

Sell Recommendations, Market Sentiment, and Analyst Credibility

Gilles Hilary*
acgh@ust.hk
HKUST

John Shon
john_shon@baruch.cuny.edu
Baruch College

* Corresponding author: HKUST, Clear Water Bay, Kowloon, Hong Kong.

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Abstract: We find that market reactions to an analyst's earnings forecasts are weaker when conditioned on the number of prior sell recommendations that the analyst makes for other firms that he follows. This effect is most prominent in periods of high market sentiment (e.g., the 1997-2001 period) and is stronger for glamour firms. This effect does not arise from sell recommendations being a proxy for lower quality analysts. Our results are consistent with the idea that investors suffer from a behavioral bias, where optimistic investors assign lower credibility to analysts who make sell recommendations because such recommendations run counter to investors' *ex ante* optimistic beliefs. Our results suggest that analysts may have been subject to a collective market pressure to hype stocks, and that those analysts that held contrarian views by issuing sell recommendations were likely to be sidelined. Consistent with this view, we find that analysts issue fewer sell recommendations when market sentiment is high.

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1. Introduction

Several empirical studies have documented an upward bias in analysts' recommendations—analysts overwhelmingly issue buy/hold recommendations and rarely issue sell recommendations. For instance, Mikhail et al. (2004) find that sell recommendations comprise only 6% of their sample of recommendations. In recent years, this upward bias in recommendations has been a major cause of concern among market participants (e.g., Cowen, Groysberg and Healy, 2006). Analysts have been criticized for their alleged role in the dot-com collapse, the overvaluation problems of Enron, and their less-than-honest assessment of the value of telecom and internet firms. For instance, Malkiel (2002) states in the *Wall Street Journal* that “there has been no credible proposal to deal with the issue of corrupted research [of analysts], which surely contributed to the bubble...”.

In this paper, we examine both supply-side and demand-side explanations of the low frequency of sell recommendations. The supply side arguments are well known. Several rational, economic factors influence analysts' incentives, which may cause them to eschew sell recommendations (e.g., Previts et al., 1994). For instance, analysts' desire to maintain access to important management-provided information may cause analysts to take actions to curry favor with management, making them reluctant to issue sell recommendations (e.g., Francis and Philbrick, 1993). Sell recommendations may also jeopardize the investment banking business of the analysts' employers (e.g., Lin and McNichols, 1998), or they may adversely affect commissions generated from customer trading transactions (e.g., Michaely and Womack, 1999).

An optimistic bias in recommendations may also improve an analyst's chances at promotions by his employer (e.g., Hong and Kubik, 2003). Given the significance of these supply-side incentives that may lead analysts to eschew sell recommendations, market participants may view analysts that issue sell recommendations as more independent. In turn, investors may assign higher credibility and more weight to the information that such analysts provide.

The alternative, demand-side, argument is less conventional, but is grounded in widely accepted behavioral theories. Many of these behavioral theories have been documented to exist in the context of analysts' forecasts (e.g., Gleason and Lee, 2003; Barber et al., 2001). One such theory is the confirmation bias theory, which suggests that investors tend to discount and neglect information that runs counter to their prior beliefs, while focusing on information that confirms their prior beliefs (e.g., Hirshleifer, 2001). Specifically, investors who have optimistic views toward a stock (or the market in general) can exhibit confirmation bias, and thus view sell recommendations as running against their prior beliefs. Put differently, investors may exhibit directional preferences and suffer from motivated reasoning, therefore overweighting information that is consistent with their preferences, while underweighting that information that is inconsistent (e.g., Hales, 2007). Under this alternative, demand-side argument, investors who exhibit confirmation bias will therefore dislike sell recommendations, discount such "contradictory" information, and ultimately assign *lower* credibility to analysts who issue such recommendations. One implication of this theory is that such bias is most likely to exist in periods when market sentiment (and investor optimism) is high. For instance, it is widely believed that the 1997-2001 period was a period of exuberance when general market sentiment was high. We therefore expect that, under this scenario, investors particularly discounted the views of analysts who issued sell recommendation during this period. In turn, to the extent that

analysts value their own credibility, they may issue fewer sell recommendations when market sentiment is high.

To investigate these possibilities, we define analyst credibility as the ability to change investors' expectations, and we operationalize this credibility as the degree to which an analyst's earnings forecasts move stock prices. Moreover, because we view credibility as a property of the *analyst*, we examine the market's reactions to his forecasts of *other firms* that he follows. Specifically, we examine whether an analyst's sell recommendation for Firm A affects the market reactions to the analyst's subsequent earnings forecasts of Firms B, C, and D. The main premise here is that sell recommendations about Firm A may have an effect on the credibility of the analyst's forecasts for the other firms in his portfolio. The advantage of this setting is that we mitigate the risk that the information contained in the sell recommendation of Firm A contains information relative to Firm B. This setting therefore creates a test that focuses on the properties of the individual analyst rather than on the properties of the firms that he covers.

