Finding ZERO: When No News is Bad News

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ABSTRACT

Hyungshin Park: Finding ZERO: When No New is Bad News
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The greater frequency of positive relative to negative earnings surprise in the distribution of analysts' forecast-based earnings surprises is well known. If the market anticipates the propensity of managers to generate positive surprises by biasing earnings or forecasts, then some of the common assumptions made in the information content studies are violated. In this paper I provide a rational framework that predicts and empirical tests that document that zero earnings surprises produce significantly negative stock price reactions, on average, and increasingly negative a firm's *ex ante* probability of generating a positive earnings surprise. If the greater frequency of positive than negative earnings surprises in typical earnings surprise distributions is attributable to bias, then a rational market framework also predicts that the slope coefficient and the y-intercept in abnormal return-earnings surprise regressions will be negatively correlated; a result that I also confirm in my empirical tests. These results have important implications for studies that examine the stock price effect of earnings surprises that meet or fail to meet hypothesized "bright lines" when empirical tests involve comparing CARs or ERCs for observations to the left and right of the bright line. Specifically, if such tests do not take into account the *ex ante* probability of positive earnings surprise inferences can be confounded. I review a selection of studies that conclude that there are asymmetric market responses around hypothesized bright lines and demonstrate how inferences

drawn from announcement abnormal returns and earnings response coefficients can be altered by controlling for the propensity for firms to generate positive surprises.

To my parents, brother and sister

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TABLE OF CONTENTS

LIST OF TABLES

Table

LIST OF FIGURES

Figure

1. Introduction

Evaluating the information content of earnings announcements has been a core issue in financial accounting research dating back to Ball and Brown (1968) and Beaver (1968). A conceptual underpinning of the information content literature is the notion that an earnings surprise of exactly zero will generate a neutral (i.e., zero) price response. While measures of earnings surprises in the literature have evolved and expanded over time, empirical researchers have typically maintained the implicit assumption that the line of demarcation between good and bad news (either of which would be expected to generate a non-neutral stock price response) is a zero surprise, independently of the actual empirical distributions of earnings surprises.

In this paper I appeal to the results of prior empirical and theoretical studies to advance a framework that describes how the market would anticipate the possibility that managers systematically bias earnings surprises; a possibility that has been linked to the greater frequency of small positive surprises relative to small negative surprises in typical distributions of analysts' forecast errors. I present empirical results that are consistent with the predictions of this framework and contradict the traditional "neutral reaction" assumption. I also demonstrate the relevance of these findings by showing how accounting for the propensity of firms to report positive earnings surprises alters inferences of asymmetric price responses around hypothesized bright lines drawn from results of empirical tests that rely on the neutral reaction assumption and partition surprises on their *ex post* sign and magnitude (e.g., Skinner and Sloan 2002 and Keung, Lin and Shih 2009).

Figure 1 presents empirical evidence that motivates my research questions. It depicts the frequency of positive-to-negative surprises, PTN, for non-zero analyst forecast-based surprises within an absolute value of 2, 5 and 10 cents, respectively, for the years 1993 to 2008. Analyst forecast-based earnings surprises, denoted ES, are measured as IBES reported EPS less IBES consensus analyst EPS estimates. It is evident in the figure that the frequency of positive surprises is consistently greater than negative surprises of a similar magnitude over the sample period. The imbalance is greatest for surprises of smaller absolute magnitudes and varies non-monotonically over time.[1]

Evidence consistent with that depicted in figure 1 has been reported in the literature on analyst forecast errors for over a decade (Degeorge, Patel and Zeckhauser 1999, Matsumoto 2002, Abarbanell and Lehavy 2003b, Dechow, Richardson and Tuna 2003, Brown and Caylor 2005, and Keung, Lin and Shih 2009). Many related studies that attempt to explain the propensity for positive earnings surprises identify the role of strategic earnings management and/or forecast management intended to influence stock price.[2]

Based on these explanations and the empirical evidence, I address the following research questions: do prices respond to earnings surprises in a manner consistent with a market that anticipates firms' propensity for generating positive earnings surprises? If so,

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[1]In this study I focus on the relative frequency of earnings surprise observations that fall in a small interval around and including zero because the overwhelming majority of *ex post* earnings surprises belong to this region, and also because most studies that hypothesize asymmetric market reactions to surprises that meet or fail to meet certain thresholds focus on surprises in this region.

[2]There is also a large literature that examines the extent to which scaling surprises by stock price is the cause of an apparent excess of small positive surprises over small negative surprises (Durtchi and Easton 2005). The evidence in figure 1 is not affected by price scaling.

what are the implications for empirical tests of asymmetric or discontinuous responses to "bright line" earnings surprises that are likely to be affected by this propensity?

To answer these questions, I provide a parsimonious model to summarize the expected impact on the stock price reactions to earnings surprises when market prices anticipate the propensity of managers to generate biased earnings surprises. This simple model illuminates essential intuitions gleaned from prior theoretical studies that analyze the consequence of management misreporting. For example, Fisher and Verrecchia (2000) (hereafter FV) demonstrate that the presence of positive bias in earnings will produce a negative average price response in a rational market and this negative market response increases in the propensity for management to inflate earnings (see FV, corollary 2).[3] Furthermore, FV suggest that the magnitude of the average negative response will be inversely related to the earnings response coefficient (ERC). This occurs because, when reporting bias is present, for a given change in any exogenous parameter, the intercept in a regression of returns on earnings surprises adjusts in the opposite direction from the direction that parameter change moves the ERC.[4]

One implication of these findings is that negative price response will be observed in the cross-section for exactly zero surprises when the market expects firms, on average, to produce positive surprises. If such a propensity is present, then the "neutral reaction" assumption implicitly adopted in traditional information content papers is violated. In fact, depending on the propensity to bias surprises upward, it is possible for even small

[3]A similar response would be predicted in the earlier model offered in Stein (1989).
[4]The earnings response coefficient is endogenously determined in FV. Specifically, it is increasing in the cost of biasing earnings, earnings precision, and prior uncertainty about terminal value, and it is decreasing in uncertainty about management objectives (see FV, corollary 1). To simplify the exposition, I assume that the ERC is exogenous. The relevant point, however, is that for a given set of specified exogenous parameters the endogenously determined intercept adjust in the opposite direction of the endogenously determined ERC.

realized positive surprises to produce, on average, negative price responses in the cross-section. Thus, in a rational market, surprises of equal magnitude but of opposite signs would be expected to generate abnormal returns of different absolute magnitude if there is an expected difference in their relative frequency.

Another, more subtle, consequence of the preceding equilibrium is that when surprise realizations are grouped by the *ex ante* probability that a firm reports a positive surprise, firms with a higher propensity for positive surprises are expected to have higher ERCs and more negative intercepts than those with a lower propensity. This prediction can be used to assess the validity of conclusions in prior literature that hypothesize that the market either rationally or irrationally rewards (penalizes) earnings surprises that exceed (falls short of) a hypothesized bright line when such conclusions are based on comparisons of ERCs or average stock returns of surprises on either side of that bright line.

I present empirical results that are consistent with a market that anticipates the propensity for managers to generate positive surprises. Specifically, I find a significantly negative mean (median) three-day announcement return of -1.07% (-0.75%) to exactly zero surprises.[5] I employ a rolling-window logit model adapted from Barton and Simko (2002) and apply out-of-sample coefficients to in-sample variable values to calculate the probability of positive surprise (PPS) and find that the highest quintile of PPS produces a significantly negative mean size-adjusted return of -1.87% while the lowest PPS quintile

[5]Baber, Chen, and Kang (2006) and Keung, Lin, and Shih (2009) also find a mean negative announcement CAR for zero surprises and attribute it to strategic behavior by managers. However, neither study hypothesizes or analyzes a role for the propensity for biased surprises in the cross-section nor considers the implications of their average findings for standard tests of asymmetric reactions to surprises of a particular sign and magnitude.

produces an insignificant mean size-adjusted return of 0.07%.[6] Furthermore, I estimate that the actual level of ES that corresponds to a neutral stock price reaction is between +1 and +2 cents for high PPS quintile firms and close to 0 cents for low quintile firms over the sample period. Finally, I also find that ERCs and intercepts in regressions of returns on surprises of small magnitude are negatively associated and also demonstrate how they move in concert to reflect the functional relation with PPS.

The preceding results have important implications for conclusions concerning the existence and potential causes of apparent asymmetric rewards or penalties to bright line earnings surprises drawn in prior studies.[7] Specifically, my results suggest that the combination of accepting the empirical validity of the neutral reaction assumption and/or sorting earnings surprises on their realized values will almost certainly produce the appearance of asymmetric responses to bright line surprises in standard tests that compare abnormal returns or ERCs on either side of hypothesized bright lines. That is, if the market behaves as if it anticipates incentive-induced biases in surprise measures employed by researchers, then adherence to standard empirical designs will generate statistical results that lend credence to hypotheses that are founded on the *supposition* that there are asymmetric rewards or penalties to surprises that fall on either side of an arbitrarily chosen bright line.

I present evidence that variables that have been used to condition earnings surprises in tests of bright line theories, such as *ex ante* price-to-earnings (PE) and market-to-book (MB) ratios, are positively correlated with my measure of PPS. I further show how this

[6]The cross-sectional relations I document also hold over time. Specifically, I find a negative serial correlation between the PPS measure and returns to exactly zero earnings surprises over the sample period.
[7]I emphasize that this study does not speak directly to the internal validity of hypotheses that predict there will be a propensity for managers to bias earnings surprises in an effort to move prices.

empirical fact confounds the interpretation of evidence from prior studies that test hypotheses that predict asymmetric price responses to bright line surprises but do not control for the propensity for positive earnings surprises observed in figure 1.

The remainder of the paper proceeds as follows. In section 2, I motivate my empirical hypotheses with arguments and evidence from the empirical literature on earnings surprises and theoretical results concerning the expected consequences for abnormal returns and ERCs of managerial misreporting in a rational market. In section 3, I describe the sample selection procedures and data used in the empirical tests. Section 4 presents the results of empirical tests of the main hypotheses along with robustness tests. In section 5, I present evidence of the impact of controlling for the propensity for positive surprises on inference drawn from prior studies that conclude there are asymmetric or discontinuous responses to hypothesized bright line surprises. Section 6 contains a summary and conclusion.

2. The model and empirical hypotheses

In this section I parse the extensive literature on earnings surprises and identify broadly representative studies that refer to strategic incentives for management to manipulate surprises in order to gain direct or indirect benefits linked to the firm's stock price. I do not perform a complete review of these literatures or attempt to challenge the results or conclusions reached in these studies. Rather, the motivation for this exercise is to demonstrate that there are ample empirical findings and arguments in the extant literature to justify the generic strategic equilibrium that includes reporting biases described below.

2.1. The propensity for positive earnings surprises

Studies that rely on or analyze analyst forecast-based surprises generally assume that when earnings are exactly equal to the outstanding forecast there is no earnings news in an announcement. However, there is abundant empirical evidence of peculiarities in distributions of surprises and related explanations for their cause that raise question about the validity of this assumption. For example, one stream of literature that investigates the distributional properties of analyst forecast-based surprises links the greater frequency of small positive forecast errors than small negative forecast errors in the cross-section to the possibility of earnings inflation (Degeorge *et al*. 1999, Bartov, Givoly and Hayn 2002, Matsumoto 2002, and Burgstahler and Eames 2006). Abarbanell and Lehavy (2003a) find evidence to support the existence of an earnings-management-induced "middle asymmetry" in the distribution of analyst forecast-based surprises that is both predictable and associated with firms' stock price sensitivity to earnings news. [8]

Another stream of research that examines biases in earnings surprise distributions identifies managerial actions that influence analysts' forecasts (Bartov *et al*. 2002, Matsumoto 2002, and Richardson, Teoh and Wysocki 2004). These studies focus on the possibility that analysts are induced (consciously or unconsciously) by managers to bias their forecasts relative to the earnings managers intend to report. Regardless of the exact nature of the equilibrium hypothesized, the most recent studies in this literature have repeatedly pointed to the greater incidence of small positive surprises relative to small negative surprises as evidence of induced pessimism in analyst forecasts.[9]

The studies cited above, and others in the earnings management literature, rely on the argument, or at least entertain the possibility, that firms manage earnings or manipulate forecasts to secure direct or indirect benefits from a higher stock price. The direction of causality in the link between managerial incentives to inflate earnings or induce analyst pessimism to produce positive surprises is sometimes difficult to pin down in these studies. However, a common thread among them is an appeal to the notion that

[8]Theories that point to strategic management behavior as the direct or indirect cause of bias in *ex post* distributions of earnings surprises also assume there are factors that prevent systematic biases from being eliminated from surprises over time (see Abarbanell and Lehavy 2003b for a discussion of why analysts would not adjust their forecasts to anticipated biased earnings). I do not attempt to explain how such equilibria can arise. Rather, I proceed from the perspective that such factors can be present (as the evidence in figure 1 seems to strongly suggest) in a rational market, and assess whether stock price responses behave in a manner that is consistent with a market that anticipates them on average.

[9]Earlier studies by Francis and Philbrick (1993) and Lim (2001) posit that analysts bias their forecasts upward to curry favor with managers in return for better access to information and, on average, more accurate forecasts. These studies were highly influenced by prior evidence of persistent mean optimism (i.e., negative apparent bias) in analysts' forecasts in developing and testing the curry favor hypothesis. However, as demonstrated in Degeorge *et al.* (1999), mean optimism in analysts' forecast errors is attributable to the disproportional impact of a relatively small number of extreme observations in the negative tail of earnings surprise distributions. It should be noted that Francis and Philbrick (1993) report positive median forecast errors in their sample, which is inconsistent with the "curry favor" hypothesis and consistent with subsequent studies that hypothesize induced pessimism in analysts' forecasts.

firms that beat hypothesized benchmarks earn equity rewards (Barth, Elliot and Finn 1999, Bartov *et al.* 2002, Kasznick and McNichols 2002, Lopez and Rees 2002). Presumably, managers' decisions to manipulate surprises would be linked to managers' perceptions of their ability to move stock prices using earnings news (i.e., stock price sensitivity to earnings news).

