

# News versus Sentiment: Predicting Stock Returns from News Stories

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The analysis and conclusions set forth are those of the authors and do not indicate concurrence by other members of the research staff or the Board of Governors.

While these are not the opinions of the Fed, if they were, then they would be damn good ones.

# Artificial intelligence and text-processing are a growing part of the finance practice

- Artificial intelligence: Lo (1994) reviews neural networks, Altman, Marco, and Varetto (1994) - corporate distress diagnosis, Atiya (2001) - bankruptcy prediction, and Khandani, Kim, and Lo (2010) - consumer credit risk.
- Industry (Hillert, Jacobs, and Müller(2014) and Hagenau, Hauser, Liebmann, and Neumann (2013)) and academic studies have increasingly confirmed the value of textual analysis.
  - Tetlock's pioneering studies ((Tetlock, Saar-Tsechansky, and Macskassy 2008) and (Tetlock 2007)) demonstrate that news stories contain information relevant to predicting both earnings and stock returns.

## Some evidence that the text in news (and annual reports) predicts return

- Textual information can *briefly* predict returns at
  - The aggregate market level ( (Tetlock 2007), (Dougal, Engelberg, García, and Parsons 2012), (Garcia 2013) and Dzielinski and Hasseltoft (2013))
  - as well at the individual stock level ( (Boudoukh, Feldman, Kogan, and Richardson 2013), (Chen, De, Hu, and Hwang 2014), (Jegadeesh and Wu 2013))
- Only (Sinha 2016) has shown that news stories can predict stock returns for up to 13 weeks

# Does textual information capture news or sentiment?

- Tetlock (2007): “The sentiment theory predicts short-horizon returns will be reversed in the long run, whereas the information theory predicts they will persist indefinitely.”
- But the evidence, so far, has been mixed
  - At market level:
    - Tetlock (2007) finds short-term return predictability, and reversal
    - Garcia (2013) shows returns predictable at market level, but only during recessions.
  - At individual stock level:
    - Loughran and McDonald (2011) find greater response for individual stocks within a multi-day event window.
    - Jegadeesh and Wu (2013) find limited return predictability for individual stocks.

# News versus Sentiment: preview of results

- Explore temporal return predictability in individual stock returns
  - Textual analysis appears to extract permanent information that is not fully incorporated into stock prices.
  - Duration of return predictability depends critically on portfolio formation procedure. Short term reaction to daily news, longer term reaction to weekly news.
- Provide a method for disentangling the effect of no news, positive news, negative news and neutral news.
- Positive news is quickly incorporated into prices, negative news effect persists.
- Much of the delayed reaction to news occurs around subsequent earnings announcement.

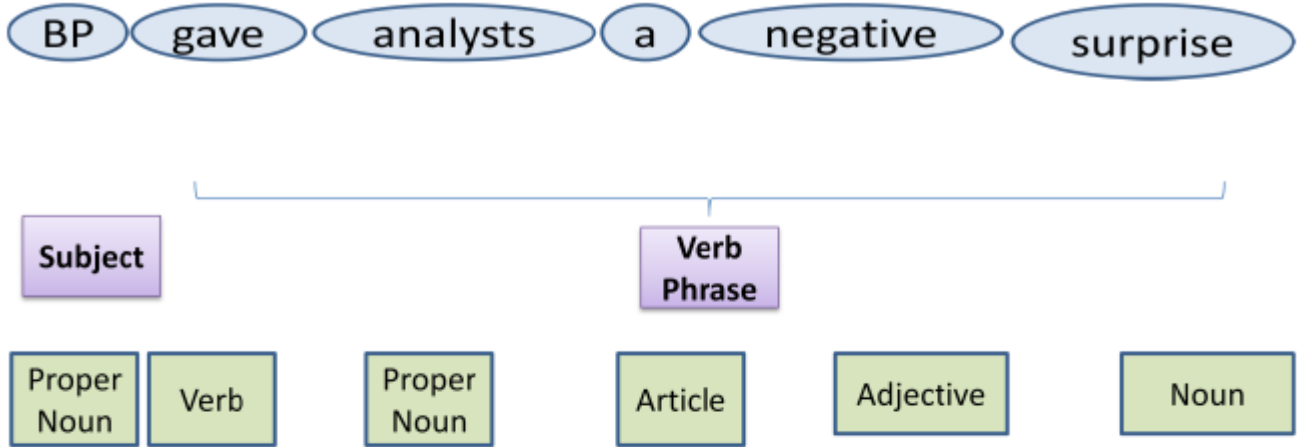
# Our Dataset

- Thomson Reuters NewsScore Data (sentiment data) from U.S. stocks from 2003-2010. Over 900,000 stories.
- Time of the story, Relevance of the story to the firm, staleness of the story, measures from the sentiment engine.