We find that market reactions to an analyst's earnings forecasts are weaker when the analyst issues sell recommendation(s) for other firms that he is following during the prior year. The effect is economically and statistically significant in our overall sample period (1993-2004). Our main specifications include analyst-firm and year fixed effects, but our conclusions are similar when we use a Fama-McBeth (1973) approach to estimate our regressions. In addition, we find that this effect is most prominent during years that had high market sentiment. For example, we find that analysts who issued sell recommendations during the 1997-2001 period of exuberance experienced a 15% reduction in the credibility of their forecasts made in the following year for other firms in their portfolios. This effect is approximately three times greater than the average effect over the entire sample period. We obtain comparable results when we

use two recently proposed measures of market sentiment by Baker and Wurgler (2006). We also find that this effect on analyst credibility is particularly strong for glamour firms and for firms with more individual shareholders. Further, we find that analysts tend to issue fewer sell recommendations in periods when market sentiment is high and that the market reaction to these sell recommendations is smaller in these periods.

These results are consistent with our behavioral-based, demand-side explanation. However, one possible alternative explanation is that an analyst's sell recommendations are a proxy for the lower quality of the analyst's future forecasts. For instance, sell recommendations may systematically be "bad calls" made by analysts. Or, sell recommendations issued for firm A may damage the analyst's relationship with firms B, C and D, causing him to lose access to valuable information. In either scenario, past sell recommendations would be a predictor of the quality of future forecasts. Under this alternative explanation, investors would rationally discount the earnings forecasts of analysts who have made sell recommendations. We perform four different tests to examine this possibility and find no support for this alternative interpretation of our results. First, on average, we find that the returns of firms that receive sell recommendations are lower than the market's return in the three months following the sell recommendation, suggesting that sell recommendations do not seem to be "bad calls" on average. Next, we re-estimate our main specifications for the subsample of sell recommendations that were *ex post* correct and find that these recommendations also have a negative effect on analyst credibility. Third, we examine whether analysts who make sell recommendations issue earnings forecasts that are systematically different from those of other analysts. Inconsistent with this view, we find that these forecasts (1) are not (*ex post*) less accurate relative to other analysts and (2) they are not further away from earnings expectations at the time of the forecast. Finally, we

find that forecasts that subsequently turn out to be further away from realized earnings have lower credibility. However, controlling for this phenomenon does not affect the fact that analysts who issued past sell recommendations are less credible. We conclude from these four different tests that it is unlikely that this alternative explanation explains our main results.

Our results collectively support the behavioral, confirmation-bias explanation, suggesting that analysts who issue sell recommendations suffer a decline in their credibility regarding the other firms that they follow in their portfolio. The results are also consistent with Hales (2007), who finds that investors' directional preferences affect how they process information, where investors overweight information that is consistent with their preferences, while underweighting that information that is inconsistent. These results provide a new perspective on the possible role that analysts played during the years of market exuberance at the end of the 1990s and the effects of the legislation passed in its aftermath. A typical view is that analysts played an active role in the creation of the exuberance. However, our results suggest that analysts may also have been subject to a collective market pressure to hype stocks, and that those who held contrarian views (i.e., issued sell recommendations) may have been sidelined, receiving less attention from market participants.

The rest of the paper is organized as follows. Section 2 discusses our main hypothesis and surveys the relevant literature. Section 3 describes our sample and presents our main empirical results. Section 4 presents additional results that focus on market sentiment. Section 5 empirically investigates an alternative interpretation of our results. Section 6 concludes.

2. Hypothesis development

2.1 Supply-side explanations of sell recommendations

As information intermediaries, sell-side financial analysts play a critical role in analyzing, interpreting, and distributing information to market participants regarding the prospects of publicly traded firms. One of the main end-products of these analysts is to issue recommendations on the firms that they follow: they issue buy recommendations for the firms that they believe are undervalued and sell recommendations for the firms that they believe are overvalued. However, researchers have found that recommendations are overwhelmingly biased upwards to be mostly buy recommendations, and that analysts rarely issue sell recommendations. For instance, Mikhail et al. (2004) find that sell recommendations comprise only 6% of their sample of recommendations, while buys/holds comprise the remaining 94%; similarly, Womack (1996) finds that buy recommendations are seven times more likely than are sell recommendations.

In recent years, this upward bias in recommendations has been a major cause for concern for regulators and market participants. For instance, Cowen, Groysberg and Healy (2006) state that analysts “were criticized for their optimistic reports on dot-com stocks following the dot-com collapse. They were then censured for failing to detect the accounting and over-valuation problems at Enron. Finally, there is evidence that some of the leading telecom and internet analysts publicly touted firms about which they were privately skeptical.” In response to these salient events, in April 2003, the SEC reached the Global Research Analyst Settlement, that heavily fined ten of the largest investment banks and these banks also agreed to implement a series of reforms to address the pervasive concerns about optimistic analyst research.

Several explanations have been offered for why analysts avoid sell recommendations. First, analysts may avoid sell recommendations to curry favor with managers and thus avoid being cut off from valuable information provided by these managers about firms (e.g., Francis

and Philbrick, 1993; Francis and Soffer, 1997). This access to manager-provided information seems to be important even in the post-Reg-FD era (e.g., Chen and Matsumoto, 2006). Second, sell recommendations can harm or jeopardize brokerage firms' present and potential investment banking business (e.g., Lin and McNichols, 1998) and they are less likely to generate trading commissions (e.g., Hayes, 1998; Michaely and Womack, 1999). Third, sell recommendations may present more risks to the analyst because such recommendations are more visible (i.e., "anti-herding"). Lastly, sell recommendations may adversely affect analysts' chances at on-the-job promotions (e.g., Hong and Kubik, 2003). These incentives suggest that analysts can bear significant costs from issuing sell recommendations.