Other studies link managers' incentive to produce positive surprises to efforts to exploit private information over limited timeframes (Bartov and Mohanram 2004 and Richardson, Teoh and Wysocki 2004). Bartov and Mohanram, for example, posit that managers produce positive surprises relative to analysts' forecasts to maintain high stock prices during a period in which they exercise stock options and sell shares. Subsequently, their firms report the disappointing earnings news that had been withheld by managers. Once again, the incentive to engage in such behavior is presumably tied to managers' perception of the stock price sensitivity to earnings news. In sum, the general tenor of the representative selection of studies cited above is that bias is more beneficial to managers and more likely to occur when stock price is highly sensitive to earnings news. My formulation below reflects this assumption.[10]

[10]The model results in FV are also consistent with this assumption. See equation 22 of FV.

2.2. A model of rational responses to biased earnings surprises

Let θ_i = the true earnings of firm i

s_i = the surprise relative to the market's prior expectation of earnings of firm i

$r_i = E[\theta_i] + s_i = \theta_0 + s_i$ = the reported earnings of firm i

$V_i = \beta \cdot E[\theta_i \mid r_i]$ = the market value of firm i given r_i

β = positive earnings multiple exogenously given

A firm manager privately observes true earnings, θ_i, where θ_i is drawn from a uniformly distributed discrete random variable $\tilde{\theta}$ with mean θ_0 and support $(-\infty, +\infty)$. The manager can disclose $r_i = \theta_i$ or $r_i = \theta_i + \bar{s}$, where $\bar{s}$ is a positive constant.[11] Figure 2 depicts the possible reporting choices of firms at each level of true earnings. In order to disclose $r_i = \theta_i + \bar{s}$, the firm manager must incur a personal cost of $c_i \bar{s}^2$, which could reflect psychic costs, or the costs of lost reputation or legal liability in the (uncertain) event that misreporting is subsequently discovered and penalized. The random cost of unit inflation (c_i) is privately known by the manager at the time of the report and is

[11] While the analysis I present explicitly contemplates surprises that result from the inflation of true earnings relative to an outstanding forecast, an equivalent formulation in which firms report true earnings that are above an outstanding forecast that has been manipulated downward at a cost to the manager will produce the same results. The relevant forecast could, for example, be issued by an analyst or even by the manager. This alternative formulation also assumes a stock price-related benefit that accrues to managers who produce a positive surprise that exceeds the stock price and non-stock price-related costs incurred when they manipulate forecasts (Bartov *et al*. 2002) In such equilibria, the more apt characterization of investors' response to an earnings surprise is disappointment when the "true" earnings reported by the firm do not exceed a relevant outstanding forecast by an amount that compensates for the expected downward bias in forecasts induced by managerial actions.

drawn from the uniform distribution $U[a,b]$. I impose a regularity condition $a < \frac{\beta}{\bar{s}} < b$ to avoid corner solutions.

When the manager discloses r_i investors make an inference about the manager's reporting choice. The investor's valuation of a firm is:

$$V(r_i = \theta_0 + s_i) = \beta \cdot E[\theta_i \mid r_i = \theta_0 + s_i] \quad (1)$$

where the earnings multiple, β, is an exogenously given positive number.[12]

The manager's utility function is a linear sum of firm value and the personal cost of earnings management. In particular, his utility function is:

$$V(r_i = \theta_0 + s_i) \quad \text{if } s_i = (\theta_i - \theta_0) \quad (2)$$

$$V(r_i = \theta_0 + s_i) - c_i \bar{s}^2 \quad \text{if } s_i = (\theta_i - \theta_0) + \bar{s} \quad (3)$$

Suppose investors believe that the manager's reporting choice depends on the manager's observation of $\tilde{c}_i = c_i$, and that there exists a threshold, $\hat{\tau}$, above which the manager reports $r_i = \theta_i$ and below which he reports $r_i = \theta_i + \bar{s}$.[13] Let $\hat{p} \equiv prob(c_i < \hat{\tau})$, then the equilibrium value of the threshold is:

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[12]A reasonable objection to this formulation is that it does not account for investors' expectation of bias in earnings from previous periods. For example, in a multi-period model with some settling up, investors could learn precisely which firms are going to bias surprises and unravel it completely and managers would have no obvious reason for manipulating surprises. It should be clear, however, that the empirical predictions from my model are founded on the assumption that some residual investor uncertainty (or incomplete learning) is present in any given period, which includes the possibility that investors imperfectly observe the manager's objective function (see FV for a similar construction). Therefore, for the sake of simplicity, I do not explicitly model the impact of previous expected bias in earnings surprises.

[13] The ^ notation of a variable indicates that it is a conjecture.

$$\hat{\tau} = \tau = \frac{\beta}{\bar{s}} \tag{4}$$

Proof: (see appendix 1)

To summarize, managers have private information regarding true earnings and also the manager-specific cost of biasing surprises upward through earnings and/or forecast manipulation. Managers must assess the trade-off between the stock price benefit of managing surprises and the personal cost of doing so. Investors have imperfect information about this tradeoff for individual firms and use it to establish stock price. As a result, there exists an equilibrium threshold for the cost of biasing surprises, under which firms inflate the surprise and above which they do not. A key feature of this equilibrium is that the investors cannot discern whether a specific firm has actually biased the surprise by observing it *ex post*, however, they are aware of the possibility that individual firms will do so and adjust the price associated with actual surprises for the *ex ante* probability that bias is present.

2.3. Empirical hypotheses

In the preceding equilibrium investors form an expectation of the probability the manager will strategically bias the earnings surprise and discount that surprise by the amount of the expected bias.

Hypothesis 1a: The average stock return to a zero surprise is negative and increasingly negative in the probability a firm will report a positive surprise

Hypothesis 1a, which follows from the second and the third comparative statics in appendix 1, indicates that we should expect the return generated by negative, zero, and possibly small positive forecast errors all to be negative, and more negative as the *ex ante* probability of positive surprise management increases. This is because, in equilibrium, rational investors anticipate that firms with a non-zero probability of generating a positive surprise will manage the surprise to a positive number (even if the firm does not actually do so because the privately observed cost of biasing surprises is too high), therefore zero or even small positive forecast errors will constitute a disappointment to the investors. In addition, investors anticipate firms with a greater *ex ante* probability of surprise management will produce an even greater earnings surprise, and, therefore, a zero surprise for these firms would be an even greater disappointment to the investors. That is, if the model is descriptively valid it should also be the case that:

Hypothesis 1b: The level of earnings surprise that corresponds to a neutral stock price reaction is a small positive number and increases in the probability that a firm reports a positive surprise

Hypothesis 1b, which follows from the fourth and fifth comparative statics in appendix 1, implies that the measurement error inherent in assuming that the line of demarcation between a good news and bad news surprise is zero increases in the probability that a firm manages its earnings surprise. Alternatively, the level of surprise that actually corresponds to "no news" becomes more positive as the probability of a positive surprise increases. Figure 3 presents a graphical summary of the hypotheses.

The following hypothesis is relevant to the interpretation of regression-based tests of price responses to earnings surprises:

Hypothesis 2: In a regression of returns on earnings surprises the earnings response coefficient and the intercept are negatively correlated

Hypothesis 2, which follows from the third comparative static in appendix 1, predicts a negative correlation between a stock's earnings response coefficient, β, i.e., the slope in the regression of returns on surprises, and the average stock return, α, i.e., the y-intercept in the regression. This follows because investors are aware of the fact that firms with higher ERCs are more likely to generate a positive earnings surprise due to greater (more severe) stock price benefit (penalty) to reporting higher (lower) earnings and will establish a discount for the expected surprise even before the actual earnings are known to or reported by the manager. The higher is the ERC, the greater is that expected discount.

The results of the model I present in this section suggest that if empirical tests of theories that predict strategic biases in surprises do not address the expected propensity for biased surprises, the conclusion of asymmetric responses to bright line surprises will likely be a self-fulfilling prophecy when a rational market anticipates bias in distribution of earnings surprises. In addition, some studies implicitly assume or explicitly hypothesize an inefficient (correction of a previously inefficient) market response (price level) to surprises that meet or fail to meet a particular bright line. Either type of argument leads to an expectation of an asymmetric price response to surprises on either side of the relevant threshold. While such theories may in fact be descriptive of the world, the preceding hypotheses have implications for tests of these theories that rely on comparing abnormal returns or ERCs but do not take into account the propensity for positive surprises depicted in figure 1.

3. Data and preliminary findings

3.1. Sample Selection

My sample includes all available quarterly earnings announcements between 1993 and 2008. I test my main hypotheses using earnings surprises based on analysts' forecasts. I choose 1993 as the beginning of my sample period for two reasons. First, this cutoff ensures the congruence of IBES and COMPUSTAT announcement dates. Dellavigna and Pollet (2009) report that the IBES announcement date and the COMPUSTAT announcement date generally agree after 1988, whereas before 1989 there are many cases where these two dates do not agree. Second, Abarbanell and Lehavy (2007) document a regime shift in the IBES database around 1991-1992, which affects the distributional properties of analysts' forecast-based earnings surprises, and suggest that longitudinal studies that straddle the year 1991-1992 but do not account for this shift may generate erroneous inferences.

Analyst forecast-based earnings surprises, ES, are calculated as IBES reported EPS less the consensus analyst forecast of EPS. For each earnings announcement I collect EPS and the most recent consensus analyst EPS forecast prior to the announcement from the stock-split unadjusted IBES dataset.[14] I restrict the period between the consensus forecast and the announcement date to be less than or equal to 31 days in order to eliminate stale forecasts. The resulting number of ES observations is 237,535.

[14]I use the median analysts' forecast as the consensus EPS forecast, but the results are qualitatively similar when I use the mean analyst consensus forecast. I use stock-split unadjusted, instead of adjusted, IBES dataset because evidence in Baber and Kang (2002) and Payne and Thomas (2003) suggests that using stock-split adjusted EPS or forecast could lead to a misclassification of non-zero forecast errors as zero forecast errors due to retroactive division adjustment to both the EPS and the forecast.

I use CRSP to calculate three-day buy-and-hold size-adjusted stock returns (-1, 1) around the announcement in order to assess the market's reaction to the earnings surprise.[15] Size-adjusted returns are the excess stock returns over the corresponding size-deciles portfolio returns. Size-deciles portfolio returns are calculated by ranking firms into deciles by the market value of equity at the beginning of the quarter.

A key variable in my study is the probability of a positive surprise, PPS. I construct this variable from a logit regression adapted from Barton and Simko (2002). In order to obtain an up-to-date estimate of PPS prior to each announcement, I estimate logit regressions in twelve-quarter rolling-windows following the methodology in Cheng (2006) as opposed to the pooled regressions employed in Barton and Simko. In addition, if any variables that are originally defined in Barton and Simko are not available to the market at the time of earnings announcement, they are replaced by the most recent values that were available. For example, I replace the current market-to-book ratio, MB, in Barton and Simko with the last quarter's MB. Because of the twelve-quarter rolling window estimation procedure, the earliest time period that PPS becomes available is the first quarter of 1996. The estimation procedures and descriptive statistics for the variables used to construct PPS are presented in appendix 2.

The total number of quarterly earnings announcements with non-missing EPS, consensus analyst forecasts, and the variables required for the PPS calculation is 95,613. However, the requirement of three years for the PPS estimation period further reduces the sample size to 82,992.

[15]Alternatively, I calculate abnormal returns using three different metrics: market-adjusted, market-model adjusted and Fama-French three-factor model adjusted returns. My results are qualitatively similar for all abnormal return measures, so I only present results for size-adjusted returns for the sake of brevity.

3.2. Descriptive statistics and preliminary findings

Descriptive statistics for the main variables are presented in panel A of table 1. All variables except for PPS are winsorized at 1% and 99% to reduce the effects of ouliers. The skewness measure and comparisons of the 95th to the 5th percentiles of ES distribution indicate a longer negative tail, consistent with prior evidence reported in Abarbanell and Lehavy (2003b). The mean ES is small but significantly negative in my sample, while the median is slightly positive and significant. Early studies of analyst forecast errors typically reported a large negative mean error. However, this finding is consistent with conclusions of declining apparent mean optimism in errors reported in more recent studies and evidence of change in IBES procedures as to which items to include in forecasts and reported earnings after 1991 (Brown and Caylor 2005 and Abarbanell and Lehavy 2007) The fact that the surprises are not scaled by price, as is frequently the case in prior studies, also contributes to this finding.

Summary statistics for the PPS measures indicate negative skewness in the distribution, but confirm a higher expected incidence of positive surprises in the sample. These results are consistent with the distributional evidence of the relatively greater frequency of positive than negative surprises in the cross-section and over time in figure 1, and provide support for the possibility that investors have the ability to predict the propensity for small positive surprises commonly found in empirical distributions of *ex post* surprises.

Summary statistics for MB ratios are on par with those reported by Barton and Simko (2002). In untabulated results I find that the mean and median values of MB and PE are higher in my sample than observed for a larger sample that was generated without the requirement of analysts' forecasts. The CAR measure produces descriptive statistics that are consistent with other estimates of size-adjusted returns in the literature. The distribution of announcement CARs appears to be nearly symmetric and centered very close to zero.

The correlation matrix in panel B of table 1 indicates a positive association between the ES and PPS, consistent with the argument that an *ex post* surprise is increasing in the *ex ante* estimate of the probability of a positive surprise. Another interesting preliminary finding in panel B is the significant positive association between PPS and both the PE and MB ratio. This finding continues to hold even when MB is excluded as an explanatory variable from the estimation of PPS. The result suggests that the level of these ratios may serve as a coarse proxy for the *ex ante* probability of a positive surprise, which, in turn, raises questions about the interpretation of conclusions concerning asymmetric price responses around surprise thresholds when data is grouped in the levels of these variables. I elaborate on this finding in section 5.

Panel A of table 2 reports the ratio of positive-to-negative surprises, PTN, for non-zero surprises of an absolute magnitude of 2, 5 and 10 cents, respectively, by PPS quintile. PTN increases monotonically from 1.07 to 5.09 in PPS quintile. Figure 4 summarizes the relation between PPS and PTN by high, middle and low quintile over the sample period, where the three middle PPS quintiles are assigned to the middle group. PTN is monotonic in quintile of PPS in every sample year.