TIMESTAMP	RIC	SentPos	SentNeg	Relevance	Item_Type	Lcnt	TopicCd
2006-01-03 12:45:10	PPC.N	0.06	0.81	1.00	Article	2	FOD US RES
2006-01-03 12:45:35	F.N	0.55	0.01	1.00	Alert	2	AUT RCH RTRS
2006-01-03 12:45:50	LCC.N	0.11	0.72	0.41	Article	1	AIR RCH RTRS

- Merge with CRSP and Compustat data.

# Thomson Reuters sentiment engine



## Pre-processing



## Lexical and sentiment pattern identification



Pr(positive)  
Pr(negative)

## Classification



# The average story is slightly positive

- Positive, Negative and Neutral sentiments sum to 1.

Table 1: Characteristics of News Sentiment Variables

Sentiment variable	Mean	Standard deviation
Thomson Reuters net sentiment	2.4%	39.0%
Thomson Reuters negative sentiment	27.5%	24.6%
Thomson Reuters positive sentiment	29.9%	21.7%

# Large firms get more news; small firms with news have higher returns than firms without news

Decile	Log market cap	News stories per week	Proportion of firms without news	Return	Return w/news	Return w/o news	Difference	<i>t-statistics</i>
Smallest 1	9.42	0.16	0.95	-0.14%	2.00%	-0.24%	2.24%	3.47
2	10.56	0.59	0.94	-0.12%	1.51%	-0.23%	1.75%	3.59
3	11.22	1.33	0.92	-0.14%	-0.02%	-0.15%	0.12%	0.4
4	11.8	2.49	0.89	-0.06%	-0.04%	-0.06%	0.01%	0.04
5	12.35	4.01	0.87	-0.05%	-0.28%	-0.01%	-0.26%	-0.86
6	12.88	5.81	0.85	-0.01%	-0.26%	0.03%	-0.29%	-0.99
7	13.43	7.63	0.82	0.04%	-0.07%	0.06%	-0.13%	-0.48
8	14.04	10.19	0.76	0.05%	0.08%	0.04%	0.04%	0.15
9	14.83	13.3	0.66	0.09%	0.12%	0.07%	0.05%	0.25
Largest 10	16.48	22.42	0.34	0.06%	0.07%	0.04%	0.04%	0.18

- When measuring the effect of news sentiment, important to control for the existence of news.

