Quantifying News Reports to Proxy "Other Information" in ERC Models

Kuo-Tay Chen*, Jian-Shuen Lian, and Yu-Ting Hsieh

Department of accounting
College of Management
National Taiwan University
1 Roosevelt Road, Sec. 4, Taipei, Taiwan, 106
ktchen@management.ntu.edu.tw

Abstract. Many previous studies have investigated how earning announcement affects stock price. They measure the effect by employing earning response coefficient (ERC) models. However, the traditional models did not explicitly consider textual information received by investors. Rather they simply referred to it as "other information". However, investor's exposure to textual information (e.g. news report) might have significant influence on how stock prices will respond to earning announcements. This study attempts to investigate whether earning surprises cause stock fluctuations and how the effect is influenced by news coverage prior to earning announcements. We find that: (1) earning surprise significantly affects stock price; (2) more news coverage tends to decrease the ERC; (3) positive earning surprises have higher influence on stock price; and (4) different combinations of news sentiment and earning surprise result in different ERC.

Keywords: earning response coefficient (ERC) model, textual information, news coverage, news sentiment.

1 Introduction

Following Ball and Brown [1] and Fama et al. [2] many studies have investigated the effect of earning announcements on stock prices reaction. Most commonly, they measure the effect by relating a security's abnormal market return to the unexpected component of reported earning of the firm issuing that security [3]. This measure usually is referred to as "earning response coefficient" or simply ERC.

Over the past few decades, ERC-related research has progressed tremendously. These studies not only help to identify and explain the differential market response to earnings information, but also build up lots of useful approaches and models to investigate the relationship between earnings announcements and stock returns. However, these traditional ERC models have had a noticeable drawback – their explanation powers (namely, the R^2) are very low.

* Corresponding author.

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The drawback might have resulted from the omission of textual information in the models. For example, financial statement footnotes or and concurrent news reports can certainly provide useful information for investors to predict a firm's future earning and affect their judgment about the firm's reasonable stock price. In addition, being exposed to new reports prior to earning announcement might have reduced the surprise shock to the investors, thus lowering the ERC. Traditional ERC models have failed to include these kinds of textual information. In this study, we attempt to partially rectify this critical omission.

> The main goal for this study attempts to investigate whether earning surprises cause stock fluctuations and how the effect is influenced by news coverage prior to earning announcements. We find that: (1) earning surprise significantly affects stock price; (2) negative earning surprises have lower influence on stock prices; (3) more news coverage tends to decrease ERC; and (4) different combinations of news sentiment and earning surprise result in different ERC.

This paper is organized as follows. Section 2 conducts literature review and develop hypothesis. Section 3 describes the research design. Section 4 explains the analysis results. Finally, Section 5 presents our conclusions and future research directions.

2 Literature Review and Hypothesis Development

Traditionally, earning response coefficient (ERC) is used to represent stock market response to earning announcement, which is measured by regressing cumulative abnormal return (CAR) on earning surprise. Previous studies [1, 5, 6, 7, 8, 9, 10, 11] have concluded that stock price changes move in the same direction as earnings changes; however, stock market responses differ between different kinds of firms. These studies identified four economic determinants of ERC variations: persistence of earning changes, risk, growth opportunities, and interest rate [7, 8, 9, 10, 11]. They found that ERC is higher when the unexpected current earnings changes are more persistent or the firm's growth opportunities are higher [8, 9, 10, 11]. Additionally, ERC is lower when firm's risk or risk-free interest rate is higher [9, 11]. Besides these four economic determinants, there are still others causes for differential market response, such as, capital structure [12], earnings quality [9,13,14], similarity of investor expectations [15], and informativeness of price [9,11], etc.

The main theme of this study is related to the "informativeness of price" argument. Before being officially announced, information related to a firm's earning might have been disclosed through various news reports, e.g. the firm has received a major order. Investors would have incorporated the information into their determination of reasonable stock prices; hence the stock price would reflect the prediction of the firm's earning. By the time earning is officially announced, market reaction would be less drastic as the stock price has already reflected some information of the announced earning. Based on this price-lead-earning logic, ERC will be lower if more information is "leaked" through news report prior to earning announcement. Following the aforementioned literature and the information leakage logic, we have developed the following hypotheses:

H1: A firm's announced earning surprise is positively related to the abnormal return of its stock.