Panel B of table 2 (top table) shows the number of observations for each level of earnings surprise by PPS quintiles. In contrast to some variations of "bright line" theories that would predict an increase in frequency for a specific surprise level, e.g., only zero or one cent earnings surprises, the frequency of earnings surprise is clearly increasing in PPS for all non-negative earnings surprises, i.e., the distribution shifts to the right conditional on PPS. The bottom table of panel B reports the mean values of PPS for given earnings surprise levels by PPS quintile. As expected, the mean PPS increases across PPS quintile for the same earnings surprise but is stable across earnings surprises levels for the same PPS quintile. I will revisit the results of this table in section 5.2.

Panel C of table 2 reports results related to the time series correlation between PTN and PPS by quarter. Model 1 presents the results of a regression of quarterly PTN on quarterly PPS. The coefficient is positive and highly significant. Model 2 includes the time variable. The results indicate a small, but significantly negative time trend in PTN for my sample, which is inconsistent with an increasing demand for firms to produce positive surprises suggested by Matsumoto (2002) and Bradshaw and Sloan (2002), but consistent with a decreasing trend in the incidence of positive surprises documented in Koh, Matsumoto and Rajgopal (2008) who argue that firm incentives to produce a positive surprise have diminished subsequent to celebrated accounting scandals. Most relevant for my study, however, is that the correlation between PTN and PPS over time remains positive and highly significant.

The evidence in table 2 and figure 4 demonstrates that PPS is highly correlated with the PTN both in the cross-section and over time. The results provide assurance that an *ex ante* variable has the ability to consistently predict the *ex post* outcome of interest.

4. Empirical Results

4.1. Hypotheses 1a and 1b

Hypothesis 1a predicts that the average stock returns to a zero forecast error will be negative and become more negative for firms with a greater probability of surprise management. Panel A of table 3 reports three-day size-adjusted abnormal returns to zero earnings surprises for each year of the sample. Mean and median PPS values exceed 50% in every year and mean and median CARs are negative in every year. Negative mean (median) CARs are statistically significant in 10 of 13 (9 of 13) years. The results for the entire sample period, which are consistent with average earnings announcement abnormal returns results reported in Baber, Chen and Kang (2006), and Keung, Lin and Shih (2009) are highly significant.

The evidence in panel A of table 3 also suggests a relation between the level of PPS and the size of the average negative return to a zero surprise. That is, years with higher average levels of PPS produce larger negative returns to zero earnings surprises than years with relatively lower values of PPS. For example, the mean values of PPS are relatively high, ranging from 74.1% to 78.3% in 2002-2006 periods. These years produce negative CARs that range from -1.28% to -1.62%. In untabulated results I find that the correlation between PPS and CARs for zero surprises is -0.08 (significant at 1% level). It is also interesting to note that neither PPS nor CARs for zero surprises are monotonic over the years, suggesting that overall incentives to bias surprises and market reactions to such biases vary in the cross-section over time.

Panel B of table 3 presents additional evidence on hypothesis 1a. The first (second) set of rows in the panel report mean (median) CARs for zero surprises by PPS quintile for

3 sub-periods (1996-1999, 2000-2004, and 2005-2008) and for the entire sample period. There is a monotonic relation between the level of PPS and CARs. Mean (median) CARs range between an insignificant 0.07% (-0.25%) for the 1st quintile of PPS to a significant -1.87% (-1.22%) for the 5th quintile for the entire sample period. A test of differences between the 5th and 1st quintile is highly significant. Similar results are observed for all sub-periods.

Hypothesis 1b is the flipside of hypothesis 1a, which is the level of surprise that generates a neutral price response is positive and increasing in the probability of a positive surprise. Tests of this hypothesis are intended to provide a numerical feel for the amount of surprise in EPS necessary to generate a neutral response, and can be thought of as a method of calibrating earnings surprises in tests of price reactions to earnings news; i.e., producing an estimate of the earnings surprise that will generate a neutral stock response, denoted *ZERO*.

Preliminary evidence related to hypothesis 1b is presented in panel A of table 4, which reports mean size-adjusted stock returns to small earnings surprises of magnitudes ranging from -10 cents to +10 cents after partitioning by quintile of PPS. Differences in returns between the lowest and highest quintile are presented in the last column. The mean return to the lowest quintile of PPS significantly exceeds that associated with highest quintile for earnings surprises that range from -5 cents up to +2 cents. Differences are insignificant for surprises out of this range. This indicates that investors are generally more disappointed when high PPS firms just miss, meet or just beat the forecast than when low PPS firms generate the identical earnings surprises.

Panel B of table 4 presents the results of two methods of estimating the value of *ZERO*: interpolation and regression. The interpolation method connects two adjacent surprises around zero; one of which produces a positive mean size-adjusted return and the other a negative mean size-adjusted return. The point where the interpolated line crosses the surprise axis is the estimated surprise that corresponds to *ZERO* (see figure 5). The regression method entails running a linear regression of CAR on a small range of surprises: -2 cents to +2 cents surprise. *ZERO*, the x-intercept, is calculated using the y-intercept and the slope from the regression.[16]

Estimates of *ZERO* are presented for each year of the sample. *ZERO* is positive in all years and significant in most years after 2000.[17] This pattern is generally consistent with the pattern of mean and median CARs for zero earnings surprise reported in panel A of table 3. For the entire sample period, average *ZERO* is estimated to be 0.54 cents and 0.49 cents for the two methods, respectively, indicating that earnings surprises must be in the neighborhood of positive one half cent to be considered "no news" in the average annual cross-section. *ZERO* estimates from the two alternative methods are generally congruent over time.

Panel C of table 4 presents estimates of *ZERO* by PPS quintiles for the 3 sub-periods described earlier and for the entire sample period. Note *ZERO* for the first PPS quintile is insignificant, while for higher PPS quintiles *ZERO* tends to be significantly positive and increasing in quintiles of PPS. For the full sample period, the interpolation

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[16] *ZERO*=-1*(y-intercept/slope). Note that given the evidence in figure 1 and the literatures this study addresses, I focus my regression tests on the earnings surprise observations near the center of the distribution, in this case between -2 and 2 cents. These observations comprise approximately 50% of the observations in the typical quarterly earnings surprise distribution. Results for earnings surprises in ranges up to an absolute value of 5 cents produce qualitatively similar results.

[17] The statistical significance of *ZERO* is assessed through a bootstrapping technique described in table 4.

(regression) method yields a *ZERO* estimate of -0.09 (-0.26) cents for the lowest PPS quintile, and +1.18 (+1.20) cents for the highest PPS quintile. The differences are highly significant. These results indicate that firms with a low probability of a positive surprise can produce zero or a slightly negative surprise and generate a neutral stock price reaction, while firms with a high probability of positive surprise require a surprise of between +1 and +2 cents to generate a neutral stock price reaction. While there is some variation, estimated values of *ZERO* for high and low PPS firms can be characterized similarly across sub-periods. Overall, the results in table 4 provide support for hypotheses 1a and 1b as well as some validation of the methods used to estimate the *ZERO*.

4.2. Hypotheses 2

In order to test hypothesis 2, I estimate the ERC in each of the 52 quarters that comprise my sample from regressions of CARs on ES in the range of -2 to +2 cents. As discussed in footnote 2, prior literature raises concerns about scaling surprises by stock price.[18] Therefore, I run my tests using both unscaled and scaled earnings surprises to ensure results are not driven by spurious correlation. Results using scaled earnings surprises are essentially the same as using unscaled surprises and thefore not presented.

Panel A of table 5 presents benchmark regressions of 3-day announcement CARs on earnings surprises in the range of -2 to +2 cents (Model 1) in the pooled, yearly and quarterly regressions. Model 1 results, which are presented for unscaled surprises, indicate that the intercept is significantly negative. As expected the ERC is higher than is

[18]Cheong and Thomas (2009) present evidence that indicates the absence of scale in earnings surprises and argues that the practice of scaling errors has taken hold in the literature with no compelling reason for it. They also show that scaling by price can lead to distortions in tests of hypotheses concerning the price response to earnings news.

typically achieved for when the full range of earnings surprises is included in the regression (Freeman and Tse 1992). The last row present the Spearman and Pearson correlations between quarterly ERCs and intercepts and the coefficient from a regression of quarterly intercepts on quarterly ERCs. Consistent with hypothesis 2, there is reliably negative association.

In rational expectations models of reporting bias, the marginal benefit of a positive surprise is increasing in the *a priori* level of a stock's ERC. In contrast, it could be argued (as some of the studies cited in section 2 do) that the realization of a positive surprises leads to a higher ERCs. To date, no empirical study has discriminated the direction of causality between the ERC and a surprise. However, either possibility suggests that there will be a monotonic relation between PPS and ERC and, by hypothesis 2, a monotonic relation (in the opposite direction) between PPS and the intercept. Panel B presents intercepts and ERCs in pooled and yearly regressions by quintile ranks of PPS. There is evidence of monotonicity in PPS for both parameters and in opposite directions.

One possibility raised by the findings reported in panel B is that when any variable hypothesized to be linked to asymmetric price reactions to bright line surprises is correlated with PPS, tests of the hypothesis that are based on differential ERCs can be confounded. To assess the potential for correlated omitted variables, I augment Model 1 by adding the variable PPS and an interaction term PPS*ES and label this Model 2. Results for unscaled ES in pooled and yearly regressions are presented in panel C of table 5. The results indicate that the PPS indicator is negative and highly significant while the interaction PPS*ES is positive and highly significant in the pooled and yearly regressions. For the yearly regressions I find that the PPS coefficient is negative in every year, while the coefficient on PPS*ES is positive in 11 of 13 years. The results for Model 2 strongly suggest that to the extent any variable used to partition data that is correlated with PPS will likely contribute to a finding of asymmetric price reactions to bright line surprises (see also section 5.1, footnote 23).

4.3. Robustness tests

4.3.1. Hindsight biases in surprises

The empirical tests conducted thus far rely on actual EPS and consensus analyst forecast data obtained from IBES. According to Bradshaw and Sloan (2002), Abarbanell and Lehavy (2007), IBES reports "street" earnings excluding one-time items (e.g., special items) and, therefore, the size and sign of surprises measured with IBES data can differ from the size and sign perceived by investors. In addition, Livnat and Mendenhall (2006) report that IBES often chooses the components to include in reported EPS after observing the market reaction to the earnings announcement. As discussed in the next section, even if systematic biases and/or hindsight biases are introduced into IBES surprises by a data provider's administrative procedures, the hypotheses and results in the paper would still be relevant, however, it would be difficult to attribute the results thus far to the empirical validity of theories that posit a strategic incentive for managers to produce biased surprises.

To ameliorate the effects of possible hindsight biases that contaminate tests of price reactions to earnings surprises, I employ a proprietary dataset from Briefing.com that should be free from this potential problem. Briefing.com provides real-time coverage of firm news since 1992. In particular, the "in play" service reports EPS relative to the outstanding First Call forecast consensus on the date of the earnings announcement. The following excerpt from Briefing.com provides an example.

7:34AM CMS Energy beats by $0.06, reports revs in-line (CMS) *10.63 : Reports Q4 (Dec) earnings of $0.30 per share, excluding non-recurring items,* ***$0.06 better than*** *the First Call consensus of $0.24; revenues rose 10.2% year/year to $1.84 bln vs the $1.84 bln consensus.*[19]

I collect all available quarterly earnings announcement data from Briefing.com using a text searching program, PERL, and construct a dataset of observations common to IBES and Briefing.com with respect to the earnings announcement date. I then rerun all of the key tests of this section. The total number of observations for this dataset is 25,886, considerably smaller than the original sample because Brieifing.com only began extensive coverage of earnings announcements after 1997 and because I delete observations for which the two data services do not report the same earnings announcement date. Untabulated descriptive statistics indicate that, compared to the sample used in this study, firms in this common dataset report larger EPS (mean of 41 cents versus 25 cents), total assets (mean of 8,207 million versus 3,127 million), earnings surprises (2 cents versus -1 cents), and size-adjusted returns (mean 0.38% versus 0.18%). However, the industry composition is very similar using the Fama-French 30 industry classification.

I find that the Briefing.com sample produces results qualitatively similar to those reported for the sample in tables 2-5 (untabulated for the sake of brevity). Specifically, I

[19]http://www.briefing.com

find that the ratio of positive-to-negative surprises is increasing in PPS, zero surprises produce negative stock reactions, on average, which are increasing in PPS quintile, and the surprise necessary to produce a neutral stock reaction is significantly positive and increasing in PPS quintile. I also find that the PPS is increasing in ERC and that ERCs and intercepts in regressions of CAR on ES are negatively correlated.

4.3.2. Changing the cutoff used to define PPS

The logit model estimation of PPS described in the appendix is based on the specification in Barton and Simko (2002), which estimates the probability that a surprise will be greater than or equal to zero.[20] Table 6 presents the PTN and CARs for zero surprises by quintile of PPS for alternative cutoffs used to estimate PPS. The alternative cutoffs range from -3, -2 -1, 0, +1, +2 and +3 cents. The results are qualitatively similar for each alternative cutoff. In untabulated results I also find that intercepts are decreasing and ERCs are increasing in PPS for all alternative specifications using these cutoffs. In the next section I elaborate on these results and their implications for studies that hypothesize that firms engage in deliberate efforts to manage earnings or analysts' forecasts in an effort to meet or beat expectations.

5. Interpreting prior literature using a rational framework

5.1. Evidence of the existence of a "Torpedo" effect

Some studies hypothesize asymmetric price responses to bright line earnings surprises for reasons that would have no direct implications for the actual empirical distributions of earnings surprises. In other words, these theories do not predict a

[20]Matsumoto (2002), Rees (2005), and Cheng (2006) have also developed similar logit models

propensity for positive earnings surprises in distributions of earnings surprises like that observed in figure 1, but nevertheless employ such distributions in their empirical tests. Moreover, inferences from empirical tests of these hypotheses often implicitly rely on the neutral reaction assumption and/or are affected by the practice of partitioning data on *ex post* realizations of surprises.