# Return pattern suggests daily news is quickly absorbed into prices

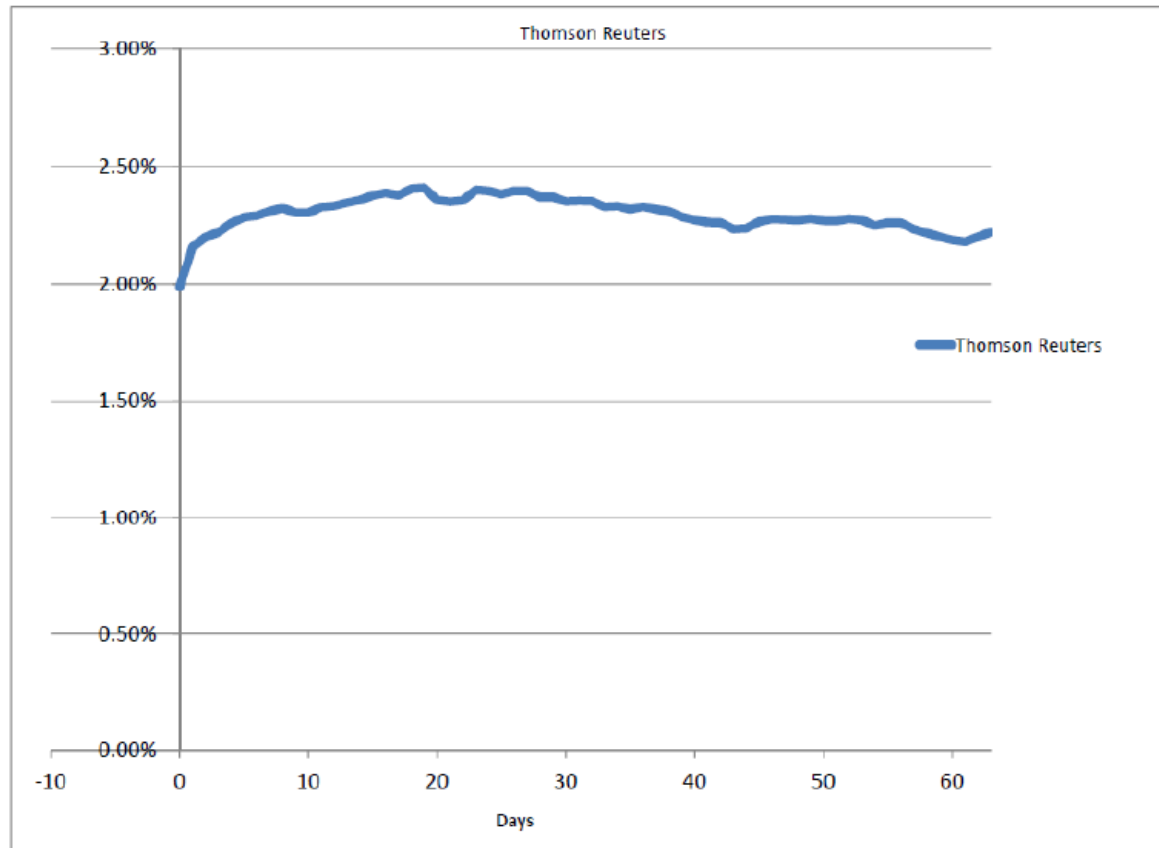
