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Prospect Theory, Analysts' Forecasts, and Stock Returns

ABSTRACT

This paper documents how prospect theory can be used to explain stock returns and analysts' forecast behavior. Positive earnings surprises are associated with increases in abnormal returns but negative earnings surprises have only a limited negative impact on returns. We find that analysts display asymmetric behavior towards positive and negative earnings growth. Analysts' forecasts are found to be accurate during periods of positive earnings growth, but overly optimistic during periods of negative earnings growth. Our findings have implications for the structuring of investment products, as well as the role of market timing in their introduction.

JEL Classification: G14; G34; O53

Keywords: Behavioral finance; Prospect theory; Analyst forecasts; Earnings growth; Earnings surprise.

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1. INTRODUCTION

This paper studies how analysts and investors react to positive and negative events. We analyze the difference in forecast errors that analysts make during both positive and negative earnings growth periods and document the role that investor sentiment plays in the earnings expectation process. Following Tversky and Kahneman's (1979) *prospect theory*, we analyze the influence of positive and negative earnings surprises. They have demonstrated how behavioral influences prevent investors from making rational choices and propose a value function whereby the disutility of a loss is much greater than the utility of a gain of the same magnitude.

A major contribution of this paper is the use of prospect theory to explain asymmetric stock market reactions resulting from an earnings surprise. Tversky and Kahneman (1991) find that investors suffer a much greater disutility during a loss and are reluctant to realize their losses during negative earnings surprise. Although Levis and Liodakis (2001) find that earnings surprise has an asymmetric impact on growth stocks and value stocks, they do not compare the asymmetric impact of positive and negative earnings surprise on abnormal stock returns, nor link such asymmetric abnormal returns to prospect theory.

We find that stock returns react strongly to positive earnings surprise, but negative earnings surprise has no significant impact on returns, implying the presence of investor loss aversion where they are reluctant to realize their losses. We also find that, while analysts are accurate during positive earnings growth, their forecasts are highly optimistic during negative earnings growth. The level of positive forecast error increases as the absolute amount of negative earnings growth increases. While Amir and Ganzach (1998) and Ashiya (2002) found that analysts are over-optimistic when they revise their forecasts downwards, and Hofstedt (1972)

reported that forecasters are reluctant to predict negative earnings growth, prior research did not examine the relationship between forecast error and earnings growth. We document that large, overly optimistic forecast errors during periods of negative earnings growth are associated with the presence of positive investor sentiment.

Our findings have important implications. First, we provide an empirical test of prospect theory from the stock market effects of earnings announcements. Second, capital-guaranteed investment products may be popular with investors due to investor loss aversion. Third, investor loss aversion indicates that there is usually sufficient time to cut losses after the announcement of a negative event. Fourth, launching new financial products during times of positive sentiment is likely to induce a positive response due to over-optimism, even if the yield or earnings growth from the security could be below expectations.

The remainder of the paper is organized as follows. Section 2 reviews the prior related literature. Section 3 describes the data and Section 4 presents our research methodology and hypotheses. The findings are reported in Section 5. Section 6 summarizes and concludes.

2. LITERATURE REVIEW

Utility theory and prospect theory share some similarities. Both recognize that utility from wealth is distinct from the actual monetary value of wealth. Hence, they analyze the satisfaction that a person would derive from his current wealth or a change in his wealth. Both theories also predict that investors are risk averse in gains, i.e., increases in wealth have diminishing marginal utility. However, they have three main differences. First, utility theory evaluates utility from the final states of wealth, which includes wealth from the prospect and other existing assets, whereas prospect theory evaluates the value of a prospect from a change in wealth due to a prospect (Tversky and Kahneman, 1979). Second, utility theory uses stated

probabilities to find the expected utility, where expected utility is the summation of utilities from each possible outcome, weighted by the probability of occurrence for each potential outcome. Prospect theory, however, uses decision weights in its value function. The decision weighting function proposed by Tversky and Kahneman (1979) has the decision weights lower than the states' probabilities, except for extreme outcomes. Extremely low probability events beyond a certain benchmark are assigned a zero probability of occurrence, whereas those with an extremely high probability of occurrence are treated with certainty. Third, utility theory assumes that investors are either risk-averse, risk neutral or risk seeking, but the same person cannot simultaneously exhibit risk aversion, risk neutrality and risk-seeking characteristics. On the other hand, prospect theory predicts that investors would be risk averse in gains and risk seeking in losses, regardless of their level of wealth. The value function of prospect theory (see Figure 1) has a gentle slope for gains and a much steeper slope for losses (Tversky and Kahneman, 1979). This means that investors would suffer a much greater disutility in a loss than they would enjoy utility from a gain of the same absolute magnitude.

Tversky and Kahneman's (1979) prospect theory offers a model to address some of the limitations of utility theory. Tversky and Kahneman (1986, 1991, and 1992) further expand prospect theory to the framing of human decisions into gains or losses, the influence of prospect theory in investment decisions, and human choice among risky decisions. Olsen (1997) finds that investment decisions by professional investment managers conform to prospect theory. Prospect theory is developed from psychological research on preference reversal. Tversky, Slovic, and Kahneman (1990), Mowen and Gentry (1980), and Tversky and Thaler (1990) find that investors prefer a high probability, low pay-off bet over a low probability, high pay-off one, but would set a higher price for the low probability, high pay-off bet when they are asked to sell the bet.

Even though prospect theory presents an opportunity to address some of the economic

issues not covered by utility theory, it has so far remained largely hypothetical. Although Shefrin and Statman (1985) found investor loss aversion from mutual funds redemption data, there has thus far been no research on prospect theory using stock returns. The exact values and relationships in both the value and weighting functions of prospect theory remain unknown. We classify observations into positive and negative events in the evaluation of prospect theory.

Analysts' earnings forecasts can be influenced by factors other than rational analysis, as noted by Dechow and Sloan (1997), Amir and Ganzach (1998), Espahbodi, Dugar, and Tehranian (2001), Allen, Cho and Jung (1997), and Ang and Ma (2001), among others. Amir and Ganzach (1998) find that analysts overreact to positive forecasts but under-react to negative ones. Ashiya (2002) presents evidence that Japanese institutional economists are pessimistic when they revise their forecast upwards, but are optimistic when they revise their forecast downwards. Hofstedt (1972) reports an unwillingness of investors to predict negative earnings growth. While prior research shows that there is asymmetry in the quantum of forecast errors, they do not examine the relationship between forecast errors and earnings growth. In this paper, we build on these prior studies by examining how positive and negative earnings surprises influence analysts' forecast errors.

Apart from behavioral influences, agency problems also cause analysts' forecasts to diverge from actual earnings per share. Loffler (1998) argues that analysts distort their earnings estimates when they believe that their clients had misconceived the true precision of their forecasts. Prior research by Conroy, Harris and Park (1998), Cooper, Day and Lewis (2001), and Levis and Liodakis (2001) find that earnings surprise has an impact on stock returns. Specifically, Levis and Liodakis (2001) show that stock returns from positive earnings surprises for value stocks are higher than those from positive earnings surprises for other types of stocks. On the other hand, they report that negative earnings surprises have a more negative impact on

growth stocks, but only a minor impact on value stocks. Moreover, De Bondt and Thaler (1985) find that 'loser' portfolios outperform 'winner' portfolios by about 25% over 36 months.