Some of the hypotheses that predict asymmetric price responses to surprises that meet or fail to meet "bright lines," link the prediction to either market mispricing or a correction of prior mispricing. For example, following on Lakonishok, Shleifer and Vishney (1994), Skinner and Sloan (2002) hypothesize that investors fixate on firms' past growth and maintain unreasonably high growth expectations for firms with high past growth rates, i.e., firms with high market-to-book ratios or high price-to-earnings ratios. They argue this irrationality is corrected around earnings announcements when there is a negative earnings surprise. This in turn, results in larger negative stock price reactions to small negative surprises for high MB and PE firms. Skinner and Sloan compare announcement CARs of high and low MB (PE) firms for small positive and negative *ex post* surprises and find that the difference in CARs for the latter are significantly larger in absolute magnitude than that for the former. They deem this response the "Torpedo" effect. [21]

[21]Other theories posit rational but non-linear responses to small negative versus positive earnings surprises as a function of the "state" of the economy or asymmetric price responses to positive and negative earnings surprises as a function of investor sentiment. These theories also have no implications for the shape of empirical distributions of ES but are tested using these data. For example, Conrad, Cornell and Landsman (2002) test the predictions of Veronesi (1999) and find ERCs associated with negative surprises increase relative to those for positive surprise as the level of the market rises. They measure the level of the market using a rolling window changes in cross-sectional PE. However, similar to the case of Skinner and Sloan (2002), they do not control for the propensity for positive surprises, which was shown earlier to be strongly positively correlated with PE.

Panel A of table 7 presents mean PPS, PTN and CAR at zero earnings surprises for MB and PE and quintiles. All three variables are increasing in MB and PE, a result that still holds when MB is not included in the estimation of PPS (see appendix 2). That is, there is reason to suspect that PE and MB are also proxies for the *ex ante* probability of a positive surprise. Similar to the results for PPS, differences in PTN and CAR for zero surprises between the high and low quintiles are significant for both MB and PE.

Panel B of table 7 reports the three-day size-adjusted stock return for earnings surprises ranging from -3 to +3 cents for all observations and by MB and PE quintile. As predicted by the positive correlation between MB (PE) and PPS, the difference in mean CARs between the highest and the lowest MB (PE) quintiles for surprises of -2 and -1 cent (-1 cent) are significantly larger in magnitude than mean CARs for surprises of +2 and +1 cents (+1 cent), respectively.[22] That is, ignoring the negative CAR to zero surprises (i.e., accepting the empirical validity of the neutral reaction assumption) predicted in hypothesis 1a and empirical results on different ZEROs by PPS reported in the previous section, then comparing returns to surprises of a similar magnitude on either side of zero leads to the conclusion that price responses are asymmetrically more negative for high MB (PE) firms for the negative earnings surprise. However, in untabulated results when I estimate (out of sample) the value of a surprise that generates a neutral response using the methods of interpolation and regression by MB quintile, I find that the absolute value of the difference in CARs between high MB and low MB

[22]Note Skinner and Sloan (2002) use a longer window abnormal return in order to capture the stock price reaction to pre-announced earnings announcements as Skinner (1994) and Soffer, Thiagarajan and Walther (2000) argue. Because the stock price reactions to longer window are likely to impound information other than earnings news, I use three-day earnings return as the primary measure of market reaction to earnings surprises. However, even when I use a set of observations from Briefing.com that are likely to be free of pre-announcement problem, a similar result is obtained.

firms around surprises in the neighborhood of 1 cent above and 1 cent below the interpolated value are not significantly different. A similar absence of significance is observed when PE is used to sort the observations. Thus, after controlling for the propensity for positive surprises in the ES distribution I find no support for the presence of a torpedo effect based on CAR tests in my sample.[23]

The remaining columns of panel B report evidence of near monotonicity in CARs but different *ZERO* points as a function of MB and PE rank. The evidence mirrors the results reported in panel A of table 4 for level of PPS.

5.2. Purported penalties to surprises that take on specific values

The usefulness of the rational expectations framework and its implications for tests of the information content of bright line surprises using comparisons of ERCs is perhaps best illustrated in the context of studies that claim to show that earnings surprises that take on specific values create asymmetric or discontinuous price responses. A recent example is Keung, Lin and Shih (2009) (KLS). The authors posit that investors have learned over time about managers' increasing tendency to bias earnings surprises through earnings or forecast manipulation. Relying on the learning hypothesis, they predict that earnings surprises in the interval [0, 1] cent will be increasingly "penalized" by the market over time. In essence, KLS draw a bright line on both sides of the earnings surprise. They compare ERCs for earnings surprises in the interval [0, 1] cent to ERCs for surprises in adjacent intervals also defined by a 1 cent range (i.e., the intervals [-1, 0) and (1, 2], etc) and find evidence that ERCs associated with surprises in the interval [0, 1]

[23]In untabulated results I find that ERCs are strongly increasing while intercepts are strongly decreasing in MB and PE for both scaled and unscaled ES, consistent with hypothesis 2 under the assumption that MB and PE proxy for the probability of a positive surprise.

are lower than surprises for both adjacent bins in the last of the three 5-year sub periods they examine but not in the first two. Based on these results, the authors conclude that the market has recently come to view an earnings surprise of exactly 0 or 1 cent as a red flag.

KLS base their prediction on a rational market, albeit one that is slow to learn. If this is so, then the predictions in H1a and H2 should both apply. KLS report abnormal returns to zero surprises are negative in each of the three sub periods they examine (see table 1 of KLS), consistent with the evidence presented in table 3 discussed in the previous section. In addition, they report abnormal returns to zero and one cent surprises become increasingly more negative in the last two sub periods. Although at first blush this results seems to be consistent with KLS's learning hypothesis, a closer examination of abnormal return patterns in adjacent surprises reveals that increasingly more negative abnormal returns for the last two sub periods are observed for most of earnings surprises ranging from less than -4 cents to 2 cents, which is inconsistent with KLS's hypothesis that zero and one cent are especially penalized by investors. Furthermore, they show that abnormal announcement returns are monotonically increasing in the sign and size of earnings surprises in every sub period, which is consistent with the results reported in panel A of table 4. That is to say, KLS find no evidence that the CARs for surprises in interval [0, 1] interrupt the usual pattern of monotonicity in bins that contain increasingly larger *ex post* surprises. Of course, it is possible for CARs to follow a monotonic pattern in *ex post* surprises while the ERCs associated with surprises in the interval [0, 1] are lower than those associated with adjacent bins.

I test the possibility of lower ERCs for surprises in the [0, 1] by running separate regressions of CAR on ES (scaled by price) for each level of surprises in the range of -2 to +2 cents for the last two 5-year sub periods examined by KLS. The key difference between my regression and KLS's is that I allow intercepts to vary by bin while they do not. In addition, I do not aggregate zero surprises with one cent surprises because there is no variation in the independent variable for zero surprises. Scaling by price is required because of the absence of variation in the independent variable in unscaled surprises.

The results of these regressions are shown in panel A of table 8. Unlike the results in KLS, slope coefficients (i.e., ERCs) are never significant for any level of surprise in either sub period once the intercepts are included. However, the y-intercept generally decreases for the second sub periods for most intervals. This is consistent with the presence of greater reporting bias in the second sub-period throughout a wide range of earning surprises, which was also indicated by the results in panel B of table 2 and table 3. That is, while not monotonically increasing over time larger negative reactions to small surprises were observed on average in these years. Thus, inconsistent with KLS's hypothesis, the market seems to penalize all small earnings surprises, not just surprises of zero or one cent. Furthermore, the penalty to these surprises appears through the average abnormal return, not through the ERC.[24]

Panel B of table 8 presents regressions similar to those presented in panel A but include the level of PPS as well as an interaction term between PPS and ES to test hypothesis 2. These regressions tests a joint hypothesis implied by the rational expectations framework. If investors penalize +1 cent earnings surprises by assigning lower ERCs because they are more likely to be biased than other surprises, and if the

[24]When I aggregate zero surprises with one cent surprises results indicate that the incremental response coefficient for the last period is not significantly different from the second period. However, consistent with the results shown in panel A of table 8, the y-intercept becomes increasingly more negative in the last period.

investors assess each firm's possibility of the bias, then the PPS coefficient should be positive while the PPS*ES coefficient should be negative in the second sub-period for +1 cent surprises. On the other hand, if investors penalize +1 cent earnings surprises by assigning low average returns instead of low ERCs, then the PPS coefficient should be negative while the PPS*ES coefficient should be positive in the second sub-period for +1 cent surprises. I find no evidence of an unusual penalty to +1 cent surprises in ERCs as the interaction terms for all intervals are insignificant. Furthermore, the PPS coefficient takes on mostly negative values for all intervals. These results indicate the penalty is applied to high PPS firms in all surprise bins, however the penalty is applied through the average stock return, in contrast to KLS's hypothesis. I conclude that the absence of significantly positive ERC interactions for most small surprises even in the presence of significantly negative intercepts is attributable to the lack of meaningful variation in the independent variables.

The evidence presented in table 8 suggests that tests for asymmetric price reactions that compare the incremental slopes of adjacent bins without also controlling for the propensity for a positive surprise and including incremental intercepts to capture the effect predicted by hypothesis 1a or 2 will have low power and can result in incorrect inferences. The argument is analogous to the discussion of potentially confounded inferences when abnormal returns on either side of a bright line are compared but generalized bias is present in all surprises.

5.3. The "Meet or Beat" literature

The notion that firms bias earnings or manage forecasts with the intent to "meet or beat" analysts' expectations (MBE) has gained greater credence with the growing number of academic studies that presume or attempt to test the empirical validity of the claim (Lopez and Rees 2002, Matsumoto 2002, Bartov *et al.* 2002, Kasznik and McNichols 2002, McVay, Nagar and Tang 2006, and Koh *et al.*2008). General acceptance of the claim has been furthered by repeated anecdotes in the popular press and highly publicized statements by policy makers concerned with what they term the "numbers game" (Levitt 1998). The increased attention to the MBE argument has, in turn, spawned a stream of work that seeks to develop models that predict the *ex ante* probability that a firm will report earnings with the specific intent of beating analysts' expectations. Barton and Simko (2002), Matsumoto (2002), Rees (2005) and Cheng (2006), for example, all employ variations of the logit model describe in the appendix to estimate the *ex ante* probability that a firm meets or beats expectations (PMBE).

However, the results in table 3 demonstrate zero earnings surprises generate, on average, negative stock responses while small positive surprises generally produce neutral or positive surprises. This evidence suggests the empirical definition of MBE, which contemplates homogeneity of the market response to "on-cutoff" (i.e., zero surprises) and "above-cutoff" (i.e., positive surprises) fails to account for the fact that the former observations produce stock price reactions that are fundamentally different from the latter. In addition, Barton and Simko (2002) show that the variables used to estimate the MBE point in logit models perform similarly when the cutoff point selected for the prediction model is changed in either directions of zero. A natural question to follow this evidence is whether the stock price reactions to earnings surprises are also similar when the probability of MBE is estimated using different cutoffs. The earlier findings presented in table 6 speak directly to this question. There I show that the ability of PPS to predict PTN and CAR for zero surprises when assumed cutoff points range from -3 to -1 cents in the identification of the logit model (i.e., cut off values that clearly fail the MBE criterion) is similar to that for an assumed cutoff of 0. Furthermore, when the cutoff point for beating expectations in the estimation of PMBE is an arbitrarily defined value in a narrow range around zero and the ratios of surprises that beat that arbitrary cutoff relative to those that miss it are calculated, the model performs similarly for all values of the arbitrary cutoff (results untabulated).

The preceding results suggest that models designed to predict the probability of meeting or beating the analysts' forecast that is deemed theoretically interesting perform equally well when the cutoff point changes. This implies a possibility that there is no special meaning to meeting/beating vs. missing the analysts' forecast.

6. Summary and conclusion

In this study I analyze the implications of a market that rationally anticipates the propensity for positive earnings surprises for testing hypotheses that predict asymmetric price reactions to surprises that meet or fail to meet certain thresholds. Consistent with extant theory, I find support for the predictions that abnormal returns to zero earnings surprises are negative and decreasing in the level of PPS and the surprise necessary to generate a neutral stock response for high quintile PPS firms is, on average, positive (empirical estimates range between 1 and 2 cents). Also consistent with prior theory, I find that ERCs and intercepts in regressions of abnormal announcement returns on earnings surprises are negatively associated. Moreover, firms with a greater *ex ante* propensity to generate positive surprises are linked to larger ERCs and more negative intercepts in these regressions. This suggests the likelihood of correlated omitted variable problems when variables that are hypothesized to be associated with asymmetric or discontinuous price reactions to bright line surprises are also correlated with the *ex ante* probability that a firm will generate a positive surprise (e.g., PE or MB).

It is important to reemphasize that my results do not refute the validity of hypotheses that involve deliberate actions by managers to generate positive surprises thorough earnings management or forecast management. Rather, they highlight the fact that if such hypotheses are empirically valid, then tests of market responses to earnings surprises that meet or fail to meet certain benchmarks can be improved if they account for the possibility that the market rationally anticipates these surprises in both the hypothesis development stage and in constructing the empirical design. In the absence of such refinements, empirical tests that implicitly adopt the neutral reaction hypothesis and/or partition surprises on their *ex post* realizations are likely to mechanically produce results that support the hypothesis of an asymmetric price reaction (alternatively, support a premise used in developing the original hypothesis rather than a prediction that follows from it).

My analysis of earnings surprises also has implications for tests of hypotheses that predict irrational or rational, but non-linear, responses to earnings surprises that meet or fail to meet bright lines. Such hypotheses do not identify a role for strategic behavior in producing documented asymmetries in various surprise distributions. While the exact answer to the cause of asymmetries in earnings surprise distributions remains something of a mystery, they are, nevertheless, an empirical fact. Therefore, to the extent that market pricing anticipates them, there is a violation of the assumption of a neutral reaction to zero surprises and thus inferences drawn from standard CAR and ERC tests will be confounded.

Table 1: Descriptive statistics

Panel A reports descriptive statistics for the main variables. Panel B presents the Spearman correlations of these variables below the diagonal and the Pearson correlations above the diagonal. *ES* is defined as IBES actual EPS minus the IBES consensus analysts' forecast where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. *PPS* measures the probability of a positive earnings surprise. *PPS* is estimated using 12-quarter rolling window logit regressions (see appendix for estimation procedure). *PE* is the price per share divided by the sum of four quarters EPS excluding extraordinary items as of the last quarter. *MB* is the market value of equity divided by the book value of equity as of the last quarter. *CAR* is calculated with buy-and-hold size-adjusted stock return during (-1, 1) days around earnings announcement. ** (*) indicates significance at 1% (5%) level, respectively.

