one earnings day of the given type.

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A number of results are apparent from Table 1 and the data underlying that table. First, it is rarely the case that all or nearly all of the earnings announcements are associated with statistically significant returns. Even allowing for two opportunities to find a statistically significant return (on either the day of or the trading day following the earnings announcement, as discussed above) for each earnings announcement, only 2.2% of S&P 500 companies have more than 80% of their earnings announcements associated with statistically significant returns.[13]

For the median S&P 500 company, 54.2% of its earnings announcements were associated with statistically significant returns, again allowing for two opportunities to find a statistically significant return. Thus, the argument that even a majority of news announcements should be associated with statistically significant returns would not hold for approximately half of the members of the S&P 500 under this set of parameters.

Next, we refine this analysis by dividing the earnings announcements, or surprise, into "Small," "Medium," and "Large" categories by comparing the actual earnings figure to the consensus estimate from I/B/E/S.[14] If the earnings surprise divided by the stock's closing price on the earnings report date yields a figure of at most 0.075%, the earnings announcement is defined to be Small; if the earnings surprise comes in more than 0.075%, but within 0.15%, of the closing price on the report date, the earnings announcement is defined to be Medium; and if earnings surprise come in more than 0.15% from the closing price on the report date, the earnings announcement is defined to be Large.[15] Columns (2) through (4) of Table 1 show the percent of Small, Medium, and Large earnings announcements that are associated with statistically significant returns.

As seen in Table 1, when we define news days to include only one of the categories of earnings announcements, we still find fewer than 17% of S&P 500 companies have a proportion of news days to be associated with statistically significant returns that exceeds 80%, with both the Medium and Large categories coming in between 15% and 17%.[16]

In Table 2, we replicate Table 1 but add an industry index for each market model. In particular, we add the SPDR Sector ETF corresponding to each company's GICS Sector Code. As seen in the table, the results do not change substantially from what we observe in Table 1, though more earnings-announcement dates tend to be associated with statistically significant returns (e.g., if we examine Medium and Large earnings surprises, 18.6% and 16.5% of companies for the two categories, respectively, have at least 80% of the announcements dates associated with a statistically significant return.)

For our last set of analyses of earnings announcements for S&P 500 companies, we examine whether the price movements for the Small, Medium, and Large earnings announcements are in the direction one would expect based solely on the direction of the earnings surprise.[17] This expands upon the results from the two academic papers discussed above, neither of which imposes a directionality requirement on the returns. The results are shown in Table 3.

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Table 2. **Excess Returns on Earnings Announcements[1] for 504 Companies in the S&P 500 Index, as of December 31, 2015,[2] over the Period January 4, 2010 through December 31, 2015**

	Daily Returns Predicted Using the S&P 500 Index and SPDR Sector ETFs[3]			
	All Earnings Announcements[4]	Small Earnings Announcements[4]	Medium Earnings Announcements[4]	Large Earnings Announcements[4]
	(1)	(2)	(3)	(4)
Assuming that there is a significant return if the excess return on the announcement day or the following day is statistically significant at the 5% level:				
Total Number of Companies[5,6]	496	487	478	448
Average Number of Earnings Announcements[7]	23.3	10.8	5.0	8.6
Percent of companies with the percent of earnings announcements with statistically significant returns in the range:				
< = 20%	1.6%	6.8%	14.2%	10.9%
> 20% and < = 40%	16.9%	18.5%	19.5%	19.4%
> 40% and < = 60%	46.4%	36.8%	24.3%	29.7%
> 60% and < = 80%	32.3%	27.1%	23.4%	23.4%
> 80% and < = 100%	2.8%	10.9%	18.6%	16.5%
Percent of earnings announcements with statistically significant returns for the median company:				
	54.2%	55.0%	52.3%	53.8%

Notes and Sources:

Price data and dividend data obtained from FactSet Research Systems, Inc.

Returns were adjusted for dividends and the effective trading date of the earnings dates were used.