Given these economic incentives and the concerns voiced by regulators and market participants regarding upwardly biased recommendations, analysts who issue sell recommendations may garner the benefits of enhanced credibility and reputation. Prior literature suggests that credibility can cross-sectionally vary among analysts. For instance, Michaely and Womack (1999) find that analysts who are affiliated with underwriters are viewed as less credible by market participants in the immediate post-IPO period, suggesting that an independent relationship with the underwriter can increase credibility. This increase in credibility and reputation should be important for analysts. First, credibility and reputation are significant factors in analysts' compensation (e.g., Michaely and Womack, 1999). For instance, a significant portion of analyst compensation is known to be based on his ranking in annual Institutional Investor All-American Research Teams rankings, for which an analyst's performance is judged in several categories (e.g., stock picking, earnings estimates). Second, higher levels of credibility and reputation translate to a higher likelihood that the analyst's recommendations will have an impact on stock prices (i.e., information content or market

reaction). Consistent with this view, Mikhail et al. (1997) find that the forecast errors of experienced analysts move markets more than those of less experienced analysts (similarly, Clement and Tse, 2003).

This discussion leads to our first prediction, based on the supply-side arguments:

H1a: Analysts who make sell recommendations increase their credibility and therefore exhibit a higher impact on prices in their subsequent earnings forecasts of other firms.

2.2 A demand-side explanation

The discussion above relies critically on the assumption that investors prefer unbiased forecasts and recommendations. However, the behavioral psychology literature provides plausible reasons for why investors may, in fact, *not* have such preferences. Indeed, numerous studies find that individuals do not always update their views in a rational, Bayesian manner (e.g., Lord et al., 1979; Isenberg, 1986). Behavioral theories suggest that it is possible for investors to suffer from cognitive biases, allowing non-value-relevant factors to enter into their information processing. This naturally also applies to investors, and studies suggest that investors systematically underreact to analysts' direct signals (see e.g., Ramnan, Rock and Shane, 2006, for a review of this literature).

Prior research in psychology suggests that preferences can influence the way individuals process information and form beliefs (e.g., Kunda, 1990; Ditto and Lopez, 1992; Ditto et al., 1998; Ditto et al., 2003; Hales, 2007). Specifically, individuals tend to discount/neglect information that runs counter to their prior beliefs, while emphasizing that information that confirms their beliefs. Consistent with this, Hirshleifer (2001, p.1549) states that "people tend to

interpret ambiguous evidence in a fashion consistent with their own beliefs. They give careful scrutiny to inconsistent facts and explain them as due to luck or faulty data gathering.” Similarly, a recent paper by Hales (2007) concludes that the “literature suggests that the amount of scrutiny given to information is not constant but rather depends on whether the information is seen in a favorable light or not, given the decision maker’s preferences. When people are presented with information that is counter to their directional preferences, they are motivated to interpret it skeptically. In contrast, people unthinkingly accept news that they prefer to hear.” Consistent with this view, Hales (2007) finds experimental evidence suggesting that investors are motivated to agree intuitively with information that suggests they might make money on their investments but disagree with information that suggests that they may lose money.

The view adopted in this study is that investors may exhibit this confirmation bias in *assessing an analyst’s credibility*. Specifically, several studies find that investors use the accuracy of an analyst’s research as input into assessing the analyst’s overall quality (e.g., Hong and Kubik, 2003; Ramnath et al., 2006). For instance, investors may use the *ex post* accuracy of an analyst’s past investment recommendations to assess the credibility of his future earnings forecasts. Under this scenario, if investors are optimistic about a firm or the market in general, they may initially conclude that an analyst’s sell recommendation is a “bad call” and reduce their assessment of the analyst’s credibility; this initial assessment may be rational. However, if the recommendation turns out to be *ex post* accurate, a Bayesian investor should subsequently correct this initial assessment. On the other hand, if investors exhibit the confirmation bias, this positive revision of the analyst’s credibility may not occur (assuming the investor still holds an optimistic view about the prospect of the stock). On average, this bias in failing to upwardly revise analyst credibility will lead to lower credibility of analysts who issue sell

recommendations, particularly during periods when investor optimism is high, irrespective of the quality of the recommendation. Moreover, evidence from prior studies suggests that this confirmation bias in assessing analyst credibility is likely to be particularly acute in the context of sell recommendations. Specifically, prior studies find that the confirmation bias is exacerbated when feedback about decisions is deferred or inconclusive (e.g., Forsythe et al., 1992). Sell recommendations exhibit these qualities because they cannot be matched to a clearly identifiable event (e.g., earnings announcements), and there are usually specific, observable benchmarks to judge sell recommendations against (e.g., market expected returns).

This discussion leads to our alternative prediction, based on the demand-side argument:

H1b: Analysts who make sell recommendations decrease their credibility and therefore exhibit a lower impact on prices in their subsequent earnings forecasts of other firms.

Note that our focus is on how investors estimate the quality of the individual analyst and not on the quality of the firm that the analyst follows. Specifically, our study does not address the question of whether sell recommendations are correctly processed by investors when they estimate the value of the firm being reviewed by the analyst.

3. Main empirical results

3.1 Sample

For each firm in our sample, we obtain daily return and price data and fiscal-year-end balance sheet data from the CRSP/Compustat Merged Database. We obtain analysts' forecasts and recommendations data for the 1993-2004 period from I/B/E/S (recommendations data are

available only from 1993 onwards). We focus on one-quarter ahead forecasts of earnings-per-share (EPS). To maintain consistency in the distribution of earnings forecasts, we keep only the analyst's first forecast for a given firm in a given quarter and we require the forecast date to be within ninety days of the forecast period end date. We winsorize data at the 1% level.