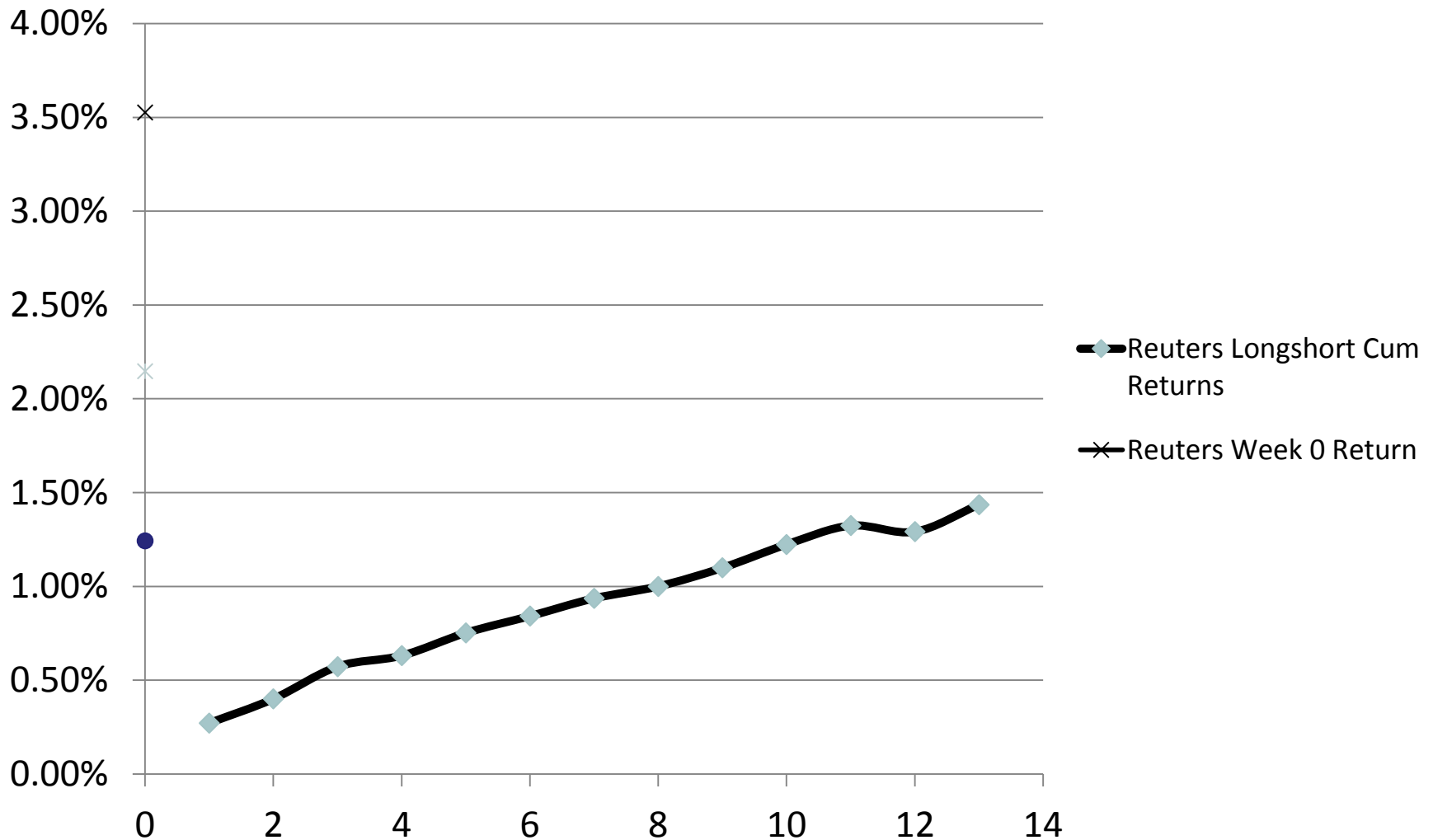
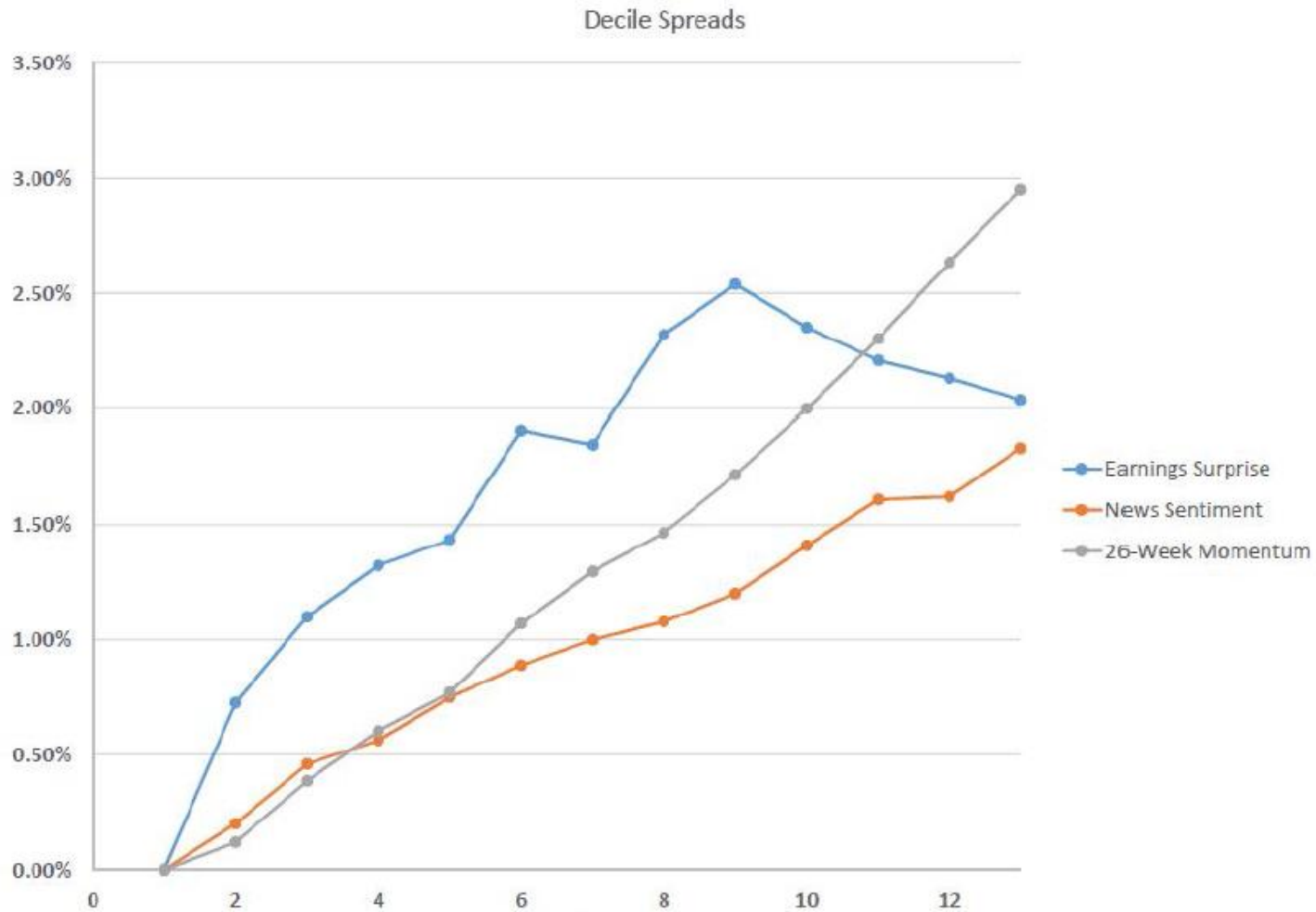