Panel A. Descriptive statistics

	Mean	***Std***	***Skew***	***Max***	***95%***	***75%***	***Med***	***25%***	***5%***	***Min***
ES	-0.01	0.13	-2.12	0.39	0.14	0.03	0.01	-0.02	-0.20	-0.70
PPS	0.70	0.16	-0.93	1.00	0.90	0.82	0.74	0.61	0.38	0.00
PE	29.77	44.70	5.09	343.75	85.00	27.41	17.86	12.88	7.60	4.60
MB	3.27	3.55	3.60	24.45	9.32	3.61	2.18	1.44	0.79	0.44
CAR	0.18%	8.11%	2.40%	26.36%	13.88%	3.92%	0.10%	-3.55%	-13.37%	-25.63%

Panel B. Correlations

	ES	***PPS***	***PE***	***MB***	***CAR***
ES		0.26**	-0.02**	0.05**	0.19**
PPS	0.28**		0.03**	0.22**	0.04**
PE	-0.02**	0.15**		0.18**	-0.00
MB	0.07**	0.35**	0.41**		-0.01
CAR	0.28**	0.04**	0.00	-0.00	

Table 2: Positive-to-Negative earnings surprise ratios by PPS quintiles

Panel A reports the ratio of positive-to-negative earnings surprises, *PTN*, by the quintile ranks of *PPS*. Panel B reports the number of observations and the mean value of *PPS* for a small range of *ES* by the quintile rank of *PPS*. Panel C reports the regression results of *PTN* on *PPS* by quarter. Positive surprises are defined as surprises greater than or equal to 0.005, and negative surprises are defined as surprises less than or equal to -0.005. The ratio is calculated using non-zero surprises of an absolute magnitude of 2, 5, and 10 cents. *ES* is defined as IBES actual EPS minus the IBES consensus analysts' forecast where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. *PPS* is the probability of a positive earnings surprise. It is estimated using 12-quarter rolling window logit regression (see appendix for estimation procedure). The statistical significance of *PTN* relative to 1 is evaluated with a χ^2-test, and the statistical significance of the difference between the *PTNs* for the highest *PPS* quintile and for the lowest *PPS* quintile is evaluated with a z-test. ** (*) indicates significance at 1% (5%) level, respectively.

Panel A. PTN by the quintile ranks of PPS

	All obs	*PPS rank=1*	*PPS rank=2*	*PPS rank=3*	*PPS rank=4*	*PPS rank=5*	*PPS rank=(5-1)*
PTN (2 cents)	2.25**	1.07*	1.58**	2.14**	3.22**	5.09**	4.01**
PTN (5 cents)	2.27**	0.99	1.55**	2.26**	3.45**	5.91**	4.92**
PTN (10 cents)	2.17**	0.89**	1.48**	2.24**	3.53**	6.10**	5.21**

Panel B. Number of observations and mean PPS at small range of ES by the quintile rank of PPS

	Number of observations by ES				
PPS rank	*-2 cent*	*-1 cent*	*0 cent*	*1 cent*	*2 cent*
1	1,021	1,300	1,916	1,455	1,037
2	854	1,279	2,387	1,928	1,435
3	680	1,187	2,682	2,294	1,707
4	459	969	2,763	2,731	1,868
5	321	715	2,634	3,040	2,223
All	3,335	5,450	12,382	11,448	8,270

	Mean PPS by ES				
PPS rank	*-2 cent*	*-1 cent*	*0 cent*	*1 cent*	*2 cent*
1	44.4%	44.6%	45.0%	45.2%	45.2%
2	63.6%	63.6%	63.9%	63.9%	63.8%
3	73.7%	73.7%	73.9%	74.1%	74.0%
4	80.7%	80.9%	80.9%	81.0%	81.0%
5	87.5%	87.5%	88.0%	88.2%	88.3%
All	64.4%	67.5%	72.1%	74.1%	74.0%

(Table 2 continued)

Panel C. The relation between PTN and PPS

Model	*Intercept*	*PPS*	*Time*	*N*	*Adj R^2*
Predicted	(?)	(+)	(?)		
Model 1: $PTN = \beta_0 + \beta_2\ PPS$	-1.04*	3.81**		52	40.39%
	(2.33)	5.96			
Model 2: $PTN = \beta_0 + \beta_1\ Time + \beta_2\ PPS$	-1.86**	5.40**	-0.04**	52	65.84%
	(5.14)	9.86	(6.18)		

Table 3: Abnormal return around earnings announcement for zero earnings surprise

Panel A reports the mean and the median values of the probability of a positive surprise, *PPS*, and the 3-day size-adjusted return around earnings announcement (*CAR*) at zero surprise by year. Panel B reports the mean and the median values of *PPS* and *CAR* at zero surprise by the quintile ranks of *PPS*. *PPS* measures the probability of a positive earnings surprise (see appendix for estimation procedure). *CAR* is calculated with buy-and-hold size-adjusted stock return during (-1, 1) days around earnings announcement. The statistical significance of the mean values and the differences in the mean values with respect to 50% for *PPS* and 0 for *CAR* are evaluated with a t-test. The statistical significance of the median values and differences in the median values are evaluated with a sign test and Wilcoxon-Mann-Whitney test, respectively. ** (*) indicates significance at 1% (5%) level, respectively.

Panel A. Mean and median values of PPS and CAR for zero earnings surprises by year

		Mean		Median	
Fiscal year	*N*	*PPS*	*CAR*	*PPS*	*CAR*
1996	600	64.9%**	-0.15%	69.5%**	-0.20%
1997	708	67.7%**	-0.04%	72.2%**	-0.16%
1998	801	66.7%**	-0.53%	70.6%**	-0.59%**
1999	668	70.5%**	-0.89%**	74.0%**	-1.25%**
2000	691	70.9%**	-0.78%*	74.3%**	-0.41%
2001	1,034	69.2%**	-1.06%**	72.6%**	-0.80%**
2002	1,182	74.1%**	-1.47%**	77.2%**	-0.71%**
2003	1,179	76.8%**	-1.28%**	80.0%**	-0.89%**
2004	1,107	78.3%**	-1.43%**	81.4%**	-0.78%**
2005	908	76.9%**	-1.52%**	80.0%**	-1.07%**
2006	835	74.4%**	-1.62%**	78.0%**	-1.49%**
2007	876	70.9%**	-1.36%**	73.8%**	-1.09%**
2008	612	67.5%**	-0.84%*	70.1%**	-0.55%
All obs	11,201	72.1%**	-1.07%**	75.6%**	-0.75%**

Panel B. Mean and median values of PPS and CAR for zero earnings surprises by PPS quintiles

	Mean							
	1996-1999		2000-2004		2005-2008		All periods	
PPS rank	*PPS*	*CAR*	*PPS*	*CAR*	*PPS*	*CAR*	*PPS*	*CAR*
1	43.7%**	0.30%	46.2%**	-0.13%	46.0%**	-0.13%	45.0%**	0.07%
2	64.0%**	-0.43%	63.7%**	-0.87%**	64.0%**	-1.37%**	63.9%**	-0.89%**
3	73.7%**	-0.53%*	74.0%**	-1.01%**	73.9%**	-1.14%**	73.9%**	-0.89%**
4	80.7%**	-0.95%**	81.0%**	-1.71%**	81.0%**	-1.65%**	80.9%**	-1.47%**
5	87.6%**	-1.18%**	88.1%**	-1.99%**	88.0%**	-2.10%**	88.0%**	-1.87%**
(5-1)	43.9%**	-1.48%**	41.9%**	-1.86%**	42.0%**	-1.97%**	43.0%**	-1.94%**

	Median							
	1996-1999		2000-2004		2005-2008		All periods	
PPS rank	*PPS*	*CAR*	*PPS*	*CAR*	*PPS*	*CAR*	*PPS*	*CAR*
1	45.7%**	-0.24%	48.3%**	-0.25%	48.3%**	-0.25%	47.2%**	-0.25%
2	64.4%**	-0.32%	63.9%**	-0.53%*	64.5%**	-0.93%**	64.2%**	-0.60%**
3	73.8%**	-0.41%*	74.1%**	-0.43%	73.8%**	-0.91%**	73.9%**	-0.52%**
4	80.6%**	-0.60%**	80.9%**	-1.09%**	81.1%**	-1.33%**	80.9%**	-0.98%**
5	86.9%**	-0.56%	87.8%**	-1.18%**	87.5%**	-1.87%**	87.5%**	-1.22%**
(5-1)	41.2%*	-0.31%*	39.5%**	-0.93%**	39.2%**	-1.62%**	40.3%**	-0.97%**

Table 4: Finding *ZERO*

Panel A reports the mean size-adjusted returns (*CAR*) to small earnings surprises by the quintile ranks of *PPS*. Panel B reports the level of earnings surprise that corresponds to a neutral stock price reaction, *ZERO*, by year. Panel C reports the value of *ZERO* by the quintile ranks of *PPS*. *ZERO* is estimated using two methods: interpolation and regression. The interpolation method entails connecting the two adjacent earnings surprises, mean size-adjusted, one of which is associated with a positive value of mean size-adjusted return and the other of which is associated with a negative value of mean size-adjusted return. Denoting the earnings surprise axis as the x-axis and the stock return axis as y-axis, the point where the interpolated line crosses x-axis is deemed the value of *ZERO*. The regression method calculates *ZERO* by estimating the x-intercept from a linear regression of return on unscaled earnings surprise of less than or equal to two cents in magnitude. In panel C, the sample period (1996-2008) is divided into three sub-periods: 1996-1999, 2000-2004, and 2005-2008. The statistical significance of *ZERO* is assessed through a bootstrapping technique. The bootstrapping methodology proceeds by first randomly selecting (with replacement) the same number of observations contained in the original sample and calculating *ZERO*. The process is repeated one thousand times to obtain the distribution of *ZERO*. Confidence intervals can be obtained from the *ZERO* distribution. *CAR* is calculated with buy-and-hold size-adjusted stock return during (-1, 1) days around earnings announcement. *PPS* is the probability of meeting or beating the consensus analysts' forecast calculated from the logit regression. ** (*) indicates significance at 1% (5%) level, respectively.

Panel A. Mean CAR at small earnings surprises

		PPS quintile ranks					
ES	***All obs***	***1***	***2***	***3***	***4***	***5***	***(5-1)***
-10	-4.14%**	-3.66%**	-2.53%**	-5.56%**	-6.41%**	-6.19%**	-2.53%
-9	-3.81%**	-1.69%**	-5.01%**	-6.20%**	-5.74%**	-3.85%**	-2.16%
-8	-3.52%**	-2.44%**	-3.97%**	-3.88%**	-6.40%**	-1.85%	0.59%
-7	-3.71%**	-2.98%**	-2.74%**	-5.12%**	-5.88%**	-4.05%**	-1.08%
-6	-3.13%**	-2.72%**	-2.65%**	-3.76%**	-4.68%**	-3.46%**	-0.74%
-5	-3.10%**	-2.22%**	-3.02%**	-3.08%**	-4.24%**	-5.60%**	-3.38%**
-4	-3.28%**	-2.57%**	-2.99%**	-3.31%**	-3.87%**	-5.69%**	-3.12%**
-3	-3.27%**	-2.12%**	-3.21%**	-3.78%**	-4.60%**	-4.47%**	-2.35%**
-2	-2.40%**	-1.57%**	-1.36%**	-3.04%**	-3.52%**	-4.85%**	-3.28%**
-1	-2.01%**	-0.70%**	-1.68%**	-2.10%**	-3.26%**	-3.22%**	-2.52%**
0	-1.07%**	0.07%	-0.89%**	-0.89%**	-1.47%**	-1.87%**	-1.94%**
1	0.32%**	1.35%**	0.66%**	0.32%	0.14%	-0.25%	-1.60%**
2	1.60%**	2.19%**	1.91%**	1.56%**	1.59%**	1.16%**	-1.02%**
3	2.19%**	1.99%**	2.38%**	2.32%**	2.10%**	2.15%**	0.16%
4	2.81%**	2.92%**	3.04%**	2.67%**	2.62%**	2.88%**	-0.04%
5	3.24%**	3.04%**	3.99%**	2.87%**	3.18%**	3.17%**	0.14%
6	3.06%**	3.09%**	3.42%**	3.10%**	3.19%**	2.68%**	-0.42%
7	3.61%**	3.09%**	3.87%**	3.90%**	3.99%**	3.06%**	-0.03%
8	3.33%**	3.46%**	3.82%**	3.34%**	2.47%**	3.75%**	0.29%
9	3.44%**	3.09%**	3.62%**	3.60%**	3.54%**	3.24%**	0.15%
10	3.90%**	6.81%**	3.26%**	3.53%**	3.20%**	3.77%**	-3.05%

(Table 4 continued)

Panel B. ZERO by year

Fiscal year	*Interpolation*	*Regression*	*N*	*Adj R^2*
1996	0.15	0.07	7,025	1.70%
1997	0.17	-0.06	8,434	1.66%
1998	0.20	0.04	8,490	1.10%
1999	0.36**	0.26*	7,558	1.36%
2000	0.28	0.07	5,485	0.86%
2001	0.73**	0.63**	5,912	1.20%
2002	0.66**	0.78**	6,231	1.50%
2003	0.74**	0.64**	6,356	2.36%
2004	0.72**	0.77**	6,378	2.54%
2005	0.86**	0.94**	5,930	3.19%
2006	1.10**	1.06**	5,507	2.89%
2007	0.68**	0.66**	5,432	4.30%
2008	0.39	0.44**	3,893	2.94%
All	0.54**	0.49**	82,631	1.91%

Panel C. ZERO by PPS

Estimated through interpolation						
			PPS quintiles			
Period	***1***	***2***	***3***	***4***	***5***	***(5-1)***
1996-1999	-0.44	0.34	0.34*	0.87**	1.48	1.92
2000-2004	0.09	0.53**	0.86**	0.87**	1.01**	0.92*
2005-2008	0.17	0.77**	1.13**	1.00**	1.14**	0.96*
All	-0.09	0.57**	0.74**	0.92**	1.18**	1.27**

Estimated through regression						
			PPS quintiles			
Period	***1***	***2***	***3***	***4***	***5***	***(5-1)***
1996-1999	-0.58	-0.02	0.31*	0.66**	1.44*	2.02**
2000-2004	-0.10	0.32	0.78**	0.98**	1.17**	1.26**
2005-2008	-0.04	0.71**	1.05**	1.10**	1.19**	1.22**
All	-0.26	0.42**	0.72**	0.95**	1.20**	1.46**

Table 5: The relation between the y-intercept and slope in a regression of CAR on earnings surprise

Panel A reports the relation between the y-intercept and *ERC* obtained from quarterly regression of Model 1, which is regression of *CAR* on *ES*. Panel B reports the y-intercept and *ERC* by the quintile ranks of *PPS* from pooled and yearly regressions of Model 1. Panel C reports the y-intercept, *ERC*, incremental y-intercept and incremental *ERC* by *PPS* from pooled, yearly, and quarterly regressions of Model 2. For the regressions in this table, *ES* observations are limited to a range of -2 to +2 cents. Results are presented for unscaled *ES*. Panel A reports the relation between the y-intercept and ERC through regression and correlation (*S*: Spearnman, *P*: Pearson). Panel B and C reports Fama-Macbeth coefficients and t-statistics with the average number of observations and the average adjusted R^2 for each yearly regression. Neg/All (Pos/All) is the ratio of the number of negative (positive) coefficients to the number of all coefficients. *CAR* is defined as buy-and-hold size-adjusted stock return during (-1, 1) days around earnings announcement. *ES* is defined as actual EPS minus the consensus analysts' forecast where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. *PPS* is the probability of a positive earnings surprise, estimated using a 12-quarter rolling window logit regression (see appendix for estimation procedure). ** (*) indicates significance at 1% (5%) level, respectively.