H2: If a firm has higher news coverage before earning announcement, its ERC will be lower.

Other than the amount of leaked information, the direction of earning surprise might also affect ERC. When there is a positive earning surprise, people tend to jump on the bandwagon and rush to buy the stock. On the other hand, when this is a negative earning surprise, people are more reluctant to sell the stock due to the over-commitment bias. Therefore, we posit the following hypothesis:

H3: The ERC for positive earning surprises will be higher than that for negative earning surprises.

The ERC might also be affected by the directional combination of news sentiment and earning surprise. Arguably, if news sentiment and earning surprise are in the same direction, then the impact of earning surprise on stock price will be lower. For example, if the sentiment of prior news report is positive, but the announced actual earning is lower than the predicted earning (i.e. a negative earning surprise), then the ERC will be higher than that when both are positive. Therefore, we posit the following hypothesis:

H4: The ERC is lower when news sentiment and earning surprise are in the same direction; it is higher when news sentiment and earning surprise are in opposite direction.

3 Research Design

3.1 The Regression Model

Our analysis is based on the following simple regression model:

CAR=a + b x SUE

Where CAR: Cumulative abnormal return in (-2,2) window around earnings announcement dates
SUE: Earnings surprise based on IBES reported analyst forecasts and actual earnings.
b: the regression coefficient is interpreted as the ERC.

We define the earnings surprise (SUE) as actual earnings minus analyst forecasts earnings, scaled by stock price. We follow the method of Livnat and Mendenhall (2006) to calculate SUE:

$$SUE_{jt} = \frac{(X_{jt} - \bar{X}_{jt})}{P_{jt}}$$

Where X_{jt} is primary Earnings Per Share (EPS) before extraordinary items for firm j in quarter t, P_{jt} the price per share for firms j at the end of quarter t, and $\bar{X}_{jt}$ it the

median of forecasts reported to I/B/E/S in the 90 days prior to the earnings announcement.

The daily abnormal returns are calculated as the raw daily return retrieved from the Center for Research in Security Prices (CRSP) minus the daily return on the portfolio of firms with approximately the same size and book-to-market (B/M) ratio. The daily returns for the size and B/M portfolios are from Professor Kenneth French's data library, which is based on classification of the population into six (two size and three B/M) portfolios.

3.2 The Data Collection

We follow the following procedure to collect data:

1. Collect News Articles: we collect news articles in the ***Wall Street Journal*** during the time period from Aug. 1999 to Feb. 2007. In total, there are 321993 articles.
2. Collect Quarterly reports (10-Q reports) and report announcement dates: We collect quarterly reports data of the company which has at least one news article in the field of 1999 to 2007 from **Compustat**, and use the rdq field (Report Date of Quarterly Earnings, the date on which quarterly earnings per share are first publicly reported) as the report announcement date.
3. Calculate SUE(Earnings surprise based on IBES reported analyst forecasts and actual): We collect data from IBES to calculate the **quarterly** SUE.
4. Calculate CAR(Cumulative abnormal return in (-2,2) window around earnings announcement dates): We use **CRSP** daily and monthly data to calculate the cumulative abnormal return.
5. Identify and total positive and negative words in news articles: Following Tetlock(2008), we identified words in news articles as positive or negative word by General Inquirer dictionary.
6. Calculate news coverage: We calculate the number of firm's news articles in the 30 days period prior to its quarterly report announcement date as the firm's news coverage. The mean of news coverage is 3.
7. Determine the final sample: We collect **26200** firm-quarter data sets and remove those with SUE in the upper and lower 0.05% from the sample. The final sample consists of **25940** firm-quarter data sets.
8. Classify high and low news coverage groups: We divided the sample into high and low news coverage groups based on the number of news coverage. If a data set has more than 3 (including 3) news articles, it is classified as high news coverage, otherwise, low news coverage.
9. Classify positive and negative SUE groups: We divide the sample into positive and negative SUE groups based on the sign of SUE's. There are 20047 data sets in the positive group and 5893 data sets in the negative group.
10. Classify positive and negative sentiment groups: We also divided the sample into positive and negative sentiment groups by the sentiment of their news articles. If the number of negative words in an article is greater than the number of positive words, we classify the news article as a negative news; otherwise, a positive news. Then, if a data set has more negative news articles than negative news article, it is classified as a negative sentiment data set; otherwise, a positive sentiment data set.