Figure 1: Cumulative Excess Returns on Daily News and Post-News Quintile Spreads

# Weekly news, on the other hand, is slowly incorporated into prices



# Weekly return from news is comparable to momentum and earnings surprise trading strategies



# Compensation for risk or excess return?

(a) Panel A: Long-short excess returns from weekly portfolio for all stocks with news

Week after news	Return	<i>t-statistics</i>	Momentum-adj return	<i>t-statistics</i>	Size-adj return	<i>t-statistics</i>
Week 1-13	2.15%	8.2	2.22%	4.8	2.65%	5.3
Week 2-13	1.83%	7.4	1.91%	4.3	2.29%	4.8

- We consider size and momentum as candidate risk factors and find that neither subsume the return predictability of news

# Why weekly news predicts return for 13 weeks, while daily news predicts return for only two days?

## Two candidate explanations:

- Information confirmation from multiple stories in the same week
- Distribution of daily news is different from weekly news

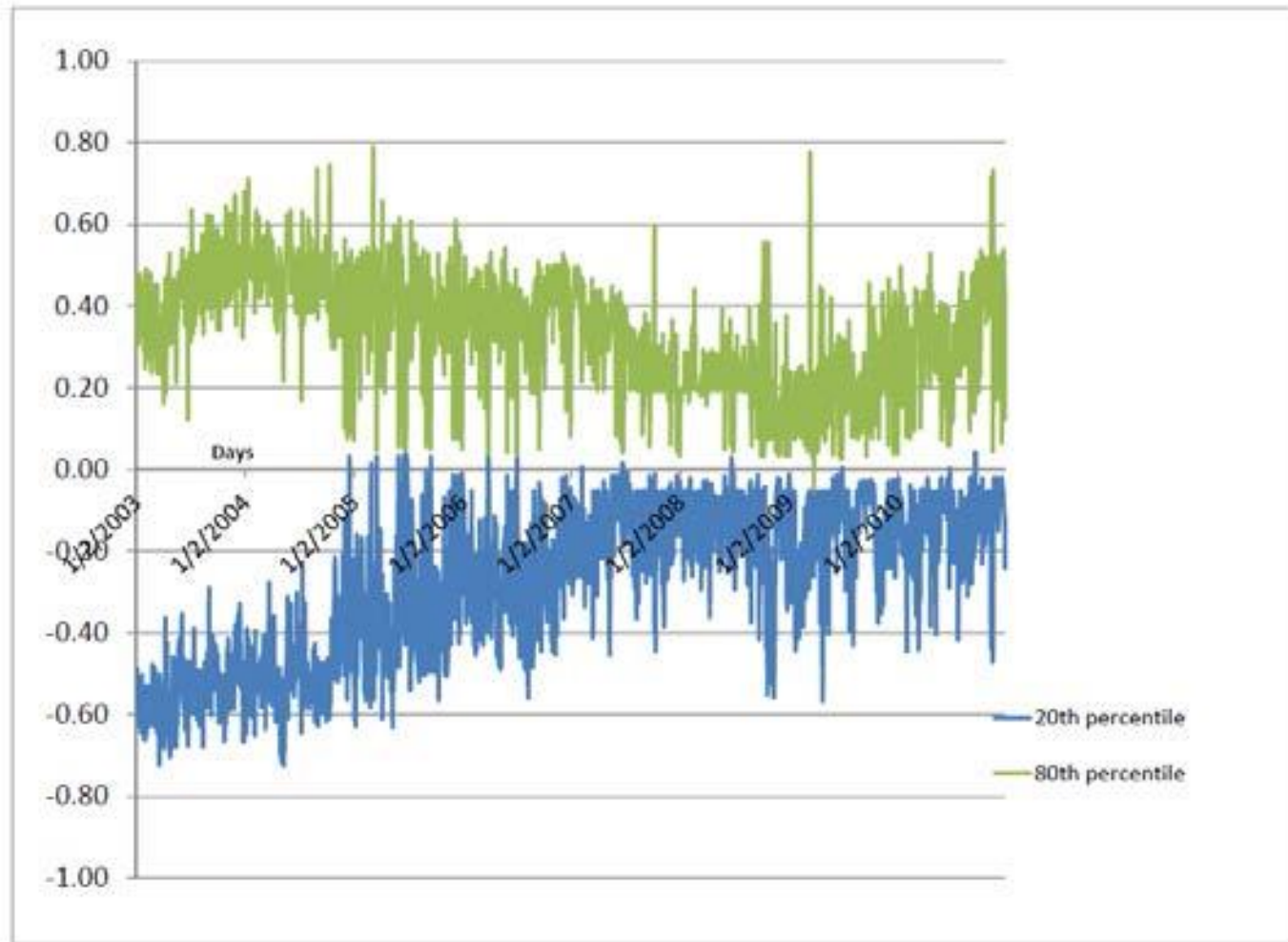
## Explanation 1: Information confirmation from multiple stories