3.2 Main empirical model

In our main empirical test, we examine whether an analyst's sell recommendation(s) affects his credibility. We interpret credibility as the believability of the analyst's other research output. In this context, we measure an analyst's credibility as his ability to move prices with earnings forecasts of the firms that he follows, conditional on the number of sell recommendations he makes for *other* firms in his portfolio in the prior year. To do this, we estimate the following model:

$$BHR3d_{i,t} = \alpha_0 + \alpha_1 SELL_{j,t} + \beta_1 ChExp_{i,t} + \beta_2 SELL * ChExp_{i,t} + \gamma_k X_{k,j,t} + \epsilon_{i,t}$$

BHR3d is the three-day abnormal market return surrounding the analyst's forecast for firm *i*. *SELL* is a simple count of the number of sell recommendations issued by the analyst in the prior year for firms other than the firm for which an earnings forecast is made. *ChExp* is the analyst's EPS forecast less the expectation at the time of the forecast, scaled by price. *ChExp* therefore represents the news in the analyst's forecast relative to contemporaneous expectations. We expect that *ChExp* is positively related to the market reaction and the coefficient for *ChExp* is larger when the analyst is more credible. In our initial tests, *ChExp* is measured using five different specifications for prior expectations: (1) realized earnings in the same quarter of the

prior year, (2) the analyst's previous forecast for the firm, (3) the previous forecast issued by any analyst following the firm, (4) the median of the last three forecasts, and (5) the median of the last three forecasts or the last year's realization, if the median is missing.

The $SELL*ChExp$ term interacts the news of an analyst's forecast revision with a count of his prior sell recommendations for other firms that he follows in his portfolio. If issuing sell recommendations increases the analyst's credibility, then a forecast revision should move the firm's price to a greater extent, and the coefficient for the interaction term should be positive. That is, an analyst's forecast revision should result in a larger market reaction when conditioned on a higher number of prior sell recommendations. Conversely, if issuing sell recommendations decreases the analyst's credibility, the interaction term should be negative—the market reaction to the analyst's forecast revision will be tempered when conditioned on lower levels of credibility.

$X_{k,j,t}$ represents a vector of K control variables: size ($LogSale$), profitability (ROA), book-to-market ($Book-to-Market$), leverage ($Debt-to-Asset$), the number of days between the forecast date and the earnings announcement ($Count$), the ratio of the number of forecasts before the forecast of interest and the total number of forecasts for the firm in the quarter ($Order$), the number of analysts covering the firm ($Coverage$), the size of the analyst's employer ($BrokerSize$), the number of firms the analyst follows ($Breadth$), and the log of the firm's price ($LogPrice$). We provide details about the construction of these variables in the Appendix.

3.3 Main empirical results

Before presenting the results from our key tests, we present descriptive statistics for our main variables in Table 1. Consistent with prior studies (e.g., see Ramnan, Rock and Shane,

2006, for a recent review of the analyst literature), our results indicate that analysts' forecasts are able to move prices. Although the average signed three-day abnormal return around an earnings forecast ($BHR3d$) is close to zero, the average absolute value ($abs(BHR3d)$) is close to 5%. The number of sell recommendations ($SELL$) is low. We find that approximately 2% of all recommendations for U.S. firms are sell recommendations (untabulated), but with a fair amount of variation over time. In Figure 1, we present the distribution of sell recommendations by year, revealing a clear U-shape in frequency over time, with even fewer sell recommendations issued at the end of the 1990s. In Table 2, we also present the univariate correlations between our main variables and control variables. The correlations among the different variables are reasonably low, suggesting that multicollinearity is not a major issue in our setting. As expected, we observe a positive relation between $ChExp$ and $BHR3d$ (statistically significant at the 1% level).

In Table 3, we report the results from the estimation of our main model. In Panel A, we present our five different specifications for $ChExp$ in columns 1 through 5, respectively. We include (but do not tabulate) analyst-firm and year fixed effects. The analyst-firm fixed effects are important because they control for factors that are largely time-invariant, such as a firm's industry membership or the analyst's investment banking status. We adjust our standard errors for heteroskedasticity using the Huber-White correction and for clustering of observations by firm. Consistent with prior studies, Panel A of Table 3 shows that $ChExp$ is positive and statistically significant in all five of our specifications (i.e., changes in expectations move prices). Both the magnitude and statistical significance of the coefficient are highest for the fourth model, suggesting that this specification is the most appropriate for capturing the information content in analysts' forecasts among the five that we consider. We therefore use this definition of $ChExp$ in the remainder of the paper. Our main focus, however, is on the interaction term, $SELL*ChExp$.