3. DATA

The data in this study consists of 2,084 companies listed on either the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) and covered by at least one analyst from July 1987 to June 2000. The observation period is meant to coincide with the availability of investor sentiment data from the weekly American Association of Individual Investors' (AAII) sentiment survey, which has been conducted since July 1987. Each observation represents data from one company in each quarterly period. Since companies announce their quarterly earnings in different months, the quarterly data of the companies may not be from the same months.

I/B/E/S provides data of the last reported actual quarterly earnings per share (EPS), the median forecast quarterly EPS, and the number of analysts on a monthly basis. The signed forecast error in equation (1) measures the deviation of the median analysts' forecast of quarterly EPS from the actual figure, normalized by the actual earnings that are announced in the following quarter.[1] The absolute value of the actual quarterly EPS is used in the denominator in order to accurately compute the sign of the forecast error. This computation method follows that used by Cooper, Day, and Lewis (2001) and Allen, Cho, and Jung (1997).

$$FE_{i,T} = \frac{\left(F_{i,T-1} - A_{i,T}\right)}{\left|A_{i,T}\right|} \tag{1}$$

where $FE_{i,T}$ is the forecast error for the *i*th stock in quarter T, $F_{i,T-1}$ is the median forecasted EPS

[1] Alternatives to our computation of the forecast error include that by Ang and Ma (2001), where the denominator of the algorithm is the stock price: $\frac{F_{i,T-1} - A_{i,T}}{P_{i,T}}$. Espahbodi, Dugar, and Tehranian (2000) used a similar computation,

for the *i*th stock in quarter T-1, and $A_{i,T}$ is the actual quarterly EPS for the *i*th stock in quarter T.

The computation of earnings growth (EG), which captures the percentage change in actual quarterly EPS, is shown in equation (2).

$$EG_{i,T} = \frac{(A_{i,T} - A_{i,T-1})}{|A_{i,T-1}|} \tag{2}$$

where $A_{i,T}$ and $A_{i,T-1}$ represent actual quarterly EPS for the *i*th stock in quarter T and T-1, respectively.

In equation (3), earnings surprise (ES) is captured by the deviation of the actual quarterly EPS from the median forecasted quarterly EPS in the previous month. Following Conroy, Harris, and Park (1998), and Levis and Liodakis (2001), the absolute value of the forecasted EPS is used in the denominator so that a negative forecasted EPS would be appropriately reflected.

$$ES_{i,T} = \frac{(A_{i,T} - F_{i,t-1})}{|F_{i,t-1}|} \tag{3}$$

where $A_{i,T}$ is the actual quarterly EPS for the *i*th stock in quarter T, and $F_{i,t-1}$ is the median forecasted quarterly EPS for the *i*th stock *one month* before the announcement of the actual quarterly EPS.

Tversky and Kahneman (1979) have stated that changes in welfare, rather than final states of welfare, are carriers of value. As such, monthly changes in the percentage of bullish investors from the AAII survey are used as a proxy for market sentiment. This measure is also used by Fisher and Statman (2000) in their study of the correlation between sentiment and stock returns. For our purposes, we convert the weekly percentage of bullish investors into monthly observations and represent sentiment in month t as S_t:

$\frac{A_{i,T} - F_{i,T}}{P_{i,T}}$. The advantage of equation (1) is that the stock price will not have a negative value, thus ensuring that the forecast error has the *correct* sign.

$$S_t = \frac{(\%Bull_t - \%Bull_{t-1})}{\%Bull_{t-1}} \quad (4)$$

where $\%Bull_t$ and $\%Bull_{t-1}$ represent the percentage of bullish respondents out of total respondents in the AAII survey data at month t and t-1, respectively.

We obtain the daily dividend-adjusted returns for all stocks and the market index from the CRSP database. The observations are then classified into either a positive growth ($EG \geq 0$) or a negative growth ($EG < 0$) group. They are also classified into a positive earnings surprise ($ES \geq 0$) and a negative earnings surprise ($ES < 0$) group. Tversky and Kahneman (1979) have stated that investors tend to perceive outcomes as gains or losses relative to a neutral reference point. Hence, a positive earnings surprise would be perceived as a gain, whereas a negative earnings surprise is perceived as a loss.

We generate two separate data sets, one relating to the forecast error and the other to the earnings surprise, as their forecasted quarterly EPS are from different months. After eliminating the top one percentile and the bottom one percentile, there are 45,488 observations in the forecast error data set, with 27,891 in the positive growth group, and 17,597 in the negative growth group. In the earnings surprise data set, there remains 50,150 observations, with 33,479 in the positive earnings surprise group and 16,671 in the negative earnings surprise group.

Table 1 shows the summary statistics for the forecast error data set. In the positive growth group, quarterly earnings grew 59.89% on average from the previous quarter whereas, in the negative growth group, quarterly earnings declined 44.65%. Panel A in Table 1 shows that the mean forecast error for all observations is positive (16.37%) indicating over-optimism in analysts' forecasts. The findings concur with those of Dechow and Sloan (1997), Espahbodi, Dugar, and Tehranian (2001), and Ang and Ma (2001) that analysts' earnings forecasts are generally over-optimistic. We note in Panel B that, when earnings growth is positive, analysts

are more accurate with their forecasts with a small forecast error (2.92%). In Panel C, the forecast error is large (37.69%) in the negative growth group, indicating that analysts slightly over-estimate a company's EPS when earnings growth is positive, but would greatly over-estimate it when earnings decline. This observation is confirmed by the significant t-statistic for the mean difference between the positive and negative earnings growth groups reported in Panel D. The results show that analysts are overly optimistic during periods of negative earnings growth. The findings are consistent with those of Ashiya (2002) and Hofstedt (1972) that analysts show a greater reluctance in forecasting negative, rather than positive, earnings growth.

Table 2 presents the descriptive statistics for the earnings surprise data set. In Panel A, earnings surprise is negative (-1.82%), indicating that analysts over-estimate the actual EPS in the month prior to the earnings announcement. From Panel B and C, we find that the mean of a positive earnings surprise of 14.30% is lower than the absolute mean of a negative earnings surprise of -34.18%. This indicates that analysts over-estimate actual EPS by a greater margin than they would under-estimate actual EPS. Even though the forecasted EPS between the positive and negative earnings surprise groups is not significantly different from each other, the magnitude of the negative earnings surprise is significantly greater than that of the positive earnings surprise (Panel D). This implies that analysts on average are overly optimistic when making their forecasts.

4. RESEARCH METHODOLOGY

Prior research by Amir and Ganzach (1998), Ashiya (2002), and Hofstedt (1972) found asymmetry in the quantum of forecast errors. Analysts show reluctance in forecasting a negative event, such as negative earnings growth, or making large downward forecast revisions. We are interested in finding out whether analysts are equally accurate in forecasting positive and

negative earnings growth, and the impact of positive and negative earnings growth on forecast error. We examine how sentiment influences forecast error during both positive and negative earnings growth periods by running equation (5) separately for the positive and negative growth groups, with the number of analysts as a control variable.

$$FE_{i,t} = b_0 + b_1 EG_{i,t} + b_2 S_{t-1} + b_3 N_{i,t} \quad (5)$$

where $N_{i,t}$ represents the number of analysts covering the *i*th stock at time t and the other variables are as previously defined. b_0, b_1, b_2, and b_3 are the coefficient estimates.