- Only 35% of the firms have more than one news in a week. This explanation argues that minority of firms drives the return predictability. Results indicate otherwise.

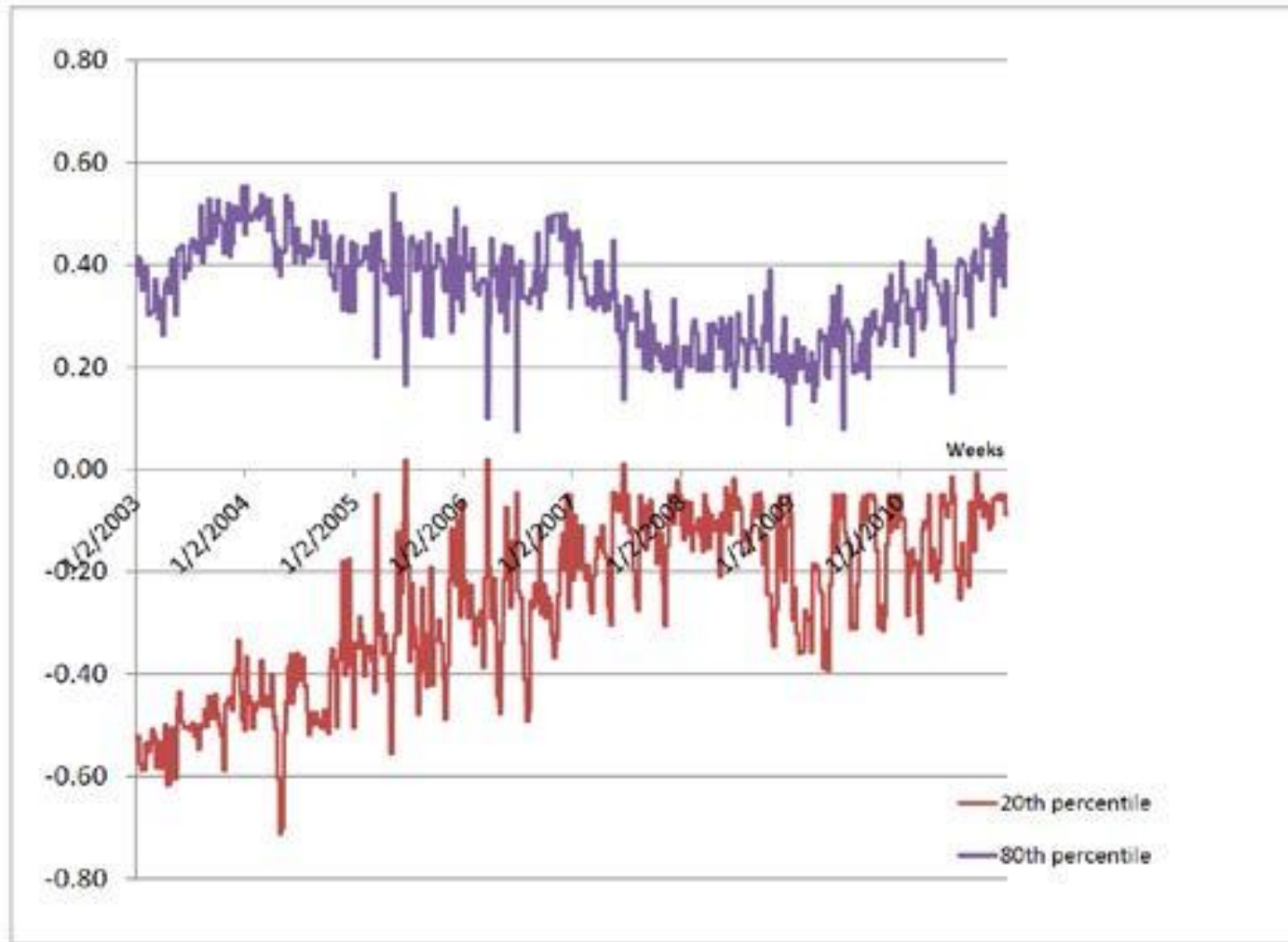
Week after news	One article	<i>t-statistics</i>	Multiple articles	<i>t-statistics</i>
Week 1-13	1.24%	5.68	2.02%	4.80
Week 2-13	1.05%	5.44	1.54%	4.24