Consistent with hypothesis *H1b*, we find that the coefficient for this interaction term is negative and statistically significant in all five specifications (at the 5% level in the first three specifications; at the 1% level in the last two specifications). For instance, in column 4, the coefficient for *SELL*ChExp* is -0.113 ($t=-3.03$). The economic magnitude is such that an analyst who has issued a sell recommendation in the previous year exhibits a reduction in credibility of approximately 5% in the earnings forecasts of other firms that he follows.¹ We call this model M1 in the rest of the study. These results are consistent with the behavioral prediction (hypothesis *H1b*) that investors are subject to the confirmation bias and therefore discount—that is, assign lower credibility to—analysts who make sell recommendations. We do not form expectations for the sign of *Sell* by itself, but we do not have a strong reason to expect that it should be significant. Consistent with this view, the t-statistic is typically below conventional levels of significance. At approximately 20%, the coefficients of determination are reasonably high. The Variance Inflated Factors (VIF) are close to one (untabulated), suggesting that multicollinearity is not material.

As a robustness check, we estimate the model in a pooled specification and remove the analyst-firm and year fixed effects. Our conclusions are not affected. In Panel B of Table 3, we also report the results of a Fama-McBeth (1973) estimation, where we estimate our model separately for each quarter. The Fama-McBeth procedure provides an alternative control for the effect of cross-correlation of standard errors. Moreover, because this approach is estimated with only 53 observations, it is much less susceptible to the risk that the statistical significance of our tests is driven by the large number of observations in our sample. Results are consistent with

¹ We obtain this estimate by multiplying the coefficient associated with *SELL*ChExp* by one and dividing the product by the coefficient associated with *ChExp*. In the fourth specification, $0.114/2.508 = 5\%$. In the other specifications, we obtain effects of 8%, 4%, 4% and 5%, respectively.

those reported in Panel A. Both the economic magnitude and statistical significance of the estimated coefficients are slightly larger relative to those in our panel specifications.

In Table 4, we repeat the estimation from Table 3, but we expand the set of control variables. Column 1 of Table 4 reports the results using the panel specification similar to that of Panel A of Table 3. We call this specification M2 in the rest of the study. Column 2 reports the results of the Fama-McBeth specification similar to that in Panel B of Table 3. In both specifications, the magnitude and statistical significance of the coefficient for $SELL*ChExp$ remains largely unchanged. The t-statistic is equal to -2.27 in Column 1 and -3.90 in Column 2. The average Variance Inflation Factor (VIF) for the M2 specification is only 1.55 and the highest single value is 2.62. These numbers are well below the conventional level for significance for multicollinearity. Lastly, we partition the sample between those observations in which $SELL$ is equal to zero and those observations in which $SELL$ is greater than zero. We reestimate our M2 specification, with $SELL$ and $SELL*ChExp$ dropped from the model. We compare the coefficient associated with $ChExp$ in each sub-sample. This approach allows the coefficients of the different control variables to be different in each sub-sample, and is therefore equivalent to allowing an interaction term between the number of sell recommendations and all the control variables. Results are consistent with our main model and indicate that the coefficient associated with $ChExp$ is significantly smaller in the sub-sample of observations where $SELL$ is greater than zero (p-value=0.04).

3.4 Robustness checks

To assess the robustness of our results, we perform several additional untabulated tests. First, we estimate our M1 (Table 3, Panel A, Column 4) and M2 (Table 4, Column 1)

specifications using several alternative definitions of *SELL*. First, we define *DSELL* as a dummy variable equal to one if at least one sell recommendation was issued by the analyst in the prior year, zero otherwise. We also define *SELLpryr* as the ratio of *SELL* to the number of firms followed by the analyst in the previous year. Third, we define *SELLqtr* as the analog of *SELL* but using the number of sell recommendation in the prior quarter instead of the prior year. Finally, we define *SELL45* similar to *SELL*, but we consider any recommendation with an IBES code equal to 4 or 5 (instead of just 5) as a sell recommendation. We interact each of these new definitions of *SELL* with *ChExp*. The new interaction terms are significant at the 1% level for the M1 specification. For the M2 specification, the interaction is significant at the 2%, 6%, 4% and 1% levels, respectively.

As explained in Section 3.2, when we calculate *SELL*, we consider only the sell recommendations made for firms other than the one for which earnings are being forecasted. To mitigate the risk that the sell recommendations carry some information concerning the firm under consideration, we also use firm-analyst fixed effects for the firm for which earnings are being forecasted as an additional control. To further address this issue, we perform three additional robustness checks. First, we form three alternative *SELL* variables, where we ignore sell recommendations issued for firms from the same industry (defined at the 2, 3, and 4-digit SIC codes). We also add the number of sell recommendations received in the prior year by the firm under consideration as an additional control variable for M2. Finally, we exclude all observations of the firms used to calculate *SELL* that also received a sell recommendation by another analyst in the same period (i.e., we only consider firms that received zero sell recommendations from other analysts). Our conclusions are not affected in any of these

specifications. This suggests that our results are not driven by a “spill-over” effect between or among firms.

In our third set of robustness tests, we examine whether our results are driven by negative or pessimistic forecasts. To do so, we create three dummy variables, interact each variable with *ChExp*, and then include the new interaction term in our M1 and M2 specifications. First, *NegRev* is equal to one if *ChExp* is less than zero, and it is equal to zero otherwise. *NegRev* therefore examines if the forecast is less than the expectation at the time of the issuance. Second, *LossPred* is equal to one if the analyst forecasts a loss, and it is equal to zero otherwise. Third, *PessPred* is equal to one if the forecast is below the realization, and it is equal to zero otherwise. *PessPred* therefore examines if the forecast is pessimistic. When each of these variables is interacted with *ChExp* and included in our main M1 and M2 specifications, we find that the coefficients associated with *SELL*ChExp* are not materially affected. Specifically, the magnitude of *SELL*ChExp* is between -0.096 and -0.108 in the M1 specification, and between -0.075 and -0.082 in the M2 specification. The t-statistics are between -2.06 and -2.93. The highest VIF is 2.67, indicating that multicollinearity is not spuriously creating these results.