If analysts are less willing to forecast negative earnings growth than they would positive earnings growth, they would make greater forecast errors during periods of negative earnings growth than during positive ones. Thus, we expect the earnings growth coefficient in the negative growth group to be larger in absolute term than that in the positive growth group. We conduct an event study to ascertain whether there are significant abnormal returns on the date of the announcement of actual EPS where the date of earnings announcement is represented by day 0. We examine the abnormal returns 15 days before and 15 days after the announcement date. Of interest is whether the absolute abnormal returns are different during positive earnings surprise and negative earnings surprise.

Daily abnormal returns are derived from the deviations from the single factor market model, as illustrated in equation (6). $\hat{\alpha}_i$ and $\hat{\beta}_i$ are estimated from the ordinary least squares regressions of stock returns against the equally weighted market index for each event period. The estimation period used is 245 days prior to the earnings announcement date to 46 days before the earnings announcement date.

$$AR_{i,d} = r_{i,d} - (\hat{\alpha}_i + \hat{\beta}_i r_{m,d}) \quad (6)$$

where $AR_{i,d}$ represents the abnormal returns for the *i*th stock on day d; $r_{i,d}$ is the rate of returns

for the *i*th stock; $r_{m,d}$ is the rate of returns for the equally weighted market index; $\hat{\alpha}_i$ and $\hat{\beta}_i$ are OLS estimates of α_i and β_i of the single factor market model, where β_i measures the sensitivity of returns for the *i*th stock to changes in returns on the market index.

The cumulative abnormal returns (CAR) over a specific window period around the announcement date are measured by:

$$CAR(d_1, d_2)_i = \sum_{d=d_1}^{d=d_2} AR_{i,d} \tag{7}$$

where $CAR(d_1,d_2)_i$ represents the CAR over the period (d_1, d_2) for the *i*th stock. Following Patell (1976), the test statistic for the CAR is:

$$Z^i_{d_1,d_2} = \frac{1}{\sqrt{n}} \sum_{i=1}^{n} \frac{1}{(d_1 - d_2 + 1)} \frac{d_i - 2}{d_i - 4} \sum_{t=d_1}^{d_2} \frac{AR^2_{i,d}}{\sqrt{\frac{\sum_{k=T_{D_b}}^{T_{D_e}} AR^2_{ik}}{d_i - 2} \left[1 + \frac{1}{d_i} + \frac{\left(R_{md} - \overline{R_m}\right)^2}{\sum_{k=d_1}^{d_2} \left(R_{mk} - \overline{R_m}\right)^2} \right]}} \tag{8}$$

where $Z^i_{d_1,d_2}$ represents the Z-statistic for the null hypothesis that $CAR(d_i,d_2) = 0$; $AR_{i,d}$ represents abnormal returns for the *i*th stock on day d; R_{md} represents the market returns; $\overline{R_m}$ is the mean market return over the estimation period; and d_1 and d_2 represent the start and end days of the accumulation period, respectively.

Levis and Liodakis (2001) found that positive earnings surprise causes higher stock returns for value stocks than for growth stocks, but has a greater negative impact on the returns of growth stocks than value stocks. However, they did not examine how the asymmetric impact of earnings surprise is influenced by prospect theory. The two-day cumulative abnormal returns used in this regression are the result generated from the earlier event study. The two-day cumulative abnormal returns are the summation of abnormal returns on the earnings

announcement date and one day after. A two-day announcement CAR is used to examine the short-term price impact of an earnings surprise.

$$CAR(0,1)_i = b_0 + b_1 EG_i + b_2 ES_i + b_3 (ES_i)^2 + b_4 N_i \quad (9)$$

where CAR(0,1) represents the two-day CAR in reaction to the EPS announcement; EG is the earnings growth; ES is the earnings surprise; N is the number of analysts for the *i*th stock; and the b_i's are the coefficient estimates of the regression. We expect a positive earnings surprise to increase abnormal returns and a negative earnings surprise to decrease abnormal returns. However, since investors are expected to suffer a greater disutility during a loss, the earnings surprise coefficient is expected to be larger in the positive surprise group than in the negative surprise group. The square of ES is included to capture a possible non-linear relation.

5. RESULTS

On average, the higher the earnings growth, the lower the forecast error (Table 3, Panel A).[2] Analysts act differently during positive and negative earnings growth. Table 3 shows that earnings growth has a significant impact on the forecast error in the negative growth group (Panel C), but not in the positive growth group (Panel B). The results indicate that, during times when the company's EPS is growing, analysts are quite accurate in their forecasts of the actual EPS. The positive intercept (0.0289) in the positive growth group when forecast error is regressed on earnings growth indicates that analysts slightly over-estimate earnings during positive earnings growth. This is consistent with the summary statistics of Table 1, which show that the mean forecast error is small (2.92%). In Panel B of Table 3, earnings growth has no

[2] We have also performed the time series-cross sectional panel regressions assuming both fixed and random effects. The results are found to be qualitatively similar and conclusions are not different from those of the pooled regressions. As such, due to space constraints, we report only the results for the pooled regressions.

significant effect on forecast error in the positive growth group, implying that analysts' forecasts are slightly over-optimistic and that the level of over-optimism remains at 2.92% as earnings growth increases. The results show that analysts' forecasts are quite accurate and consistent during periods of positive earnings growth. On the other hand, in times of declining EPS, they are highly over-optimistic and tend to over-estimate it. Panel C of Table 3 shows a significant negative coefficient (-0.5698) for earnings growth in the negative growth group. In contrast, Panel C of Table 1 shows the mean forecast error in this group to be large and positive (37.69%), indicating that analysts over-estimate EPS during times of negative earnings growth. We note that the magnitude of over-estimation increases with the rate of earnings decline. These results support those of Amir and Ganzach (1998), Ashiya (2002), and Hofstedt (1972). We observe an asymmetry in the impact of earnings growth on forecast errors whereby an increase in positive earnings growth does not result in any increase in the level of over-optimism. It appears, therefore, that analysts are either unable or reluctant to forecast a decline in earnings.

Although we do not claim that prospect theory has led to analysts' forecast errors, the asymmetry in the impact of positive and negative earnings growth on forecast errors bears similarity to the value function of prospect theory, where gains and losses have an asymmetric impact on the value of a prospect. It is worth noting that Tversky and Kahneman (1986) found that investors typically frame a decision problem into gains and losses. Tversky and Kahneman (1992) further showed that the removal or a lack of monetary incentives does not influence or alter the outcomes of prospect theory. Since investors have a loss aversion according to the predictions of prospect theory, analysts would avoid making pessimistic forecasts if their incentives are tied to investor trading activity. Figure 2 illustrates the relationship between actual EPS, forecasted EPS, and earnings growth. As positive earnings growth increases (from zero), analysts are quite accurate with their forecasts, and display only a small and consistent level of

over-optimism. As it decreases (from zero), the forecasted EPS increasingly outstrips the actual EPS. Analysts increasingly over-estimate EPS as rate of negative earnings growth increases.