# Explanation 2: Distribution of daily news is different from weekly news



# Explanation 2: Distribution of daily news is different from weekly news



# Multiple ways in which news could affect prices

- Buy on rumor, sell on news (Brunnermeier 2005) : Overreaction.
- No news is good news (Fang and Peress 2009) News leads to attention-driven demand, future returns are inferior.
- Bad news travels slowly (Hong, Lim and Stein 2002, Frazzini 2006): Underreaction.

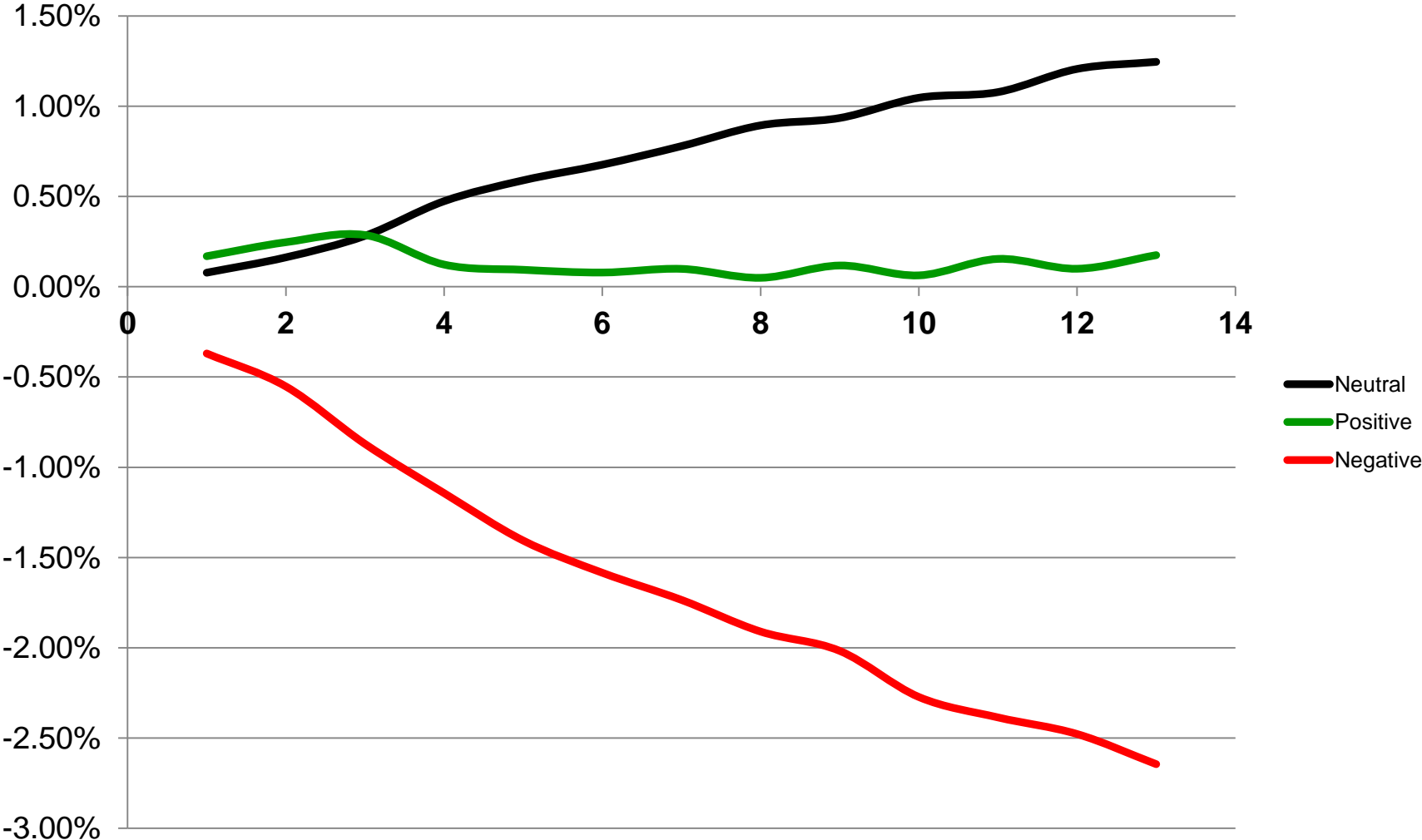
## Cross-sectional Regression Methodology