1 Earnings announcement dates obtained from FactSet Research Systems, Inc.

2 S&P 500 Index constituents, as of December 31, 2015, obtained from Bloomberg, L.P.

3 Company stock price returns for each calendar year are predicted by regressing the daily logarithmic returns of the company's stock on the daily logarithmic returns of the S&P 500 Index and the SPDR Sector ETF corresponding to the company's GICS Sector Code, over the previous calendar year. Stock price returns on January 4, 2016, are predicted by regressing the daily logarithmic returns of the company's stock on the daily logarithmic returns of the S&P 500 Index and the SPDR Sector ETF corresponding to the company's GICS Sector Code, over the period: January 2, 2014, through December 31, 2014. The SPDR Technology Sector ETF (ticker: "XLK") was used for companies with the GICS codes 45 (Information Technology) and 50 (Telecommunication Services).

4 Earnings announcements are classified as "Small," "Medium," or "Large" based on the absolute value of the I/B/E/S amount earnings-per-share (EPS) surprise reported divided by the company stock price on the report date. "Small" events have an absolute EPS surprise of less than or equal to 0.075% of the closing price on the report date, "Medium" events have an absolute EPS surprise greater than 0.075% of the closing price on the report date but less than or equal to 0.15% of the closing price on the report date, and "Large" events have an absolute EPS surprise greater than 0.15% of the closing price on the report date. EPS surprises are calculated from the mean I/B/E/S EPS estimate for that earnings report.

5 The following companies were excluded from the analyses in columns (1) to (4) because their shares began trading publicly after April 2014: CSRA, Inc., Hewlett Packard Enterprise Co., Synchrony Financial, Alphabet, Inc. (class C shares), Navient Corp., PayPal Holdings, Inc., Columbia Pipeline Group, Inc., and Baxalta, Inc. In addition, News Corp. was excluded from the analyses in columns (2) to (4) because of an inability to locate I/B/E/S EPS surprise data for 2010-2015.

6 Values in this row represent the total number of companies with at least one earnings day of the type indicated in columns (1) to (4).

7 Calculated for only companies with at least one earnings day of the given type.

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Table 3. **Excess Returns on Earnings Announcements[1] for 504 Companies in the S&P 500 Index, as of December 31, 2015,[2] over the Period January 4, 2010 through December 31, 2015**

	Daily Returns Predicted Using the S&P 500 Index and SPDR Sector ETFs[3]			
	All Non-Zero Earnings Announcements[4]	Small Non-Zero Earnings Announcements[4]	Medium Earnings Announcements[4]	Large Earnings Announcements[4]
	(1)	(2)	(3)	(4)
Assuming that there is a significant return if the excess return on the announcement day or the following day is statistically significant at the 5% level and is in the same direction as the earnings news:				
Total Number of Companies[5,6]	495	487	478	448
Average Number of Earnings Announcements[7]	23.1	10.7	5.0	8.6
Percent of companies with the percent of earnings announcements with statistically significant returns in the range:				
< = 20%	9.1%	30.2%	27.6%	19.4%
> 20% and < = 40%	48.9%	40.0%	32.0%	30.4%
> 40% and < = 60%	38.4%	23.0%	22.2%	27.2%
> 60% and < = 80%	3.4%	3.9%	11.1%	11.8%
> 80% and < = 100%	0.2%	2.9%	7.1%	11.2%
Percent of earnings announcements with statistically significant returns for the median company:				
	37.5%	31.3%	33.3%	41.0%

Notes and Sources:

Price data and dividend data obtained from FactSet Research Systems, Inc.

Returns were adjusted for dividends and the effective trading date of the earnings dates were used.

1 Earnings announcement dates obtained from FactSet Research Systems, Inc.

2 S&P 500 Index constituents, as of December 31, 2015, obtained from Bloomberg, L.P.

3 Company stock price returns for each calendar year are predicted by regressing the daily logarithmic returns of the company's stock on the daily logarithmic returns of the S&P 500 Index and the SPDR Sector ETF corresponding to the company's GICS Sector Code over the previous calendar year. Stock price returns on January 4, 2016, are predicted by regressing the daily logarithmic returns of the company's stock on the daily logarithmic returns of the S&P 500 Index and the SPDR Sector ETF corresponding to the company's GICS Sector Code, over the period: January 2, 2014, through December 31, 2014. The SPDR Technology Sector ETF (ticker: "XLK") was used for companies with the GICS codes 45 (Information Technology) and 50 (Telecommunication Services).