In our fourth set of robustness tests, we estimate our results using only analyst-firm observations where the value of *SELL* is greater than zero at least once over the entire period of analyst coverage for the given firm (i.e., if the analyst never issues a *SELL* for the firm over his entire span of covering a particular firm, we purge all observations of this analyst-firm pair from the sample). By doing so, we virtually remove all the influence of cross-sectional variations and focus on time series properties. This reduces the power of our tests, but further mitigates the possibility of an omitted variable. In the M1 specification, the value of the coefficient associated with *SELL*ChExp* becomes -0.995 with a t-statistic of -2.35. In M2 specification, the value

becomes -0.073 with a t-statistic of -1.75 (p-value=0.08). This result, however, is perhaps not surprising given that our main models already include analyst-firm fixed effects.

4. Additional results

Results from the previous section suggest that investors put less weight on the earnings forecasts issued by analysts who have issued sell recommendation in the recent past. Overall, these results are consistent with the behavioral prediction that investors are subject to a confirmation bias and therefore discount—that is, assign lower credibility to—analysts who make sell recommendations (e.g., Daniel, Hirshleifer and Subrahmanyam, 1998). Conversely, the results are inconsistent with the prediction that analysts make such sell recommendations to increase their credibility and trumpet their independent-mindedness. In this section, we first show that this effect is stronger during periods when market sentiment is high and investors are more likely to be optimistic. We also show that the market reaction to sell recommendations is smaller and that issuing buy recommendations may increase an analyst’s credibility in such periods. We then show that analysts issue fewer sell recommendations during these periods. Finally, we show that the forecasts of analysts who have issued sell recommendations are not further away from consensus relative to the forecasts of analysts who have not issued sell recommendations.

4.1 Credibility and market sentiment

We interpret our main results to be consistent with market participants exhibiting the confirmation bias, by ignoring information that goes against their prior beliefs. If this interpretation is correct, then it is natural to expect that this confirmation-bias effect should be

stronger during periods when investors are more bullish. We test this intuition within both time series and the cross-sectional specifications.

First, we explore the possibility that our findings are stronger during the 1997-2001 period, which is widely considered as a period of market exuberance. We explore this possibility by partitioning our overall sample into three distinct periods: the era of exuberance (1997-2001), the pre-exuberance period (1993-1996), and the post-exuberance period (2002-2004). Panel A of Table 5 presents results from these sub-period estimations. Results indicate that the detrimental effect that sell recommendations have on analysts' credibility is concentrated in the era of exuberance (1997-2001). Specifically, Column 2 shows that the coefficient for $SELL*ChExp$ is highly statistically significant and negative (-0.398 with a t-statistic of -5.81) in the 1997-2001 period. On the other hand, the coefficient is statistically insignificant in both the pre- and post-exuberance sub-periods. The economic magnitude is such that, during this period of exuberance, an analyst who has issued a sell recommendation in the previous year exhibits approximately a 15% reduction in credibility, as measured by the forecasts that he issues for other firms that he follows.²

For our second time-series test, we use two measures of market sentiment recently proposed by Baker and Wurgler (2006).³ Specifically, they create a market-sentiment index by conducting a principal component analysis to form a linear combination of several individual measures of market sentiment, including the market trading volume, the dividend premium, closed-end dividend discount, the amount of equity issuance, and the strength of the IPO market. Baker and Wurgler (2007) offer two versions of this index: (1) *Sent1* is the raw estimate of their

² We obtain this estimate by multiplying the coefficient associated with $SELL*ChExp$ by one and dividing the product by the coefficient associated with $ChExp$. For the fourth specification, $0.402/2.645 = 15\%$.

³ We refer the interested reader to Baker and Wurgler (2006) for a more complete description of the estimation procedure for this index. We downloaded the data from <http://pages.stern.nyu.edu/~jwurgler/>. We use their yearly estimates in Table 5 and 7 and their monthly estimates in Table 6.

procedure, while (2) *Sent2* is based on a similar procedure where each component is first orthogonalized with respect to macro-economic conditions. To implement these variables in our tests, we classify each year as a high or low sentiment period based on whether the value of *Sent* is above or below the median value for the sample (the partition using either *Sent1* or *Sent2* is identical). We then estimate our main model for the high and low sentiment sub-periods. Results reported in Panel B of Table 5 are consistent with those in Panel A. Specifically, Column 2 shows that the coefficient for *SELL*ChExp* is negative (-0.373) and highly statistically significant (t-statistic of -6.05) in periods of high market sentiment. On the other hand, the coefficient is statistically insignificant in the periods of low market sentiment (Column 1 reports a t-statistic of 0.88). We also consider the high market sentiment periods outside the 1997-2001 period. Because this period is characterized by a particularly high level of market sentiment, this obviously reduces the power of the test. For example, the average value of *Sent1* and *Sent2* is 0.06 and -0.04, respectively, outside the 1997-2001 period and 0.82 and 0.74, respectively, during this period. The difference is statistically significant at less than the 1% level in both cases. Results of the regression are reported in Column 3 of Panel B of Table 3. The coefficient for *SELL*ChExp* is negative and significantly different from zero at the 12% level.