Analyst forecasts are influenced by market sentiment. Panel A of Table 3 shows that sentiment has a significant positive impact on analysts' forecast errors. However, sentiment impacts forecast errors primarily during negative earnings growth (Panel C), but not during positive earnings growth (Panel B). When a company is experiencing negative earnings growth, strong sentiment could cause analysts to be overly optimistic in their forecasts. A decline in sentiment causes analysts to become more realistic in their over-optimistic earnings forecasts, resulting in a reduction of a positive bias or a negative forecast error. The asymmetric impact of sentiment on forecast error shows that strong sentiment during negative earnings growth can lead to analysts making positive forecast errors.

The presence of more analysts reduces forecast errors (Table 3). This is true for both the positive and negative growth groups. As the number of analysts following a company increases, more scrutiny is placed on its financial performance. The mean analysts' forecast becomes more accurate. Moreover, the impact of the number of analysts in reducing the forecast error is greater during times of negative earnings growth than during positive earnings growth.

Table 4 and Figure 3 present the event study results. In both the positive earnings growth and earnings surprise groups, the announcement effect of EPS is positive and significant at the 0.1% level on day -2, continuing to day 1 (Panel A). The corresponding two-day CAR over the period [0, 1] is also positive and significant (Panel B). On the other hand, during periods of negative earnings growth and earnings surprise, the announcement effect is negatively significant. In terms of economic value, during times of positive (negative) growth, investors earn a significant announcement day return of 0.45% (-0.13%) but, when faced with a positive (negative) earnings surprise, they earn a significant announcement day return of 0.60% (-0.55%).

It is worthy to note that, in Figure 3, Chart A and B, and Chart C and D, are not symmetrical to each other. These results concur with our expectations and are consistent with those of prior studies.

Table 5 shows the results of the regression of the two-day CAR on earnings growth, earnings surprise, and the number of analysts. In Panel A, we see that announcements of EPS during periods of earnings growth and earnings surprise as a whole have a positive impact on the two-day CAR. However, on average, the number of analysts following a company does not seem to matter. There is a possibility that the relations are non-linear, judging by the significant coefficient for the square of earnings surprise. We note that there is an asymmetric impact on the CAR, where the effect from positive earnings surprise (Panel B) is generally larger than that from negative earnings surprise (Panel C). Investors tend to react to positive earnings growth and surprise, by bidding up the stock price, more so than they would bid down a stock price in the event of negative earnings growth and surprise. The reluctance of investors to realize their losses reveal their greater disutility during negative earnings growth and surprise. These results are consistent with those of Shefrin and Statman (1985) that individual investors are reluctant to sell losers but are quick to bid up the stock price in the event of positive earnings surprise.

In Panel B of Table 5, we find that the square of an earnings surprise has a negative impact on CAR. This shows that the effect of positive earnings surprise. The effect of marginal positive earnings surprise diminishes as positive earnings surprise increases. Thus, investors are quick to realize their profits, as the utility of a large gain is not proportionately larger than the utility of a small profit. A larger earnings surprise does not result in a proportionately larger return. This finding is in line with Tversky and Kahneman's (1979) prospect theory, where the value function is concave for gains, where the marginal utility for an additional gain decreases. The relationship between the two-day CAR and earnings surprise is illustrated graphically in

Figure 4. The concave relation shows that investors are risk averse in gains and risk seeking in losses. Since the dissatisfaction from a large realized loss would not be much greater than the dissatisfaction from a smaller realized loss, investors would prefer not to realize their losses, in the hope that the stock price would recover. This occurs despite investors bearing the risk of losing even more as the stock price declines to adjust for a larger negative earnings surprise.

6. CONCLUSION

The objective of this paper is to examine how analysts and investors react to positive and negative events. We analyze the difference in forecast errors that analysts make during both positive and negative earnings growth periods and document the role that investor sentiment plays in the earnings expectation process. We compute and regress forecast errors on earnings growth, sentiment, and the number of analysts to determine their impact during periods of positive and negative earnings growth. An event study is also performed to examine the announcement effect of actual quarterly EPS under conditions of positive or negative growth, and positive or negative earnings surprise. The two-day announcement CAR is regressed on earnings growth, earnings surprise, and the number of analysts are run to establish the impact of these variables on stock returns during periods of positive and negative earnings surprise.

Using explanations from prospect theory, we find that analysts make larger forecast errors during times of negative earnings growth than during positive ones. They have a tendency to over-estimate EPS during negative earnings growth periods. This indicates that they are either unable or unwilling to forecast an earnings decline. We document that market sentiment has a positive impact on forecast errors during times of negative earnings growth but no significant impact on forecast errors during positive ones. Strong sentiments cause analysts to be overly optimistic during negative earnings growth. This may explain the larger absolute forecast errors

during negative earnings growth periods compared to positive periods. Earnings surprise is found to have an asymmetric impact on returns. Increases in positive earnings surprise are associated with an increase in returns but increases in negative earnings surprise have only a slight impact on returns. The utility of a large gain is not proportionately larger than the utility of a small profit. This explains the tendency of investors to realize their profits early. The results of this study are consistent with the propositions of Tversky and Kahneman's (1979) prospect theory, where gains and losses have an asymmetric impact on the value of a prospect.

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Table 1

Summary Statistics for the Forecast Error Data Set

This table provides summary statistics for the forecast error data set. Panel A provides the statistics for both groups. In Panel B, the company's actual quarterly EPS in the current quarter is equal or higher than its actual EPS in the previous quarter. In Panel C, the company's actual quarterly EPS in the current quarter is lower than its actual EPS in the previous quarter. Panel D reports the mean differences of the variables between the positive and negative growth groups. Sentiment is the proportional change in the bullish respondents in the monthly AAII survey. The number of analysts refers to those that publish a forecast during a quarterly period for a company. Actual quarterly EPS is that announced by the company every quarter. Forecast quarterly EPS is the median one-quarter forward forecast of the next quarter's actual EPS in the first available month. Forecast error is computed by subtracting the actual EPS from the forecasted EPS and then by the absolute value of the actual EPS. Earnings growth is computed by subtracting the reported actual EPS in the previous quarter from that reported in the current quarter. The difference is then divided by the absolute value of the reported actual EPS in the previous quarter. The levels of significance of 5%, 1%, and 0.1% are represented by *, **, and ***, respectively.

Variable	Mean	Standard Deviation	Minimum	Maximum
Panel A: All Observations (N = 45,488)				
Sentiment	0.0364	0.2293	-0.4214	0.7661
Number of analysts	5.2456	4.4771	1.0000	40.0000
Actual quarterly EPS ($)	0.3231	1.9398	-144.8000	278.4600
Forecast quarterly EPS ($)	0.3498	1.4852	-35.0000	222.7700
Forecast Error	0.1637	0.6554	-0.9467	6.0000
Earnings Growth	0.1945	1.0480	-4.6667	8.3333
Panel B: Observations in Positive Earnings Growth Group (N = 27,891)				
Sentiment	0.0342	0.2258	-0.4214	0.7661
Number of analysts	5.3555	4.5582	1.0000	40.0000
Actual quarterly EPS ($)	0.3844	2.0907	-56.0000	278.4600
Forecast quarterly EPS ($)	0.3746	1.7889	-35.0000	222.7700
Forecast Error	0.0292	0.4351	-0.9467	5.7778
Earnings Growth	0.5989	1.0717	0.0000	8.3333
Panel C: Observations in Negative Earnings Growth Group (N = 17,597)				
Sentiment	0.0398	0.2347	-0.4214	0.7661
Number of analysts	5.0715	4.3400	1.0000	34.0000
Actual quarterly EPS ($)	0.2260	1.6685	-144.8000	100.2500
Forecast quarterly EPS ($)	0.3105	0.7920	-18.0000	55.6900
Forecast Error	0.3769	0.8580	-0.9315	6.0000
Earnings Growth	-0.4465	0.5902	-4.6667	-0.0063

Panel D: Two-Sample T-Test of Difference Between Positive and Negative Earnings Growth Groups

	Mean Difference	t-Statistic
Sentiment	-0.0056	-2.54*
Number of analysts	0.2840	6.59***
Actual quarterly EPS ($)	0.1584	8.49***
Forecast quarterly EPS ($)	0.0641	4.48***
Forecast Error	-0.3477	-57.04***
Earnings Growth[a]	1.0454	17.28***

[a]The difference in the absolute values is used.