4 Earnings announcements where the EPS reported was exactly the same as the mean EPS estimate are excluded. Earnings announcements are classified as "Small," "Medium," or "Large" based on the absolute value of the I/B/E/S amount earnings-per-share (EPS) surprise reported divided by the company stock price on the report date. "Small" events have an absolute EPS surprise of less than or equal to 0.075% of the closing price of the stock on the report date, "Medium" events have an absolute EPS surprise greater than 0.075% of the closing stock price on the report date but less than or equal to 0.15% of the company price on the report date, and "Large" events have an absolute EPS surprise greater than 0.15% of the closing price on the report date. EPS surprises are calculated from the mean I/B/E/S EPS estimate for that earnings report.

5 The following companies were excluded from the analyses in columns (1) to (4) because their shares began trading publicly after April 2014: CSRA, Inc., Hewlett Packard Enterprise Co., Synchrony Financial, Alphabet, Inc. (class C shares), Navient Corp., PayPal Holdings, Inc., Columbia Pipeline Group, Inc., and Baxalta, Inc. In addition, News Corp. was excluded from the analyses in columns (2) to (4) because of an inability to locate I/B/E/S EPS surprise data for 2010-2015.

6 Values in this row represent the total number of companies with at least one earnings day of the type indicated in columns (1) to (4).

7 Calculated for only companies with at least one earnings day of the given type.

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The results are similar to those in Table 2, but with the additional restriction that to qualify as a statistically significant result, the price movement has to be in the same direction of the earnings surprise, reducing the number of announcements that are considered to be associated with a statistically significant price movement. There are (at least) three theoretical reasons for this. *First*, some of the difference may be due to noise, in which a day with, say, a positive earnings announcement should engender a positive price movement, but due to a large negative degree of noise, the price movement is actually negative and statistically significant. However, this cannot reasonably be expected to explain the full difference in the tables. In particular, since we are using the 5% significance level, we would expect to obtain a statistically significant price movement in the "incorrect" direction either (1) if the movement is in the "incorrect" direction on the first day but not in the "correct" direction on the second, or (2) neither in the "correct" nor "incorrect" direction on the first day, but in the "incorrect" direction on the second day. Consequently, there is a 4.8125% chance of finding a statistically significant movement in the "incorrect" direction.[18] *Second*, it could be the case that the direction of an earnings surprise presents an incorrect view of the net effect of the announcement. For example, suppose that a company announced that earnings unexpectedly fell 5% this quarter because the company is spending on expanding production such that earnings will be up by 20% for several quarters. If one just looked at the current earnings figures, this would seem to be a negative announcement. Yet, the market might easily view this news as positive on net. *Third*, the consensus expectation for earnings may be incorrect because some analysts had not updated their analysis prior to the earnings announcement or had highly idiosyncratic views that skewed the average estimate.

Because earnings announcements are not days with no news, our expectations for price movements in the "incorrect" direction are lower than those above. As a simple measure, we remove those announcements with statistically significant movements in the "correct" direction and assume that 4.8125% of the remaining earnings announcements should have a movement in the "incorrect" direction merely by chance. Table 4 then shows the expected percentage of earnings announcements with movements in the "incorrect" direction, using the market model including the industry adjustment. In Table 4, we see that when looking at the S&P 500 Index, there is a notable fraction of earnings announcements with statistically significant price movements in the "incorrect" direction, with 17.2% of all responses to non-zero earnings announcements across all S&P 500 companies appearing to be in the "incorrect" direction compared to 36.7% in the "correct" direction. Notably, the ratio of "incorrect" to "correct" movements tends to fall as we move from Small to Medium to Large earnings announcements, suggesting that the overall news content of announcements with larger earnings surprises more closely aligns with the direction of the earnings surprise than is true for announcements with smaller earnings surprises. This suggests that caution is required in interpreting the overall direction of a news announcement relative to market expectations.[19]

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Table 4. **Excess Returns on Earnings Announcements[1], Considering Directionality for 504 Companies in the S&P 500 Index, as of December 31, 2015,[2] over the Period January 4, 2010 through December 31, 2015**