- For a given lag  $k$  ranging from 0 to 13, we regress stock returns for firm  $i$  on sentiment score

$$r_{i,t} = \alpha_{k,t} + \gamma_{k,t} * If\_news_{i,t-k} + \beta_{k,t} * Positive_{i,t-k} + \delta_{k,t} * Negative_{i,t-k} + \varepsilon_{i,t} \quad (1)$$

- $\alpha_{k,t}$ : return on firms with no news at lag  $k$ .
- $\gamma_{k,t}$ : return premium for firms with neutral news over firms with no news. If “no news is good news,” then  $\gamma_{k,t}$  will tend to be negative.
- $\beta_{k,t}$ 's and  $\delta_{k,t}$ 's : excess returns on costless, well-diversified portfolios that have 100% net loadings on positive or negative sentiment variables at a given lag

# Cumulative coefficients over next 13 weeks



# On how does news affect prices: Results

- Buy on rumor, sell on news : There is a significant positive “news effect”; 1.25% over 13 weeks.
- No news is good news : In our dataset, no news is *not* good news. It is no news.
- Bad news travels slowly : Indeed the underreaction to news is driven by negative news; 2.6% over 13 weeks.

# News and Earnings

- In weeks subsequent to a news story, we divide firms into three categories based on whether they have not yet announced earnings since the news (“Pre-earnings”), firms that announce earnings in that week (“Earnings”), and firms that have already announced earnings between the news release and the current week (“Post-Earnings”).

Week after news	Pre-Earnings		Earnings week		Post-Earnings	
	Average	<i>t-statistics</i>	Average	<i>t-statistics</i>	Average	<i>t-statistics</i>
Week 1-13	0.25%	0.11	5.57%	2.66	1.83%	2.14
Week 2-13	-0.07%	-0.03	4.76%	2.33	1.83%	2.14

- Most of news returns occur in the Earnings week, a smaller fraction in the post-earnings week.

# Conclusion

- The longer lasting predictability establishes that the effect of news on prices is not merely due to transient sentiment or liquidity.
- Controlling for the news effect, positive news affects stock prices within one week. However, negative news predicts low stock returns for up to one quarter.
- Most of the delayed reaction to news occurs around subsequent earnings announcements.
- Future research can further explore patterns of predictability. Comparison of return patterns across different types of news may enhance our understanding of how markets process information.