Table 2

Summary Statistics for the Earnings Surprise Data Set

This table provides summary statistics for the earnings surprise data set. Panel A provides the statistics for all the observations. In Panel B, the company's latest forecast quarterly EPS is lower than or equal to the actual quarterly EPS. In Panel C, the latest forecasted quarterly EPS is lower than the actual EPS. Panel D reports the mean differences of the variables between the positive and negative earnings surprise groups. The number of analysts captures those that publish a forecast during a quarterly period for a company. Actual quarterly EPS is the quarterly EPS announced by the company every quarter. Forecast quarterly EPS is the median forecast of the next quarter's actual EPS one month prior to the month of the announcement of the actual EPS. Earnings surprise is computed by subtracting the forecasted quarterly EPS from the actual quarterly EPS, and then dividing by the absolute value of the forecasted quarterly EPS. Earnings growth is computed by subtracting the reported actual EPS in the previous quarter from the reported actual EPS in the current quarter. This difference is then divided by the absolute value of the reported actual EPS in the previous quarter. The levels of significance of 5%, 1%, and 0.1% are represented by *, **, and ***, respectively.

Variable	Mean	Standard Deviation	Minimum	Maximum
Panel A: All Observations (N = 50,150)				
Number of analysts	6.5011	5.2923	1.0000	42.0000
Actual quarterly EPS ($)	0.3193	1.9305	-162.5000	278.4600
Forecast quarterly EPS ($)	0.3261	1.5532	-111.3800	178.2100
Earnings Surprise	-0.0182	0.4452	-4.0000	2.0000
Earnings Growth	0.1888	1.0458	-5.0000	8.3333
Panel B: Observations in Positive Earnings Surprise Group (N = 33,479)				
Number of analysts	6.8225	5.4007	1.0000	38.0000
Actual quarterly EPS ($)	0.3637	1.8791	-37.0000	278.4600
Forecast quarterly EPS ($)	0.3197	1.4333	-50.0000	178.2100
Earnings Surprise	0.1430	0.2604	0.0000	2.0000
Earnings Growth	0.3034	1.0040	-5.0000	8.3333
Panel C: Observations in Negative Earnings Surprise Group (N = 16, 671)				
Number of analysts	5.8556	5.0058	1.0000	42.0000
Actual quarterly EPS ($)	0.2302	2.0268	-162.5000	77.9700
Forecast quarterly EPS ($)	0.3391	1.7697	-111.3800	133.6600
Earnings Surprise	-0.3418	0.5508	-4.0000	-0.0040
Earnings Growth	-0.0413	1.0895	-5.0000	8.3333

Panel D: Two-Sample T-Test of Difference Between Positive and Negative Earnings Surprise Groups

	Mean Difference	t-Statistic
Number of analysts	0.9669	19.35***
Actual quarterly EPS ($)	0.1335	7.30***
Forecast quarterly EPS ($)	-0.0194	-1.32
Earnings Surprise[a]	-0.1988	-54.57***
Earnings Growth	0.3447	35.20***

[a]The difference in the absolute values is used.

Table 3

Regression Results of Forecast Error

This table shows the regressions results of the forecast error (FE) on earnings growth (EG), investor sentiment (S), and the number of analysts (N): $FE_{i,t} = b_0 + b_1 EG_{i,t} + b_2 S_{t-1} + b_3 N_{i,t}$. T-statistics are in parentheses. The levels of significance of 5%, 1%, and 0.1% are represented by *, **, and ***, respectively.

Model	(b_0)	EG (b_1)	S (b_2)	N (b_3)	F-Statistic	R^2
Panel A: All Observations (N = 45,488)						
1	0.1925	-0.1481	-	-	2700.47***	0.0560
	(63.40***)	(-51.97***)				
2	0.1911	-0.1481	0.0383	-	1354.79***	0.0562
	(62.19***)	(-51.97***)	(2.94**)			
3	0.2345	-0.1488	-	-0.0080	1426.3***	0.0590
	(50.61***)	(-52.29***)		(-11.99***)		
4	0.2331	-0.1488	0.0381	-0.0080	953.89***	0.0592
	(50.04***)	(-52.29***)	(2.93**)	(-11.98***)		
Panel B: Observations in the Positive Growth Group (N = 27,891)						
1	0.0289	0.00055	-	-	0.05	0.0000
	(9.68***)	(0.23)				
2	0.0292	0.00058	-0.0095	-	0.36	0.0000
	(9.71***)	(0.24)	(-0.82)			
3	0.0428	-0.00039	-	-0.0025	9.51***	0.0007
	(9.79***)	(-0.16)		(-4.36***)		
4	0.0432	-0.00036	-0.0094	-0.0025	6.56***	0.0007
	(9.82***)	(-0.15)	(-0.82)	(-4.35***)		
Panel C: Observations in the Negative Growth Group (N = 17,597)						
1	0.1225	-0.5698	-	-	3193.36***	0.1536
	(16.42***)	(-56.51***)				
2	0.1199	-0.5695	0.0690	-	1600.96***	0.1540
	(15.94***)	(-56.48***)	(2.72**)			
3	0.1484	-0.5663	-	-0.0048	1603.79***	0.1542
	(14.10***)	(-55.91***)		(-3.49***)		
4	0.1458	-0.5660	0.0688	-0.0048	1072.03***	0.1546
	(13.79***)	(-55.88***)	(2.71**)	(-3.49***)		

Table 4

Abnormal Returns

This table shows the event study results of earnings growth and surprises from days -15 through 15, where day 0 represents the date of announcement of quarterly EPS. Panel A reports the daily abnormal returns, which are derived from the deviations from the single factor market model. The cumulative abnormal returns for various aggregations periods are presented in Panel B. T-statistics are in parentheses. The levels of significance of 5%, 1%, and 0.1% are represented by *, **, and ***, respectively.