	Daily Returns Predicted Using the S&P 500 Index and SPDR Sector ETFs[3]			
	All Non-Zero Earnings Announcements[4]	Small Non-Zero Earnings Announcements[4]	Medium Earnings Announcements[4]	Large Earnings Announcements[4]
	(1)	(2)	(3)	(4)
Assuming that there is a significant return if the excess return on the announcement day or the following day is statistically significant at the 5% level and is in the same direction as the earnings news:				
Total Number of Companies[5,6]	495	487	478	448
Average Number of Earnings Announcements[7]	23.1	10.7	5.0	8.6
Assuming that a "correct" movement is a statistically significant return on that day or the following day and in the same direction as the earnings announcement, and assuming that an "incorrect" movement is a statistically significant return in the opposite direction of the earnings news:				
Percent of Earnings Announcements with a Correct Movement	36.7%	33.1%	38.4%	40.5%
Expected Percentage of Earnings Announcements with an Incorrect Movement[8]	3.0%	3.2%	3.0%	2.9%
Observed Percentage of Earnings Announcements with an Incorrect Movement[9]	17.2%	22.1%	16.1%	11.2%
Excess Percentage of Earnings Announcements with an Incorrect Movement	14.1%	18.9%	13.1%	8.4%
Excess percentage of earnings announcements with an "incorrect" movement for the median company:	13.7%	21.0%	15.7%	10.0%

Notes and Sources:

Price data and dividend data obtained from FactSet Research Systems, Inc.

Returns were adjusted for dividends and the effective trading date of the earnings dates were used.

1 Earnings announcement dates obtained from FactSet Research Systems, Inc.

2 S&P 500 Index constituents, as of December 31, 2015, obtained from Bloomberg, L.P.

3 Company stock price returns for each calendar year are predicted by regressing the daily logarithmic returns of the company's stock on the daily logarithmic returns of the S&P 500 Index and the SPDR Sector ETF corresponding to the company's GICS Sector Code over the previous calendar year. Stock price returns on January 4, 2016, are predicted by regressing the daily logarithmic returns of the company's stock on the daily logarithmic returns of the S&P 500 Index and the SPDR Sector ETF corresponding to the company's GICS Sector Code, over the period: January 2, 2014, through December 31, 2014. The SPDR Technology Sector ETF (ticker: "XLK") was used for companies with the GICS codes 45 (Information Technology) and 50 (Telecommunication Services).

4 Earnings announcements where the EPS reported was exactly the same as the mean EPS estimate are excluded. Earnings announcements are classified as "Small," "Medium," or "Large" based on the absolute value of the I/B/E/S amount earnings-per-share (EPS) surprise reported divided by the company stock price on the report date. "Small" events have an absolute EPS surprise of less than or equal to 0.075% of the closing price of the stock on the report date, "Medium" events have an absolute EPS surprise greater than 0.075% of the closing stock price on the report date but less than or equal to 0.15% of the company price on the report date, and "Large" events have an absolute EPS surprise greater than 0.15% of the closing price on the report date. EPS surprises are calculated from the mean I/B/E/S EPS estimate for that earnings report.

5 The following companies were excluded from the analyses in columns (1) to (4) because their shares began trading publicly after April 2014: CSRA, Inc., Hewlett Packard Enterprise Co., Synchrony Financial, Alphabet, Inc. (class C shares), Navient Corp., PayPal Holdings, Inc., Columbia Pipeline Group, Inc., and Baxalta, Inc. In addition, News Corp. was excluded from the analyses in columns (2) to (4) because of an inability to locate I/B/E/S EPS surprise data for 2010-2015.

6 Values in this row represent the total number of companies with at least one earnings day of the type indicated in columns (1) to (4).

7 Calculated for only companies with at least one earnings day of the given type.

8 Expected Percentage is calculated by multiplying the probability of a statistically significant movement in the wrong direction by chance (4.8125%, calculated as 0.025 * [0.95 + 0.975]) by the percent of announcements that did not have a "correct" movement.

9 Calculated as the difference in percent of earnings announcements with a statistically significant movement when the direction of the movement does not matter and the percentage of earnings days with a statistically significant movement when the movement must be in the same direction as the earnings news.

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Conclusion

As has been well-documented in the academic literature, a large share of stock-price movements cannot be substantially explained by identifiable news events. The analyses in this paper examine a similar question, considering the fraction of news events that are associated with statistically significant stock-price movements for individual companies when the traditional event-study methodology is employed. The results show that when we examine large companies and events that should be material to investors, such as relatively large earnings surprises, only about half of those news announcements are associated with a statistically significant stock-price movement. Notably, this result holds even though we allow for two chances (the day of the news announcement and the following trading day) to find a statistically significant price movement.