3.3 Hypotheses Testing

We use the following procedure to analyze our data and validate the hypotheses. Firstly, for H1, we use the entire data sets to run the regression model to see whether b is statistically significant.

For H2, we run two versions of the regression model; one for the high news coverage group, the other for the low new coverage group. We then compare the ERCs for these two models to determine whether they are significantly different.

For H3, we also run two versions of the regression model; one for the positive SUE group, the other for the negative SUE group. We then compare the ERCs for these two models to determine whether they are significantly different.

For H4, we run four versions of the regression model, one for each directional combination of sentiment and SUE. We then compare the ERCs for these four models to determine whether they are significantly different. There are four combinations: positive sentiment / positive SUE, positive sentiment / negative SUE, negative sentiment / positive SUE, and negative sentiment / negative SUE.

4 The results

Table1 shows the statistical result for hypothesis H1. Since b, namely the ERC, is significantly, we can conclude that earning surprises affect stock prices. That is, H1 is confirmed.

Table 2 shows the statistical results for hypothesis H2. The ERC for the high news coverage group is 2.56186, while the ERC for the low news coverage group is 3.22156. Since 2.56186 is apparently lower than 3.22156, H2 is also confirmed.

Table 1. Regression results for H1

CAR= a + b * SUE	ERC (b)	3.14290 (t=27.39 , P<0.0001)
	Adjusted R-square	0.0281
	Sample size	25942

Table 2. Regression results for H2

High news coverage	ERC	2.56186 (t=8.31 , P<0.0001)
	Adjusted R-square	0.0153
	Sample size	4390
Low news coverage	ERC	3.22156 (t=25.98 , P<0.0001)
	Adjusted R-square	0.0303
	Sample size	21552

Table 3 shows the statistical results for hypothesis H3. The ERC for the positive earning surprise group is 3.18871, while the ERC for the negative earning surprise group is 0.53500. Since 3.18871 is apparently higher than 0.53500, H3 is also confirmed.

Table 4 shows the statistical results for hypothesis H4. The ERC is 3.20904 for the positive news / positive earning surprise combination, 0.31425 for the positive news / negative earning surprise combination, 2.90845 for the negative news / positive earning surprise combination, and 2.21731 for the negative news / negative earning surprise combination. Therefore, for the negative news group, H4 is confirmed. However, for the positive news group, the result is opposite to H4.

Table 3. Regression results for H3

SUE>=0	ERC	3.18871 (t=18.03 , P<0.0001)
	Adjusted R-square	0.0159
	Sample size	20048
SUE<0	ERC	0.53500 (t=2.51 , P=0.0122)
	Adjusted R-square	0.0009
	Sample size	5894

Table 4. Regression results for H4

	SUE>=0		SUE<0	
Positive news	ERC	3.20904 (t=17.45 , P<0.0001)	ERC	0.31425 (t=1.39 , P=0.1634)
	Adjusted R^2	0.0159	Adjusted R^2	0.0002
	Sample size	18726	Sample size	5400
Negative news	ERC	2.90845 (t=4.52 , P<0.0001)	ERC	2.21731 (t=3.25 , P=0.0012)
	Adjusted R^2	0.0145	Adjusted R^2	0.019
	Sample size	1322	Sample size	494

5 Conclusions and Future Research Directions

This study attempts to investigate the influence of textual information on the ERC. We find that: (1) earning surprise significantly affects stock price; (2) more pre-announcement news coverage tends to decrease the ERC; (3) positive earning surprises have higher influence on stock price; and (4) different combinations of news

sentiment and earning surprise result in different ERC. Since the last finding is partially opposite to our hypothesis, our future study will try to find out the reason. Also, we will try to test whether adding textual information to the ERC models can provide more explaining power.

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