We then form two new specifications of *SELL*, *SELLsent1* and *SELLsent2*, where we weight the number of sell recommendations by the value of the sentiment at the time of the issuance. *SELLsent1* is equal to zero if no sell recommendation was issued in the year preceding the earnings forecast, is negative if sell recommendations were issued at the time when the market sentiment was “bearish” and is positive if the sell recommendations were issued when the market was “bullish”. We reestimate our M1 and M2 specifications with these two new variables. The interactions of *ChExp* with *SELLsent1* and *SELLsent2* are both highly significant

with t-statistics ranging between -6.72 and -7.49 (untabulated results). In comparison, the t-statistics are -2.29 and -3.06 for our main specification (M1 and M2) in the overall sample and -6.05 and -5.29 if we restrict the sample to periods of high sentiment. In fact, the $ChExp*SELLsent$ is also highly significant in the period of low market sentiment (untabulated results indicate that the t-statistic of the interaction of $ChExp$ with $SELLsent1$ and $SELLsent2$ equals -5.20 and -5.32, respectively). These results and the ones in the previous paragraph suggest that our findings are not unique to the 1997-2001 exuberance period but rather, that market sentiment was exceptionally high during this period.

Lastly, we consider cross-sectional variations by partitioning the sample between value and glamour firms during the 1997-2001 period. We use the median of the book-to-market ratio (based on our entire sample) as a natural break point in identifying value and glamour firms (high and low book-to-market ratios, respectively). Results reported in Panel C of Table 5 indicate that, even though the effect that we document is present for both groups of firms, it is stronger for glamour firms relative to value firms. An untabulated chi-square test indicates that the difference is statistically significant with a p-value slightly above 1%. When we consider the overall period (i.e., not limited to the 1997-2001 period), the untabulated results reveal that (1) the coefficient associated with $SELL*ChExp$ is negative and statistically significantly different from zero in both high and low growth sub-samples (t-statistics equal -2.02 and -2.03, respectively), and (2) the magnitude of the coefficient is approximately twice as large for the high growth firms than for the low growth firms (-0.084 versus -0.167). However, contrary to the 1997-2001 sub-period, the two coefficients are not statistically different from each other. Untabulated results are similar when we use the median of $Sent$ as a partitioning variable.

Overall, these time-series and cross-sectional results suggest that the main results documented in Section 3 are most pronounced in periods and firms that exhibit high market sentiment. This finding exists in both time series and cross-sectional partitions of the overall sample. That is, to the extent that investors are subject to the confirmation bias and assign lower credibility to analysts who make sell recommendations, they seem to do so in situations that we identify as exhibiting high market sentiment.

4.2. Direct market reaction to sell recommendation and market sentiment

Our main tests focus on the market reaction to subsequent earnings forecasts issued by analysts conditional on their issuance of sell recommendations. We focus on market reactions to subsequent earnings forecasts rather than subsequent sell recommendations because we do not have a good benchmark to estimate what the reaction should be. For example, it is possible that, absent cognitive biases, investors should react more to sell recommendations when these recommendations are more infrequent than when they are more common. With this important caveat in mind, we nevertheless investigate the direct relation between market reactions and sell recommendation by regressing the three day market reaction around the issuance of a sell recommendation on market sentiment (*Sent1* or *Sent2*), controlling for *LogSale*, *ROA*, *Book-to-Market*, *Debt-to-Asset*, *Coverage*, *BrokerSize*, *Breadth* and *LogPrice*. Results reported in Table 6 indicate that the market reaction to a sell recommendation is weaker when market sentiment is higher (more “bullish”). The t-statistics associated with *Sent1* and *Sent2* are 1.72 and 3.58 respectively. Increasing *Sent1* and *Sent2* by one standard deviation reduces the magnitude of the average drop in price by approximately 3% and 5%.

4.3 Buy recommendations, credibility and market sentiment

Thus far, our analysis has focused on sell recommendations. We replicate our analysis considering buy recommendations. We create a new variable *BUY*, which counts the number of buy recommendation in the prior year for firms other than the one under consideration. A buy recommendation is represented with a value of 1 in the IBES database. The issuance of a buy recommendation is a much more common occurrence than the issuance of a sell recommendation. For example, the mean and median of *BUY* are 3 and 2, respectively. The corresponding values for *SELL* are 0 and 0.2. Issuing a buy recommendation should therefore have a more limited effect on analysts' credibility than should issuing a sell recommendation. To test this conjecture, we estimate the specifications reported in Column 4, Panel A of Table 3 (our M1 specification), and in both columns of Table 4 (our M2 specification and the corresponding Fama-McBeth regression). Consistent with our prediction, *BUY* is insignificantly different from zero in all three regressions. However, if we include *BUY* and its interactions with *ChExp* in the specification reported in Table 5, Panel B, Column 2, the coefficient associated with *Buy*ChExp* is positive (0.025) with t-statistic equal to a 1.83. This result is consistent with the idea that analysts may be able to increase their credibility during the period of exuberance by issuing buy recommendations.

4.4 Issuance of sell recommendations and market sentiment

Having established that issuing sell recommendations weakens analyst credibility and that this effect is stronger during periods when market sentiment is higher, it is natural to expect that analysts would issue fewer sell recommendations when market sentiment is high. To investigate this conjecture, we perform two related tests.