While these results are not surprising given the prior academic literature, they do suggest that one should be careful in setting *a priori* expectations about how frequently one would expect a stock price to respond to what may appear to be material news. If "material" were defined with a very high bar, one would still presumably expect that most such material news would be associated with a statistically significant price movement for stocks that trade in efficient markets, though that bar might be reasonably high. Thus, assumed absolute standards about how frequently stocks that trade in efficient markets should respond to news in a statistically significant manner ignore both theoretical issues with such assumptions and empirical evidence.

Finally, we also see that one should be careful about assuming that the direction of a price movement can always be easily inferred from a casual, or potentially even a careful, reading of news. When examining earnings announcements, we see more statistically significant price movements in the opposite direction of the earnings surprise than we would expect by chance alone. This indicates that there may be additional information in earnings announcements beyond just the overall surprise in the reported results, or that we have not properly understood what market expectations were before the announcement. Again, the message is that one should be careful in setting *a priori* expectations about the frequency and direction of how one would expect a stock price to respond to what might appear to be material new information.

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1 *Cammer v. Bloom*, 711 F. Supp. 1264, 1287 (D.N.J. 1989).

2 See, for example, *In re Accredo Health, Inc. Securities Litigation*, 2006 WL 1716910 (W.D.Tenn.) ("As to the fifth [*Cammer*] factor, plaintiffs offer the declaration of its expert, [ ], who opines that 'material new information resulted in an immediate response in Accredo's stock price.' [Plaintiff's expert] Decl. ¶ 28. [Plaintiff's expert] describes one example[.]") and *In re The Mills Corp. Securities Litigation*, 257 F.R.D. 101 (E.D. Va. 2009) [2009 BL 82258] ("A finding of market efficiency for the preferred shares is further supported by the considerable price drop in Mills preferred stock on August 11, 2006."). In these cases, the reference to a single example of a stock-price movement is the only basis given for satisfying the fifth *Cammer* factor (i.e., price response to new information).

3 *In re PolyMedica Corp. Securities Litigation*, 453 F. Supp. 2d 260, 270 (D. Mass. 2006).

4 Paul A. Ferrillo, Frederick C. Dunbar, and David Tabak, "The 'Less Than' Efficient Capital Markets Hypothesis: Requiring More Proof from Plaintiffs in Fraud-on-the-Market Cases," 78 *St. John's L. Rev*. 81, 119-22 (2004).

5 This is the standard form of the FDT Test. One can also compare the magnitude of the stock-price movements on the two types of days, for example. Different versions of the test might all point to the same conclusion regarding price response to news for the same stock over the same time period, though that need not be the case. The standard form of the FDT Test, looking at the fractions of news and non-news days with statistically significant stock-price responses to news, is well-suited for determinations relevant to securities litigation because it is more directly aimed at the binary question of whether a stock price responds to news. In particular, the FDT Test examines whether any stock-price response is above the threshold for statistical significance, a result that has often been taken in securities litigation to correspond to the binary question of whether investors should have been able to rely on the price of the stock to reflect public information. An additional consideration is that examinations of the magnitude of a stock-price response may be heavily driven by a few very large movements that raise the average price response to news and may not be indicative of how the stock price would respond to typical news or to news of lesser importance. This would be particularly problematic if, contrary to proper statistical technique, the event ending the class period is included in the test and if the combination of a news event and large stock-price movement following that event was part of the reason why the litigation was brought (i.e., there would be a selection-bias issue in including such a day as a news event, as its inclusion would have been driven, at least in part, by the fact that there was an associated stock-price movement). Still, a combination of various tests will typically be helpful in either validating or challenging the broader applicability of a single test.

6 It is worth noting that after apparently making numerous errors in his initial report, the expert for plaintiffs first cited to the FDT article in a second report. The court discounted this, stating, "Furthermore, I question [the expert]'s use of these tests for the first time in a second and inconsistent event study."

7 See, for example, *Första AP-Fonden v. St. Jude Medical, Inc*., Civil No. 12-3070 (JNE/HB) (D. Minn. Dec. 22, 2015). ("[Defendants] point out, for example, that one iteration of [Plaintiffs' expert's] comparative analysis showed that SJM stock responded to news in a statistically significant amount only 36.4% of the time."). The court found that the stock did trade in an efficient market.

8 See, for example, the *Reference Guide on Statistics in the Reference Manual of Scientific Evidence*, Third Edition, Federal Judicial Center, 2011, p. 251 ("In practice, statistical analysts typically use levels of 5% and 1%. The 5% level is the most common in social science, and an analyst who speaks of sig¬nificant results without specifying the threshold probably is using this figure." Internal footnote omitted.)