Panel A. Relation between Y-intercept and ERC

Model	***Intercept***	***ES***	***N***	***Adj R^2***
Predicted	(-)	(+)		
Model 1 (Pooled regression): $CAR = \alpha_0 + \beta_0 ES$	-0.0044**	0.90**	82,631	1.91%
	(15.77)	40.08		
Model 1 (Yearly regression): $CAR = \alpha_0 + \beta_0 ES$	-0.0046**	0.89**	1,589	2.10%
	(6.73)	23.69		
Model 1 (Quarterly regression): $CAR = \alpha_0 + \beta_0 ES$	-0.0047**	0.91**	6,356	2.12%
	(4.68)	18.45		

Model	β_0	***N***	***Adj R^2***	***Corr*** (α_0, β_0)
Predicted	(-)			
Model 1' (Using coefficients from Model 1): $\alpha_0 = \gamma \beta_0$	-0.01**	52	55.47%	-0.40** S
	(8.11)			-0.45** P

(Table 5 continued)

Panel B. Y-intercept and ERC by the quintile ranks of PPS

Model	***PPS rank***	***Intercept***	***ES***	***N***	***Adj R^2***
Model 1 (Pooled regression): $CAR = \alpha_0 + \beta_0 ES$	*1*	0.0025*	0.96**	6,090	2.20%
		2.40	11.75		
	2	-0.0041**	0.97**	7,140	2.17%
		(4.22)	12.61		
	3	-0.0085**	1.18**	7,670	3.08%
		(9.17)	15.63		
	4	-0.0139**	1.46**	7,920	3.85%
		(13.89)	17.83		
	5	-0.0181**	1.50**	7,903	3.92%
		(17.36)	17.99		
	(5-1)	-0.0206**	0.54**		
		(14.00)	4.63		

		Average values from the yearly regressions			
Model	***PPS rank***	***Intercept***	***ES***	***N***	***Adj R^2***
Model 1 (Yearly regression): $CAR = \alpha_0 + \beta_0 ES$	*1*	0.0026	0.94**	468	2.10%
		0.66	3.17		
	2	-0.0034	0.94**	549	2.17%
		(0.96)	3.44		
	3	-0.0079*	1.17**	590	3.10%
		(2.45)	4.37		
	4	-0.0128**	1.44**	609	3.83%
		(3.70)	4.92		
	5	-0.0159**	1.28**	608	3.28%
		(4.33)	4.51		
	(5-1)	-0.0184**	0.34*		
		(8.12)	1.99		

(Table 5 continued)

Panel C. Incremental Y-intercept and ERC by PPS

Model	*Intercept*	*ES*	*PPS*	*PPS*ES*	*N*	*Adj R^2*
Predicted	(?)	(?)	(-)	(+)		
Model 2: (Pooled) $CAR = \alpha_0 + \beta_0 ES + \alpha_1 PPS + \beta_1 PPS*ES$	0.0216**	0.42**	-0.04**	1.12**	36,723	3.20%
	10.55	2.59	(14.91)	4.94		
Model 2: (Yearly) $CAR = \alpha_0 + \beta_0 ES + \alpha_1 PPS + \beta_1 PPS*ES$	0.0200**	0.41*	-0.04**	1.02**	2,825	3.19%
	6.46	2.08	(8.94)	3.60		
		(Neg/All)	(13/13)	(11/13)	*(Pos/All)*	

Table 6: Robustness test

The table presents the ratios of positive-to-negative earnings surprises, *PTN*, and the mean 3-day size-adjusted return around earnings announcement, *CAR*, for zero surprises by the quintile ranks of *PPS*. Positive surprises are defined as surprises greater than or equal to 0.005, and negative surprises are defined as surprises less than or equal to -0.005. The ratio is calculated using non-zero surprises of an absolute magnitude of 2 cents. *PPS* is the probability of a positive earnings surprise. It is estimated using 12-quarter rolling window logit regression (see appendix for estimation procedure). *PPSm3*, *PPSm2*, *PPSm1* are the probabilities of an earnings surprise greater than or equal to -3 cents, -2 cents and -1 cent, respectively. *PPSp3*, *PPSp2*, and *PPSp1* are the probabilities of an earnings surprise greater than or equal to 3 cents, 2 cents and 1 cent, respectively. The statistical significance of *PTN* relative to 1 is evaluated with a χ^2-test, and the statistical significance of the difference between the *PTNs* for the highest *PPS* quintile and for the lowest *PPS* quintile is evaluated with a z-test. *CAR* is calculated with buy-and-hold size-adjusted stock return during (-1, 1) days around earnings announcement. *ES* is defined as actual EPS minus the consensus analysts' forecast where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. ** (*) indicates significance at 1% (5%) level, respectively.

	PPSm3		*PPSm2*		*PPSm1*		*PPS*		*PPSp1*		*PPSp2*		*PPSp3*	
PPS ranks	***PTN***	***CAR***	***PTN***	***CAR***	***PTN***	***CAR***	***PTN***	***CAR***	***PTN***	***CAR***	***PTN***	***CAR***	***PTN***	***CAR***
1	0.93**	0.05%	0.91**	0.06%	0.90**	0.05%	0.89**	0.07%	0.92**	-0.10%	1.00	-0.13%	1.10**	-0.28%
2	1.46**	-0.80%**	1.46**	-0.82%**	1.46**	-0.81%**	1.48**	-0.89%**	1.52**	-0.81%**	1.64**	-0.93%**	1.74**	-1.14%**
3	2.22**	-0.92%**	2.23**	-0.92%**	2.26**	-0.96%**	2.24**	-0.89%**	2.31**	-1.15%**	2.49**	-1.39%**	2.62**	-1.39%**
4	3.47**	-1.51%**	3.50**	-1.50%**	3.50**	-1.44%**	3.53**	-1.47%**	3.59**	-1.31%**	3.42**	-1.33%**	3.13**	-1.22%**
5	5.88**	-1.81%**	6.00**	-1.81%**	6.05**	-1.83%**	6.10**	-1.87%**	5.24**	-2.01%**	4.10**	-1.72%**	3.48**	-1.49%**
(5-1)	4.95**	-1.85%**	5.08**	-1.87%**	5.15**	-1.89%**	5.21**	-1.94%**	4.32**	-1.91%**	3.10**	-1.59%**	2.39**	-1.21%**

Table 7: The relation between the probability of a positive surprise and market-to-book or price-to-earnings ratios

Panel A reports the positive-to-negative earnings surprise ratios, *PTN*, and the mean values of the probability of a positive surprise, *PPS*, and the 3-day size-adjusted return around earnings announcement (*CAR*) at zero surprise by the quintile ranks of market-to-book (*MB*) or price-to-earnings (*PE*) ratio. Panel B reports the mean size-adjusted returns for small earnings surprises by the quintile ranks of *MB* and *PE*. The statistical significances of the mean values and the differences in the mean values with respect to 50% for *PPS* and 0 for *CAR* are evaluated with t-test. The statistical significance of the median values and the differences in median values are evaluated with sign tests and Wilcoxon-Mann-Whitney tests, respectively. The statistical significance of *PTN* relative to 1 is evaluated with a χ^2-test, and the statistical significance of the difference between the *PTN* for the highest *PPS* quintile and for the lowest *PPS* quintile is evaluated with a z-test. *MB* is the market value of equity divided by the book value of equity as of the last quarter. *PE* is the price per share divided by the sum of four quarters EPS excluding extraordinary items as of the last quarter. *PTN* is calculated using non-zero surprises of an absolute magnitude of 2 cents. *PPS* measures the probability of a positive earnings surprise (see appendix for estimation procedure). *CAR* is calculated with buy-and-hold size-adjusted stock return during (-1, 1) days around earnings announcement. *ES* is defined as actual EPS minus the consensus analysts' forecast where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. ** (*) indicates significance at 1% (5%) level, respectively.

Panel A. PPS, PTN, and CAR at zero ES by the quintile ranks of MB or PE

		MB ranks			***PE ranks***	
Ranks	***PPS***	***PTN***	***CAR***	***PPS***	***PTN***	***CAR***
1	63.0%**	1.52**	0.15%	66.6%**	1.70**	-0.13%
2	67.9%**	1.61**	-0.22%*	70.7%**	1.78**	-0.05%
3	70.3%**	1.79**	-0.22%*	73.2%**	1.89**	-0.30%**
4	73.8%**	2.09**	-0.74%**	75.1%**	2.21**	-0.51%**
5	77.2%**	2.54**	-1.18%**	75.2%**	2.29**	-0.80%**
(5-1)	14.2%**	1.02**	-1.33%**	8.6%**	0.60**	-0.67%**

(Table 7 continued)

Panel B. Mean CAR at small ES's by the quintile ranks of MB and PE

	MB rank						*PE rank*					
ES	***1***	***2***	***3***	***4***	***5***	***(5-1)***	***1***	***2***	***3***	***4***	***5***	***(5-1)***
-3	-1.50%**	-1.87%**	-2.08%**	-2.88%**	-2.96%**	-1.46%**	-1.73%**	-1.99%**	-2.24%**	-2.28%**	-2.70%**	-0.97%**
-2	-1.31%**	-1.20%**	-1.45%**	-1.81%**	-3.03%**	-1.73%**	-1.21%**	-1.10%**	-1.71%**	-1.75%**	-1.94%**	-0.73%*
-1	-0.43%**	-0.60%**	-1.10%**	-1.78%**	-2.28%**	-1.85%**	-0.75%**	-0.85%**	-1.09%**	-1.51%**	-1.88%**	-1.13%**
0	0.15%	-0.22%*	-0.22%*	-0.74%**	-1.18%**	-1.33%**	-0.13%	-0.05%	-0.30%**	-0.51%**	-0.80%**	-0.67%**
1	0.77%**	0.81%**	0.70%**	0.42%**	0.11%	-0.66%**	0.48%**	0.57%**	0.58%**	0.73%**	0.53%**	0.05%
2	1.57%**	1.20%**	1.36%**	1.60%**	1.53%**	-0.04%	1.11%**	1.14%**	1.46%**	1.83%**	2.01%**	0.90%**
3	2.14%**	1.85%**	2.04%**	2.11%**	2.25%**	0.11%	1.69%**	1.79%**	2.04%**	2.52%**	2.44%**	0.75%**

Table 8: Earnings response coefficients for given levels of surprise

Panel A reports results from the regressions of *CAR* on scaled *ES* for unscaled earnings surprises of -2,-1, +1 and +2 cents, respectively. Panel B reports results from the regressions of *CAR* on scaled *ES*, *PPS*, and *PPS**scaled ES* for unscaled earnings surprises of -2,-1, +1 and +2 cents, respectively. *CAR* is defined as buy-and-hold size-adjusted stock return during (-1, 1) days around earnings announcement. *ES* is defined as actual EPS minus the consensus analysts' forecast where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. Scaled *ES* is calculated by dividing unscaled *ES* by stock price at the end of the fiscal quarter. *PPS* measures the probability of a positive earnings surprise (see appendix for estimation procedure). ** (*) indicates significance at 1% (5%) level.