Day	Positive Growth	Negative Growth	Positive Earnings Surprise	Negative Earnings Surprise
Panel A: Daily Average Abnormal Returns				
-15	0.00% (-0.389)	-0.03% (-2.621**)	0.00% (-0.291)	-0.04% (-2.983**)
-14	0.00% (-0.855)	-0.07% (-5.328***)	-0.02% (-2.322*)	-0.05% (-3.668***)
-13	-0.03% (-3.246**)	-0.06% (-5.597***)	-0.02% (-3.045**)	-0.09% (-6.186***)
-12	-0.05% (-4.551***)	-0.05% (-3.716***)	-0.04% (-3.605***)	-0.07% (-5.104***)
-11	-0.01% (-1.379)	-0.02% (-2.554*)	0.01% (-0.696)	-0.05% (-3.678***)
-10	0.01% (0.673)	-0.01% (-1.989*)	0.02% (1.157)	-0.03% (-2.920**)
-9	-0.02% (-1.945)	-0.07% (-5.470***)	-0.01% (-2.082*)	-0.09% (-5.655***)
-8	-0.02% (-1.531)	-0.06% (-4.599***)	0.01% (-0.372)	-0.13% (-6.591***)
-7	0.00% (-0.543)	-0.04% (-2.545*)	0.01% (0.487)	-0.07% (-4.226***)
-6	0.01% (1.200)	-0.04% (-2.894**)	0.01% (1.259)	-0.06% (-3.339***)
-5	0.00% (-0.392)	-0.02% (-1.440)	0.00% (0.432)	-0.03% (-2.731**)
-4	-0.01% (-1.409)	-0.07% (-5.579***)	-0.01% (-1.730)	-0.08% (-5.547***)
-3	0.00% (-0.840)	-0.01% (-1.773)	0.03% (1.063)	-0.06% (-4.613***)
-2	0.09% (4.950***)	-0.01% (-2.164*)	0.11% (7.042***)	-0.07% (-5.722***)
-1	0.20% (13.366***)	-0.03% (-2.619**)	0.23% (16.850***)	-0.14% (-8.817***)
0	0.45% (33.496***)	-0.13% (-9.599***)	0.60% (47.685***)	-0.55% (-33.251***)
1	0.13% (10.895***)	-0.17% (-9.366***)	0.18% (16.513***)	-0.33% (-19.091***)
2	0.00% (0.969)	-0.01% (-1.265)	-0.01% (1.443)	0.00% (-2.134*)
3	-0.03% (-0.669)	-0.06% (-2.789**)	-0.03% (-0.386)	-0.05% (-3.412***)
4	0.02% (2.424*)	-0.02% (-0.788)	0.01% (2.450*)	-0.01% (-1.072)
5	0.02% (2.316*)	0.00% (-0.503)	0.02% (3.058**)	-0.01% (-1.781)
6	-0.01% (0.645)	-0.03% (-1.529)	-0.02% (-0.073)	-0.01% (-0.689)
7	-0.01% (-0.613)	-0.03% (-1.786)	-0.01% (-0.751)	-0.03% (-1.713)
8	0.02% (1.444)	-0.01% (-1.921)	0.01% (1.241)	0.00% (-1.914)
9	0.00% (0.818)	0.00% (-0.076)	0.00% (0.868)	-0.01% (-0.214)
10	0.02% (1.462)	0.01% (0.165)	0.02% (2.000*)	0.01% (-0.696)
11	0.01% (1.422)	-0.02% (-2.307*)	0.02% (1.964*)	-0.05% (-3.405***)
12	-0.02% (-1.120)	-0.03% (-1.677)	-0.01% (-0.816)	-0.05% (-2.193*)
13	-0.02% (-1.852)	0.03% (2.430*)	-0.01% (-1.158)	0.03% (1.796)
14	0.00% (0.809)	0.00% (0.168)	0.00% (0.496)	0.01% (0.576)
15	0.03% (2.306*)	0.03% (1.349)	0.03% (2.411*)	0.02% (1.162)
Panel B: Cumulative Average Abnormal Returns				
(-15,0)	0.63% (9.151***)	0.73% (-15.121***)	0.93% (15.458***)	-1.61% (-26.258***)
(-10,0)	0.72% (14.178***)	-0.50% (-12.262***)	1.00% (21.646***)	-1.32% (-25.150***)
(-5,0)	0.73% (20.074***)	-0.27% (-9.460***)	0.96% (29.125***)	-0.94% (-24.773***)
(-4,0)	0.73% (22.165***)	-0.25% (-9.720***)	0.96% (31.712***)	-0.90% (-25.916***)
(-3,0)	0.74% (25.487***)	-0.18% (-8.077***)	0.96% (36.320***)	-0.82% (-26.202***)
(-2,0)	0.74% (29.914***)	-0.17% (-8.303***)	0.93% (41.325***)	-0.76% (-27.591***)
(-1,0)	0.65% (33.136***)	-0.16% (-8.639***)	0.82% (45.633***)	-0.68% (-29.747***)
(-1,+1)	0.78% (33.346***)	-0.33% (-12.462***)	1.00% (29.125***)	-1.02% (-35.310***)
(0,+1)	0.58% (31.389***)	-0.30% (-13.410***)	0.77% (45.395***)	-0.88% (-37.011***)
(0,+2)	0.58% (26.188***)	-0.32% (-11.679***)	0.76% (37.898***)	-0.88% (-31.452***)
(0,+3)	0.55% (22.346***)	-0.38% (-11.509***)	0.73% (32.628***)	-0.93% (-28.944***)
(0,+4)	0.57% (21.071***)	-0.40% (-10.646***)	0.74% (30.279***)	-0.95% (-26.368***)
(0,+5)	0.59% (20.180***)	-0.40% (-9.924***)	0.76% (28.889***)	-0.95% (-24.797***)
(0,+10)	0.60% (16.037***)	-0.45% (-8.881***)	0.77% (22.327***)	-1.00% (-19.890***)
(0,+15)	0.61% (13.688***)	-0.44% (-7.373***)	0.79% (19.237***)	-1.03% (-17.008***)

Table 5

Regression Results of Cumulative Abnormal Returns

This table shows the results the regression of the two-day CAR on earnings growth, earnings surprise, the square of earnings surprise, and the number of analysts following a company: $CAR(0,1)_{i,T} = b_0 + b_1.EG_{i,T} + b_2.ES_{i,T} + b_3.(ES_{i,T})^2 + b_4.N_{i,T}$ where CAR(0,1) represents the two-day CAR in reaction to the EPS announcement; EG is the earnings growth; ES is the earnings surprise; N is the number of analysts for the *i*th stock; and the b_i's are the coefficient estimates of the regression. T-statistics are in parentheses. The levels of significance of 5%, 1%, and 0.1% are represented by *, **, and ***, respectively.