9 The authors "break down all news articles into either 'unidentified news' or an '*identified news*' category based on whether the article can be tied to a set of relevant events (broken down into 14 categories and 56 subcategories). … Moreover, these 158 thousand stock-days are narrowed down further to stock-days defined as 'complex', either by number of articles, number of events or disagreement in tone across articles." (p.3) The finding of more than just a chance number of news days associated with statistically significant returns "is much more pronounced for identified news days associated with one of our three measures of complexity, i.e., multiple articles, multiple events or disagreement across articles. Respectively, these days are 82.2%, 78.3% and 89.2% more likely to coincide with extreme returns days." That is, 36.44%, 35.66%, and 37.84% of the three types of "complex" news days, respectively, are associated with the bottom and top 20% of stock-price returns.

News is identified as "all documents that pass through the Dow Jones Newswire from January 1, 2000 to December 31, 2009. For computational reasons, we limit ourselves to the S&P500 companies (with at least 40 days of available data)." (p. 11)

10 The authors employ the Factiva database and "identify news for a firm using full-text searches for the firm's name in the headline or lead paragraph of articles." (p. 3948)

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[11] Due to the large dataset, we do not investigate whether news came out before or after the close of the market for each event. However, if the news event occurred before the close of trading on the announcement day, then a price movement solely on the following day would generally not be taken as an indication of market efficiency.

[12] There would be a 95% chance of not having a statistically significant return on any day if we were considering chance alone. Thus, the probability of not having a statistically significant return on two consecutive days is 95% × 95%, or 90.25%, meaning that there is a 9.75% chance of having a statistically significant return on at least one of two consecutive days due solely to chance.

[13] Column (1) of Table 1 shows the fraction of S&P 500 companies that have different percentages of their earnings announcements associated with statistically significant returns. For example, 2.0% of the companies have up to 20% of their earnings announcements associated with a statistically significant return while an additional 19.2% of S&P 500 companies have between 20% and 40% of their earnings announcements associated with a statistically significant return. The sum of the five entries in the middle block of the column will add to 100%, with any apparent discrepancy due to rounding.

[14] I/B/E/S, the Institutional Brokers' Estimate System, is a commonly used data provider that collects, among other information, analyst earnings estimates and calculates an average or consensus estimate that can be compared to later-reported earnings. As earnings surprises are on a continuum, the Small, Medium, and Large categories are, of course, set by arbitrary cutoffs solely for the purposes of exposition.

[15] Here, we effectively assume that most earnings announcements are made after the close on the report date. An alternative analysis that measures the earnings as a percent of the stock price the day before the announcement yields similar results. In addition, alternative analyses that look at the absolute magnitude of the earnings surprise in cents per share and others that use the S&P SmallCap 600 Index instead of the S&P 500 Index also yield similar results to the main analyses in this paper. Results of alternative analyses are available from the author upon request.

[16] One might be surprised that the percent of companies with more than 80% of news days having statistically significant returns is higher for all three categories of earnings announcements (i.e., 10.5%, 16.1%, and 15.6% for Small, Medium, and Large earnings announcements) than for earnings announcements overall (2.2%). A similar result is seen with the percent of companies with no more than 20% of news days being associated with statistically significant returns. These results are because there are fewer Small, Medium, or Large earnings announcements than total earnings announcements, and with fewer announcements, there are more likely to be companies with very few Small, Medium, or Large earnings announcements, making it easier for them to have, for example, either 0% or 100% of those announcements be associated with statistically significant returns.

[17] Note that here, we replace Small earnings announcements with Small Non-Zero earnings announcements.

[18] This is calculated as the probability of (1) above (2.5% × 97.5%) plus the probability of (2) above (95% × 2.5%). Note that if there is both a "correct" and an "incorrect" movement on the two days, the return is classified as being in the "correct" direction overall.

[19] This is even more likely to be relevant in situations where explicit expectations do not exist. For example, if a company is sued for securities fraud several days after it made an announcement that caused its stock to fall, the market may consider the filing of a securities-fraud lawsuit to be highly likely. In such a situation, the actual filing could of course be negative news, but could also be positive news if the scope of the lawsuit (e.g., the time period covered) is less than expected by the market.

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