Panel A. Regression of CAR on scaled ES for intervals defined in KLS

Model: CAR = $\alpha + \beta$ ES/price

Interval	*Year*	*Intercept*	*ES/price*	*N*	R^2
ES=-2 cent	*1997-2002*	-0.0108**	0.88**	2,817	0.30%
		(6.31)	3.06		
	2003-2007	-0.0212**	0.09	2,699	-0.03%
		(13.71)	0.34		
ES=-1 cent	*1997-2002*	-0.0092**	0.15	4,556	-0.02%
		(6.85)	0.26		
	2003-2007	-0.0172**	0.91*	4,341	0.10%
		(13.83)	2.28		
ES=1 cent	*1997-2002*	0.0064**	0.17	10,006	-0.01%
		6.98	0.33		
	2003-2007	0.0021*	0.40	8,212	0.00%
		2.43	1.13		
ES=2 cent	*1997-2002*	0.0163**	-0.41	6,687	0.01%
		14.15	(1.30)		
	2003-2007	0.0130**	-0.42	6,183	0.02%
		12.38	(1.59)		

(Table 8 continued)

Panel B. Regression of CAR on scaled ES, PPS, and PPS*scaled ES for intervals defined in KLS

Model: CAR = $\alpha_0 + \alpha_1 PPS + \beta_0 ES/price + \beta_1 PPS*ES/price$

Interval	***period***	***Intercept***	***PPS***	***ES/price***	***PPS*ES/price***	***N***	***R^2***
ES=-2 cent	*1997-2002*	0.0027	-0.0172	2.38**	2.13	856	1.83%
		0.25	(1.02)	3.64	0.66		
	2003-2007	0.0374**	-0.0870**	-1.31	4.39	1,341	2.92%
		3.18	(5.17)	(0.68)	1.25		
ES=-1 cent	*1997-2002*	0.0186*	-0.0477**	5.00	-8.17	1,501	0.58%
		2.01	(3.37)	1.64	(1.17)		
	2003-2007	0.0498**	-0.0988**	7.23*	-7.04	2,252	2.31%
		4.78	(7.13)	2.26	(1.66)		
ES=1 cent	*1997-2002*	0.0250**	-0.0282**	8.97*	-13.79	3,344	0.73%
		3.18	(2.63)	2.41	(1.88)		
	2003-2007	0.0216**	-0.0262**	2.37	-2.84	4,975	0.24%
		2.88	(2.74)	0.96	(0.70)		
ES=2 cent	*1997-2002*	0.0267**	-0.0155	-0.37	2.26	2,219	0.05%
		2.93	(1.25)	(0.23)	0.75		
	2003-2007	0.0280**	-0.0178	-1.32	2.20	3,728	-0.01%
		3.03	(1.51)	(0.61)	0.70		

Figure 1: The ratio of positive-to-negative earnings surprises over time

The figure shows the ratio of positive-to-negative earnings surprises ratio (*PTN*) over time. *PTN* ratios are calculated for analysts' forecast-based surprise, *ES* defined as IBES actual EPS minus the IBES consensus analysts' forecast of EPS, where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. A surprise is deemed positive when it is greater than or equal to 0.005, and negative when it is less than or equal to -0.005. *PTNs* are calculated for samples restricting the absolute values of *ES* to be within 2 cents, 5 cents, and 10 cents.

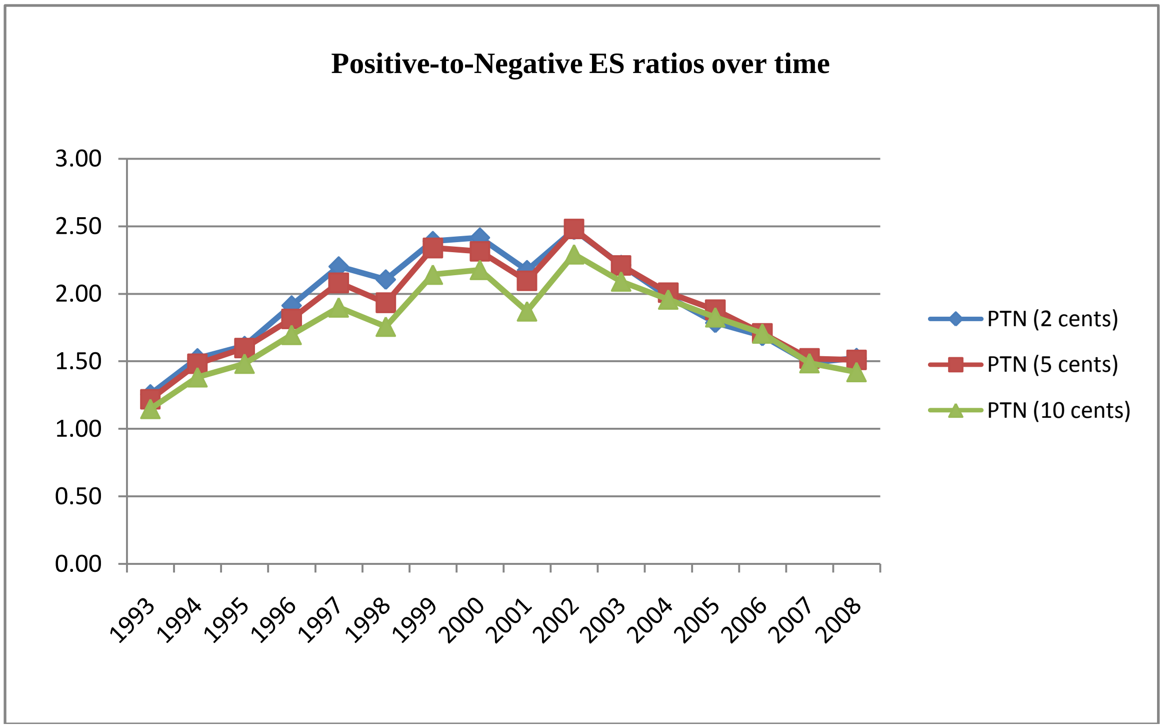


Figure 2: Firm's potential reporting choices

The following figure shows the manager's reporting choice after observing the true earnings. The manager can either disclose true earnings or true earnings plus a bias. For example when θ is the realized true earnings, the firm manager can report either θ or $\theta + \bar{s}$

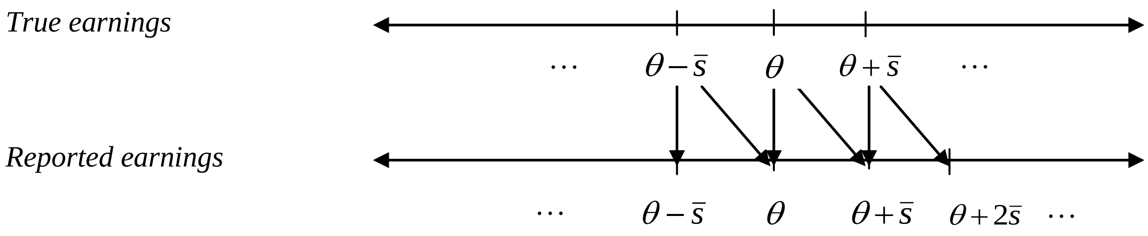
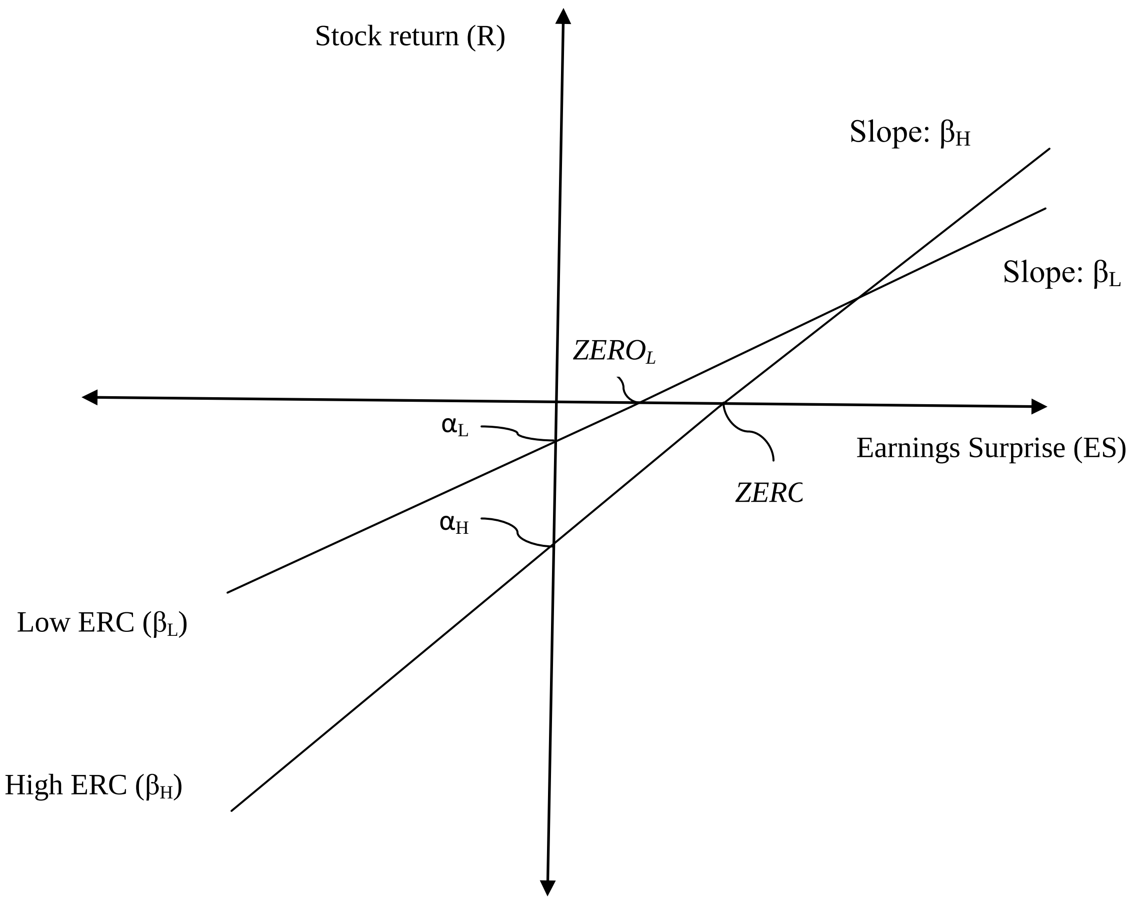


Figure 3: Graphical summary of Empirical Hypotheses

The following figure summarizes the empirical hypotheses. *R* is the stock return around earnings announcement. *ES* is earnings surprise defined as actual earnings minus the analysts' forecast. α is the y-intercept and β is the earnings response coefficient of the return vs. earnings surprise regression. The subscript *H* and *L* stands for the High probability of positive earnings surprise and Low probability of positive earnings surprises, respectively. *ZERO* is the level of earnings surprise that corresponds to the neutral stock price reaction.



Hypothesis 1a: $\alpha_H < \alpha_L < 0$

Hypothesis 1b: $0 < ZERO_L < ZERO_H$

Hypothesis 2: if $\beta_H > \beta_L$ then {Prob(ES_H>0) > Prob(ES_L>0)} and $\alpha_H < \alpha_L$

Figure 4: The ratio of positive-to-negative earnings surprises by PPS

The figure reports the ratio of positive-to-negative earnings surprises, *PTN*, by the probability of a positive surprise, *PPS*, over time. *PTN* ratios are calculated for analysts' forecast-based surprise, *ES*, defined as IBES actual EPS minus the IBES consensus analysts' forecast of EPS, where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. A surprise is deemed positive when it is greater than or equal to 0.005, and negative when it is less than or equal to -0.005. *PTN* measures are calculated by restricting the earnings surprise to be non-zero and of an absolute value within 10 cents. *PPS* is estimated using 12-quarter rolling window logit regressions (see appendix for estimation procedure). *PPS* level is high when the *PPS* quintile rank is 5, *PPS* level is low when the *PPS* quintile rank is 1, and *PPS* level is middle otherwise.

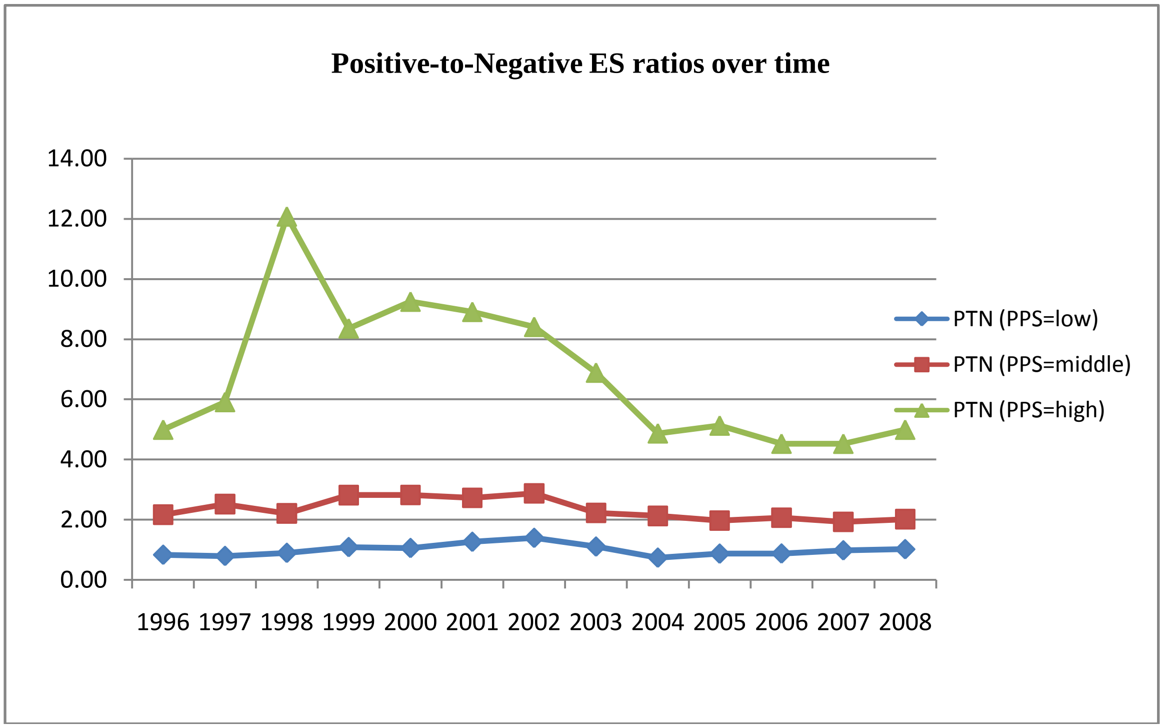
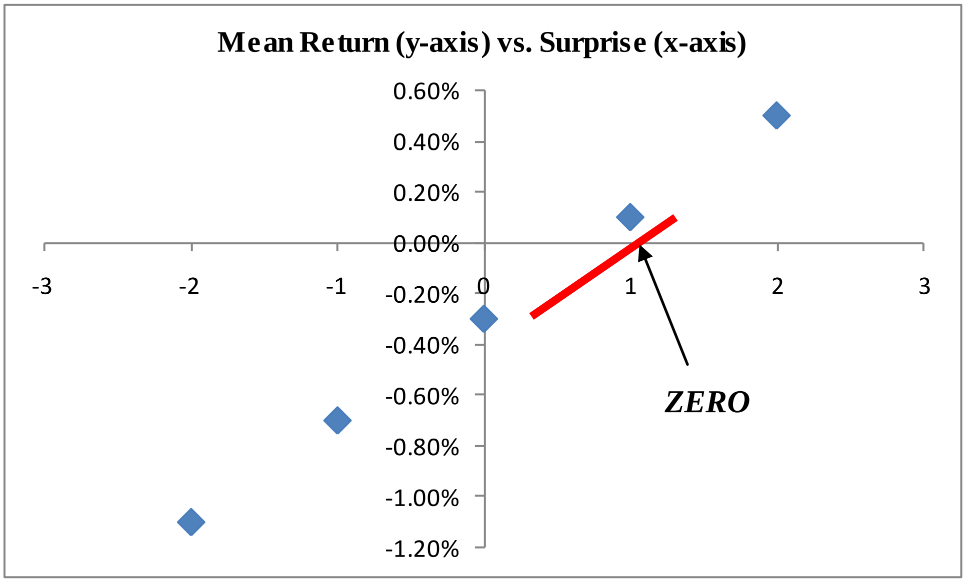


Figure 5: Finding *ZERO* through interpolation

The following figure summarizes the interpolation method in table 4. First, mean size-adjusted returns at small surprise levels are calculated (-3 to +3 cents). Second, two adjacent points are selected, one below the earnings surprise axis and the other above it. *ZERO* is the point at which the connecting line intersects the earnings surprise axis.