Model	(b_0)	EG (b_1)	ES (b_2)	ES^2 (b_3)	N (b_4)	F-Statistic	R^2
Panel A: All Observations (N = 42,431)							
1	0.0017	0.0033	-	-	-	190.50***	0.0045
	(6.78***)	(13.80***)					
2	0.0015	0.0016	0.0180	0.0038	-	290.26***	0.0201
	(6.06***)	(6.72***)	(25.94***)	(12.18***)			
3	0.0021	0.0032	-	-	-0.000067	96.27***	0.0045
	(5.39***)	(13.77***)			(-1.43)		
4	0.0020	0.0016	0.0180	0.0037	-0.000061	218.13***	0.0202
	(4.86***)	(6.67***)	(25.92***)	(12.05***)	(-1.32)		
Panel B: Observations in the Positive Earnings Surprise Group (N = 28,541)							
1	0.0070	0.0025	-	-	-	72.10***	0.0025
	(22.95***)	(8.49***)					
2	0.0026	0.0016	0.0483	-0.0248	-	158.91***	0.0164
	(6.82***)	(5.33***)	(18.55***)	(-13.31***)			
3	0.0081	0.0024	-	-	-0.00016	40.28***	0.0028
	(16.69***)	(8.32***)			(-2.91**)		
4	0.0023	0.0016	0.0486	-0.0249	0.000039	119.31***	0.0164
	(4.02***)	(5.34***)	(18.43***)	(-13.31***)	(0.70)		
Panel C: Observations in the Negative Earnings Surprise Group (N = 13, 890)							
1	-0.0088	0.0017	-	-	-	17.37***	0.0012
	(-19.97***)	(4.17***)					
2	-0.0079	0.0014	0.0036	0.00086	-	7.00***	0.0015
	(-12.66***)	(3.25**)	(1.72)	(1.22)			
3	-0.0074	0.0017	-	-	-0.00023	12.00***	0.0017
	(-10.85***)	(4.19***)			(-2.57*)		
4	-0.0061	0.0013	0.0046	0.0011	-0.00026	7.46***	0.0021
	(-6.96***)	(3.09**)	(2.18*)	(1.56)	(-2.97**)		

Figure 1

Value Function of Prospect Theory

The figure illustrates the value function of Tversky and Kahneman's (1979) prospect theory. We evaluate gains and losses starting from the current state of wealth. The function has a gentle slope for gains and a steeper slope for losses, implying that investors would suffer a greater disutility in losses than they would enjoy utility from a gain of the same absolute magnitude. Moreover, the value function is concave for gains and convex for losses.

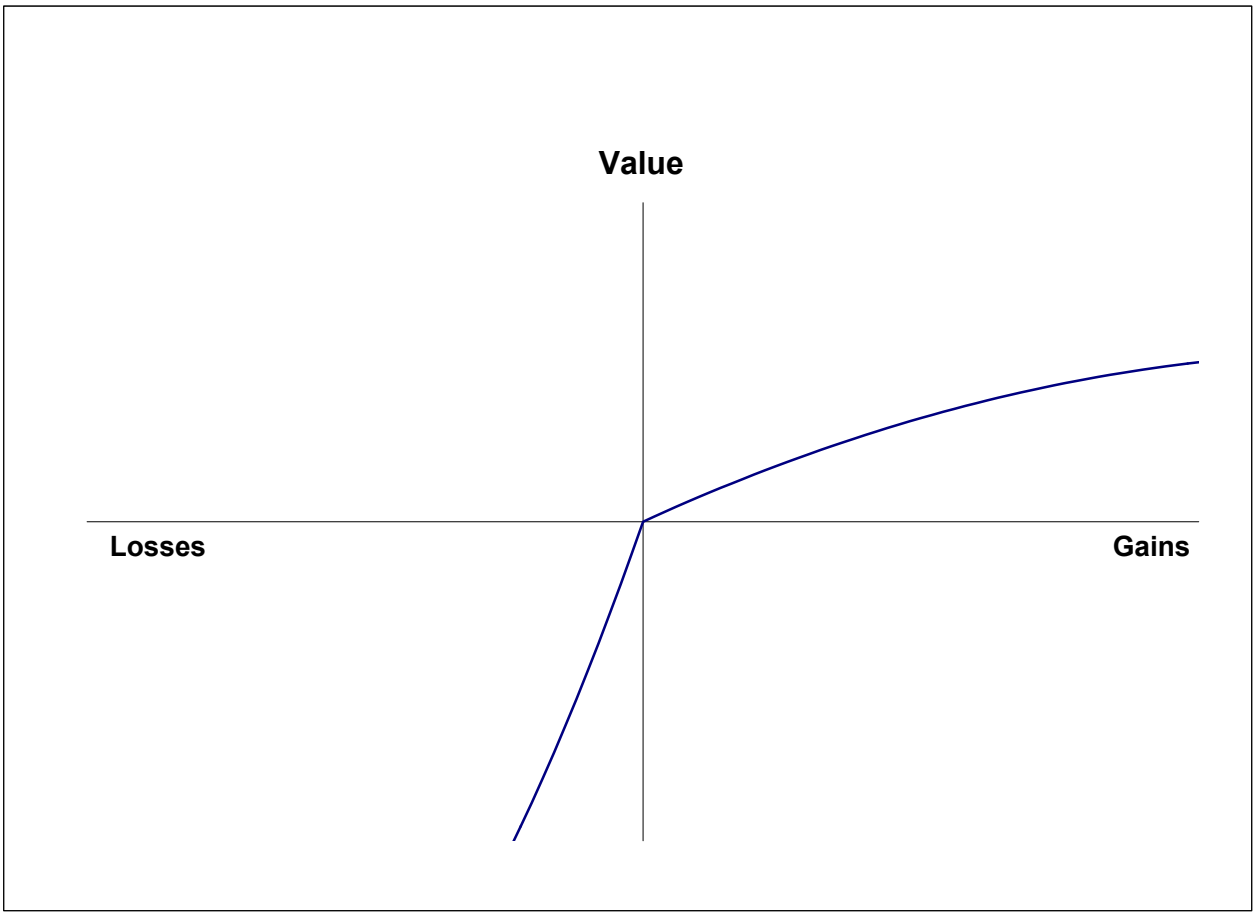

Figure 2

Actual EPS, Forecasted EPS, and Earnings Growth

This figure illustrates the relationship between actual EPS, forecasted EPS, and earnings growth. The vertical line represents the scenario of zero earnings growth, when a company's actual EPS in the current quarter is exactly the same as that in the previous quarter. The diagonal line in bold, named Actual EPS, represents all possible cases for the actual EPS in the current quarter. The intersection of the vertical line and the Actual EPS line represents the point where the actual EPS of the company in the current quarter is the same as that in the previous quarter. The dashed diagonal line, named Forecast EPS, represents forecasted EPS in the current quarter. The Forecast EPS line is kinked at the point of zero earnings growth and then overlaps that of the Actual EPS line. This illustrates the way analysts make greater forecast errors during periods of negative earnings growth than positive ones.

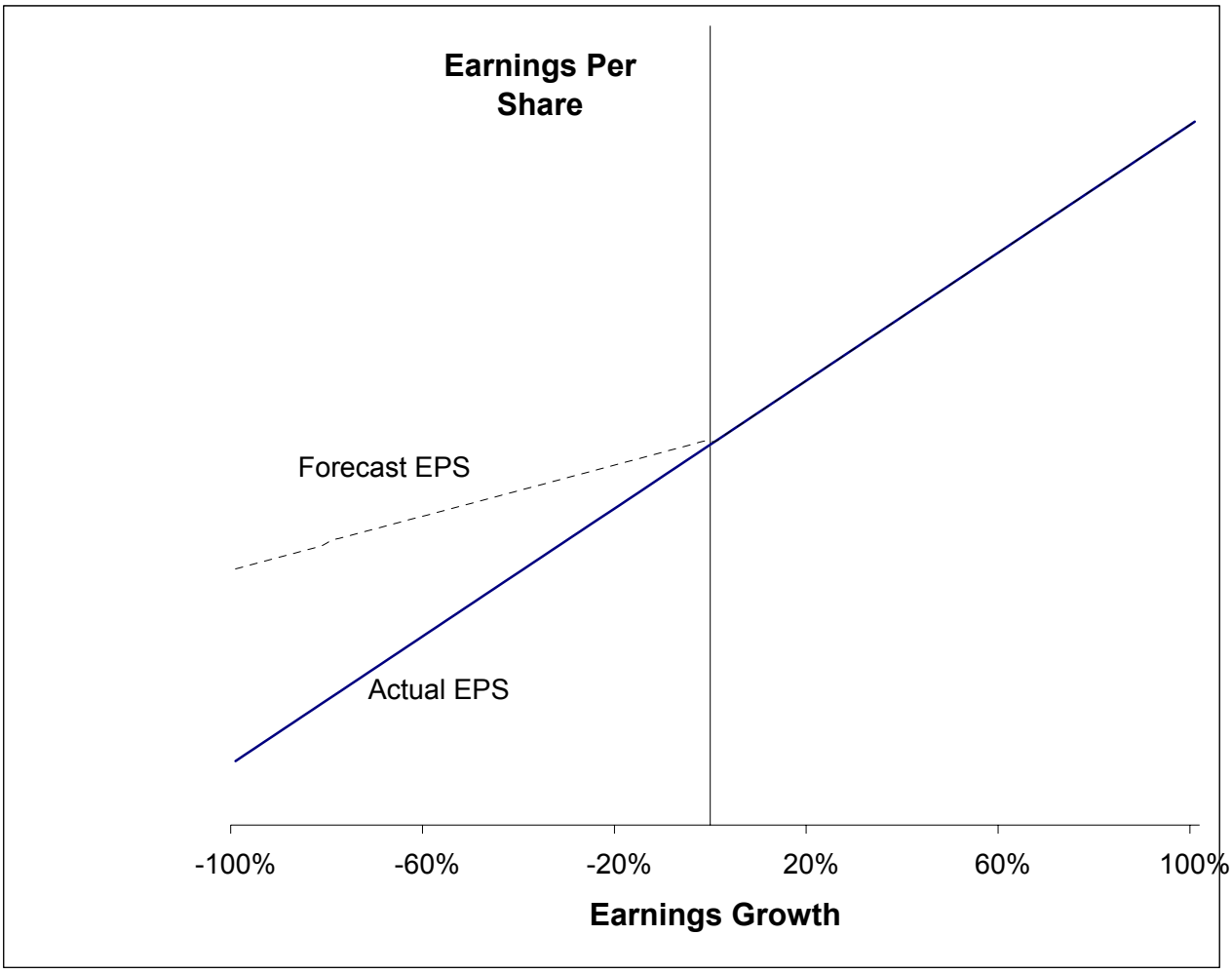

Figure 3

Plots of Cumulative Abnormal Returns

The plot of the CAR from 30 days before earnings announcement date to 30 days after the earnings announcement date is shown for announcements occurring during (a) positive growth, (b) negative growth, (c) positive earnings surprise, and (d) negative earnings surprise. Day 0 represents the date of the announcement.

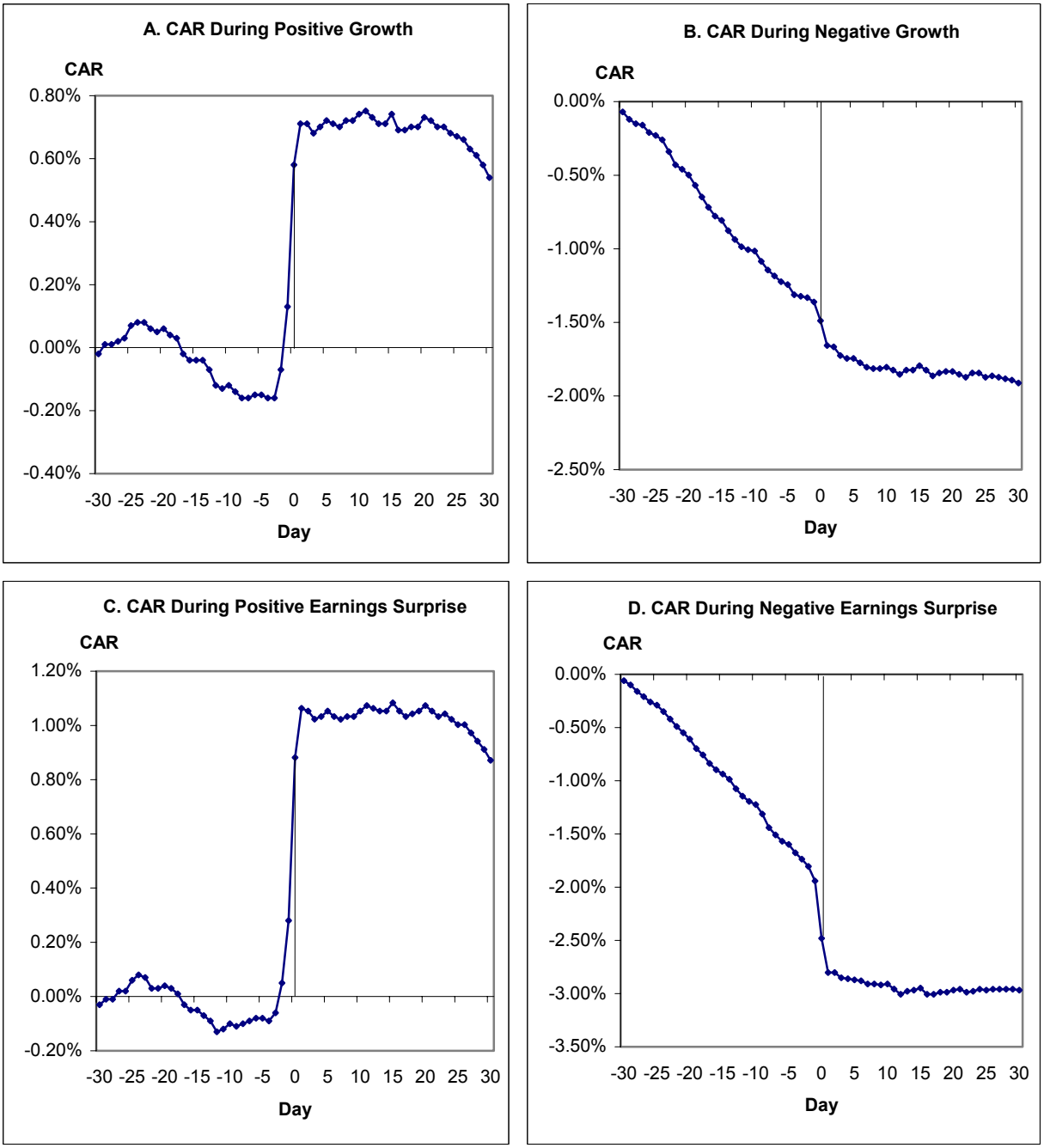

Figure 4

Earnings Surprise and Two-day CAR

The figure depicts the relationship between earnings surprise and the two-day announcement cumulative abnormal returns. The slope is concave during positive earnings surprise, indicating that any further increases in earnings surprise would generate smaller increases in abnormal returns. Increases in negative earnings surprise have only a slight impact on returns, as indicated by the gentler slope. This indicates that investors are reluctant to take losses in the event of negative earnings surprise as they appear to suffer a greater disutility in losses.