Appendix 1
Equilibrium and Comparative Statics

The equilibrium cutoff of earnings management cost for reporting biased surprises

The value of the firm conditional on the earnings report is:

$$V(r_i = \theta_0 + s_i) = \beta \cdot E[\theta_i \mid r_i = \theta_0 + s_i] \quad \text{(A1)}$$

The manager will inflate earnings if:

$$\hat{V}(r_i = \theta_i + \bar{s}) - c_i \bar{s}^2 \geq \hat{V}(r_i = \theta_i) \quad \text{(A2)}$$

Invoking the first rational-expectation condition (i.e., the manager's conjecture on the market pricing function should equal the actual market pricing function: $\hat{V}(\cdot) = V(\cdot)$), I substitute for $\hat{V}(\cdot)$ in (1):

$$\beta(\theta_i + \bar{s}) - \hat{p}\beta\,\bar{s} - c_i \bar{s}^2 \geq \beta\theta_i - \hat{p}\beta\,\bar{s} \quad \text{(A3a)}$$

or $$c_i \leq \frac{\beta}{\bar{s}} \quad \text{(A3b)}$$

Next, invoking the second rational-expectation condition (i.e., investors' conjecture that the manager reports $s_i = (\theta_i - \theta_0) + \bar{s}$ if and only if $c_i < \hat{\tau}$ otherwise the manager reports $s_i = (\theta_i - \theta_0)$ should be identical to what manager actually does),

$$\hat{\tau} = \tau = \frac{\beta}{\bar{s}} \quad \text{(A4)}$$

Comparative statics

Define the stock price reaction conditional on disclosure r_i as $R = V(r_i) - V_0$, where $V_0 = \beta\theta_0$. The probability of surprise management is $p \equiv prob(c_i < \tau) = F(\tau = \frac{\beta}{\bar{s}}) = \frac{\beta / \bar{s} - a}{b - a}$ where $F(.)$ is the CDF of c_i. Therefore, $R = \beta s_i - \beta p\bar{s}$ where the earnings multiple β is also the earnings response coefficient of return on surprise regression. Also let $\alpha = R$ when $s_i = 0$ then α is the y-intercept of a regression of returns on surprises. The following comparative statics apply:

(i) $\frac{dp}{d\beta} = \frac{1}{\bar{s}(b-a)} > 0$.

(ii) If $s_i = 0$, then $R = \alpha = -\beta p\bar{s} < 0$

(iii) If $s_i = 0$, then $\frac{dR}{dp} = \frac{d\alpha}{dp} = -p\bar{s}\frac{d\beta}{dp} - \beta\bar{s} < 0$,

and $\frac{dR}{d\beta} = \frac{d\alpha}{d\beta} = -p\bar{s} - \beta\bar{s}\frac{dp}{d\beta} < 0$

$$\left(\because \frac{dp}{d\beta} > 0\right)$$

(iv) The earnings surprise necessary to generate $R = 0$ is $s_i^0 = p\bar{s} > 0$

(v) $\frac{ds_i^0}{dp} = \bar{s} > 0$ and $\frac{ds_i^0}{d\beta} = \bar{s}\frac{dp}{d\beta} > 0$

$$\left(\because \frac{dp}{d\beta} > 0\right)$$

Appendix 2
The Probability of a Positive Surprise

I construct the probability of positive surprise, PPS, by running a logit regression presented below in a twelve-quarter rolling window, which is adapted from Barton and Simko (2002).[25] The out-of-sample coefficients are then applied to in-sample values of input variables to obtain the PPS.

$$Pr(ES \geq 0)/Pr(ES<0) = exp(\beta_0 + \beta_1 NOA + \beta_2 SHARES + \beta_3 BIG5 + \beta_4 PB \\ + \beta_5 LTGN\_RISK + \beta_6 ANALYSTS + \beta_7 PREV\_MB + \beta_8 CV\_FORECAST \\ + \beta_9 DOWN\_REV + \beta_{10} SALES\_GRW + \beta_{11} ROE + \beta_{12} \Delta ROE + \beta_{13} MKT\_CAP$$

ES is defined as the actual EPS minus the median consensus analysts' forecast issued within one month prior to the earnings announcement. ES sometimes entails more than two decimals. In these cases, I treat ES≥0 if ES>-0.005. Following Barton and Simko I use thirteen independent variables for the logit regression: net operating assets at the end of prior quarter (NOA), weighted average number of common shares outstanding during the current quarter (SHARES), an indicator variable coded one if the firm has a Big 5 auditor in current quarter (BIG5), market-to-book ratio as of the end of last quarter (PB), an indicator variable coded one for high litigation risk industries such as pharmaceuticals/biotechnology, computers, electronics and retail (LTGN_RISK), number of analysts in the most recent consensus EPS forecast (ANALYSTS), an indicator variable coded one for a nonnegative ES in last quarter (PREV_MB), coefficient of variation in analysts' most recent EPS forecast (CV_FORECAST), an indicator variable coded one if at least one of the firm analysts revised his forecast down during the current quarter (DOWN_REV), sales for last quarter divided by the sales for four quarters prior to last quarter (SALES_GRW), net income divided by shareholder's equity at the end of

[25] I estimate the logit regression using twelve-quarter rolling window following the technique in Cheng (2006).

last quarter (ROE), the change in ROE from two quarters before to last quarter (ΔROE), and the natural logarithm of market value of common shares at the end of current quarter (MKT_CAP).[26]

The definitions of some of these variables are slightly different from Barton and Simko because Barton and Simko use this model to examine how each factor affects the probability of meeting or beating the forecast, whereas I use this model to calculate PPS prior to the announcement. Therefore, I only use values that are available prior to the earnings announcement. For example, I use PB, SALE_GRW, ROE, and ΔROE as of last quarter as opposed to as of current quarter in Barton and Simko.

The descriptive statistics of the input variables are presented in panel A of appendix table 1. All variables are winsorized at 1 and 99%. The values are generally comparable to Barton and Simko in spite of the difference in the period (1993-1999 in Barton and Simko vs. 1993-2008 in my sample) and the definitions of some variables. Both the mean and the median values of NOA are slightly higher in my sample (3.22 vs. 2.66 for mean and 2.16 vs. 1.97 for median), and the mean value of SHARES is almost the double of Barton and Simko (122.48 vs.60.69). This is likely to be due to firm size and shares increasing rapidly in recent years. The mean value of BIG5 is slightly above 90% indicating that most of the firms have Big 5, now Big 4, auditors. Mean PB ratio is about 3.5 indicating the market value of equity is about three and a half times greater than the book value.[27] Firm-quarters with high litigation risk are approximately 40% of the whole sample, indicating firms are often exposed to high litigation risk. The mean value of

[26]Barton and Simko hypothesize that NOA reflects the cumulative overstatement effect of prior earnings management on the balance sheet, larger SHARES make firms hard to manage EPS, greater PB, LTGN_RISK, ANALYSTS, and PREV_MB leads to a greater incentives to manage earnings. CV_FORECAST captures the imprecision of analysts' forecast which is likely to be negatively related to incentives to meet or beat, SALES_GRW, ROE, ΔROE all capture the firm performance which is known to be positively related to the forecast error. Barton and Simko also consider the effect of potential downward forecast guidance on the probability of meeting or beating by including DOWN_REV and MKT_CAP. Firms with greater MKT_CAP are likely to have less optimistic forecast and therefore greater probability of meeting or beating. Barton and Simko don't predict any signs for DOWN_REV and BIG5. See Barton and Simko for detailed discussion of the rationale for including these variables in their logit model.

[27] Firms with negative book values are deleted from the sample.

ANALYSTS is 8.06, slightly larger than 6.39 reported by Barton and Simko, which reflects an increase analyst following in recent years. PREV_MB is 0.70, which, in part reflects the evidence in figure 1 of imbalance of positive to negative surprises in the cross-section. The mean CV_FORECAST in my sample is smaller than that reported by Barton and Simko (0.04 vs. 0.20) because I restrict the forecast to be within 31 days prior the announcement to avoid stale forecasts. A slightly greater DOWN_REV is observed in my sample (0.34 vs. 0.23). The levels of the remaining variables are very similar to those reported in Barton and Simko.

Panel B summarizes the results of the logit regression. Because of the twelve-quarter rolling window estimation procedure, the first regression window is from the first quarter of 1993 to the fourth quarter of 1995. There are in total 52 windows, and therefore 52 separate regressions are run, each regression based on approximately 18,000 observations. Panel B presents the mean values of coefficients from 52 regressions alongside with the mean p-values, and the number of positive coefficients. All coefficients display signs consistent with those found in Barton and Simko except for DOWN_REV and ΔROE, with comparable magnitudes well. This is likely to be due to a slight difference in the definitions of variables and the estimation period of my model. Pseudo R^2 and mean concordance percentage value indicate the regression model is powerful for surprise prediction (however, see additional comments in section 5).[28]

[28] Pseudo R^2 in panel B can be interpreted as adjusted R^2 in OLS regression. It is defined as 1-exp{2[logL(M)-logL(0)/n] where logL(M) and logL(0) are the maximized log likelihood for the fitted model and the "null" model containing only intercept term, and n is the sample size. See Maddala (1983).

Appendix Table 1
Probability of a positive earnings surprise measure

Panel A reports the descriptive statistics of the input variables for logit regressions that calculate the probability of a positive earnings surprise. The logit regression is adopted from Barton and Simko (2002) and is estimated through 12 quarter rolling windows during 1993-2008. The coefficients from the following out-of-sample regression are then applied to the in-sample values of input variables to obtain the probability of a positive earnings surprise.

Model I: $Pr(ES\geq 0)/Pr(ES<0) = exp(\beta_0 + \beta_1 NOA + \beta_2 SHARES + \beta_3 BIG5 + \beta_4 PB + \beta_5 LTGN\_RISK + \beta_6 ANALYSTS + \beta_7 PREV\_MB + \beta_8 CV\_FORECAST + \beta_9 DOWN\_REV + \beta_{10} SALES\_GRW + \beta_{11} ROE + \beta_{11} \Delta ROE + \beta_{12} MKT\_CAP)$

ES is defined as actual EPS minus the consensus analysts' forecast where the consensus analysts' forecast is the median value of the most recent analysts' forecasts issued within one month prior to the earnings announcement. PPS is the probability of a positive earnings surprise from Model I: PPS=Pr(ES≥0). Panel B presents the mean values of the coefficients, the mean p-values, and other key statistics of the logit regression. All input variables are winsorized at 1% and 99%. ** (*) indicates significance at 1% (5%) level, respectively.

Panel A. Descriptive statistics

	Mean	***Std***	***Skew***	***Max***	***75%***	***Med***	***25%***	***Min***
NOA	3.23	3.76	3.26	24.63	3.58	2.17	1.28	-1.25
SHARES	122.40	281.91	5.04	2061.00	91.56	39.60	20.54	5.05
BIG5	0.91	0.29	-2.83	1.00	1.00	1.00	1.00	0.00
PB	3.64	3.71	3.44	25.38	4.10	2.55	1.65	0.51
LTGN_RISK	0.39	0.49	0.45	1.00	1.00	0.00	0.00	0.00
ANALYSTS	8.10	5.77	1.28	27.00	11.00	6.00	4.00	2.00
PREV_MB	0.70	0.46	-0.90	1.00	1.00	1.00	0.00	0.00
CV_FOREC	0.05	0.35	-0.75	1.50	0.11	0.04	0.00	-1.71
DOWN_REV	0.34	0.47	0.69	1.00	1.00	0.00	0.00	0.00
SALES_GRW	0.21	0.46	3.04	2.85	0.27	0.11	0.00	-0.59
ROE	0.03	0.36	-3.34	0.79	0.17	0.10	0.01	-2.11
ΔROE	-0.01	0.14	-2.32	0.57	0.01	0.00	-0.02	-0.89
MKT_CAP	6.81	1.66	0.43	11.35	7.84	6.66	5.64	3.48

(Appendix Table 1 continued)

Panel B. Summary of the logit regression

	Predicted sign	*Mean coefficient*	*Mean P-values*	*Fama-Macbeth P-value*	*Number of positive coefficients*
Intercept	(?)	-1.219	0.00	0.00	(0/52)
NOA	(-)	-0.028	0.05	0.00	(1/52)
SHARES	(-)	-0.001	0.00	0.00	(0/52)
Big5	(?)	0.143	0.20	0.00	(48/52)
PB	(+)	0.005	0.30	0.00	(36/52)
LTGN_RISK	(+)	0.143	0.09	0.00	(52/52)
ANALYSTS	(+)	0.029	0.04	0.00	(52/52)
PREV_MB	(+)	0.876	0.00	0.00	(52/52)
CV_FORECAST	(+)	0.007	0.21	0.62	(29/52)
DOWN_REV	(+)	-0.758	0.00	0.00	(0/52)
SALES_GRW	(+)	0.441	0.00	0.00	(52/52)
ROE	(+)	0.230	0.12	0.00	(48/52)
ΔROE	(+)	-0.012	0.65	0.33	(23/52)
MKT_CAP	(+)	0.202	0.00	0.00	(52/52)
Pseudo R^2		15.2%			
Mean Concordant percentage		70.6%			
Mean Discordant percentage		29.0%			
Mean Number of Observations		17,654			

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