First, we regress *MSell* on proxies for market sentiment and various control variables. *MSell* represents the number of sell recommendations issued by the analyst for a given calendar quarter and a given analyst. Our sample of 82,832 analyst-quarters in this test is therefore slightly different from our previous analyses. To measure market sentiment, we first use a dummy variable (*Exub*) that takes the value of one for years in the 1997-2001 period. We also use the two continuous measures of market sentiment from Baker and Wurgler (*Sent1* and *Sent2*) that we discussed above. Our control variables are the median by analyst and quarter of the variables that we used in Table 4 (i.e., *MLogSale*, *MROA*, *MBook-to-Mkt*, *MDebt-to-Asset*, *MCount*, *MOrder* and *MLogPrice*). *MCoverage* is the number of firms followed by the analyst for a given calendar quarter; *MBrokerSize* is the size of the analyst's employer during the given calendar quarter. We also control for the analyst's past forecast error (*MPastError*). To calculate this error, we first estimate the absolute error as the absolute value of the difference between the analyst forecast and the realized earnings (scaled by price). We then estimate the relative error as the difference between the analyst's absolute error and the median of the absolute error for all the other analysts following the firm in a given quarter. We then calculate *MPastError* as the median value for an analyst of his relative error over the prior year.

We present our results in Table 7. As expected, results indicate that analysts tend to issue fewer sell recommendations when market sentiment is high. This is true irrespective of the proxy that we use (*Exub*, *Sent1*, *Sent2*). Although this result is perhaps unsurprising by itself, it reinforces our interpretation of the data in the prior tables. Interestingly, we also find that the effect of *Sent1* and *Sent2* is reduced but not subsumed by *Exub*. In addition, glamour stocks are less likely to receive a sell recommendation. These results are consistent with the ones presented in Section 4.1. and suggest, at minimum, that analysts consider investors' sentiment (independent

of its macro-economic implications) in deciding whether or not to issue sell recommendations. Table 7 also indicates that prior forecast errors do not lead analysts to issue more sell recommendations. *MPastError* is negative and insignificantly different from zero at conventional levels. This does not support the idea that analysts view sell recommendations as a way to restore credibility weakened by prior forecast errors. If anything, prior poor performance reduces the likelihood of issuing a negative forecast. This result also suggests that there is no endogenous relation between analysts' performance (and hence their credibility) and the issuance of sell recommendations.

In a second test, we calculate the number of sell recommendations issued every month. We then regress this variable on *Exub*, *Sent1* and *Sent2*. Untabulated results indicate that these three measures of market sentiment are extremely negatively correlated with the number of sell recommendation issued (p-values equal 0.00 in all cases). Increasing *Sent1* or *Sent2* by one standard deviation reduces the average number of sell recommendation by 27%. When we include both *Exub* and either *Sent1* or *Sent2* in the regressions, *Sent1* and *Sent2* remain highly significant (p-value equals 0.00 in both cases) but the p-value of *Exub* drops to 0.15 and 0.10 respectively. These results are consistent with the ones presented in Table 6.

4.5 Ownership and biased responses to sell recommendations.

Finally, we consider if institutional and individual investors react similarly to prior sell recommendations. To investigate this question, we form a dummy variable *Dind* that takes the value of one if the percentage of institutional investors is below the median in the sample, zero otherwise. We interact this variable with *Sell*ChExp*. We include both variables (*Dind* and *Dind*Sell*ChExp*) in our M1 and M2 specifications and estimate both models for the 1997-2001

period. Untabulated results indicate that $Dind*Sell*ChExp$ is significantly negative in both models (p-value=0.02 and 0.03, respectively), but $Sell*ChExp$ is not significant anymore. This result suggests that individual investors are more subject to the cognitive bias documented in this study than are institutional investors.

5. Alternative interpretation

Results from Section 3 suggest that investors systematically assign lower credibility to the forecasts of analysts who have issued sell recommendations in the recent past. We interpret these results to be consistent with investors exhibiting confirmation bias, through which contradictory information is underweighted. An alternative view is that past sell recommendations convey information about the quality of the future forecasts that analysts make and therefore, about their capacity to move prices. For instance, perhaps these sell recommendations are systematically “bad calls”, and therefore convey useful information to investors about the lower quality of the analysts who make such recommendations. Or, perhaps analysts who make sell recommendations for Firm A lose access to management-provided information from Firms B, C, and D (because managers of these firms fear that the *next* pessimistic recommendation is going to be for their firms), causing these analysts to make less reliable forecasts of other firms in the future. If lower-quality analysts produce less-accurate earnings forecasts, then investors should therefore rationally discount their subsequent forecasts. We perform four tests to examine this possibility and find that none of the results from these tests support these alternative explanations.

5.1 Are the sell recommendations systematically a mistake?

One of the conditions for the first alternative interpretation to hold is that sell recommendations should systematically be an indicator of poor analyst performance. To investigate if analysts' sell recommendations are systematically "bad calls", we calculate the abnormal return (i.e., firm return minus market return) for all firms ninety days after receiving a sell recommendation. The average is approximately -1% and statistically lower than zero (p-value=0.00). This suggests that the firms that receive sell recommendations do, indeed, perform poorly, and that analysts are, on average, making the "right call". Sell recommendations therefore do not seem to be a systematic indicator of poor analyst performance. This result is consistent with the finding of Womack (1996), who reports that sell recommendations can predict abnormal returns up to six months after the issuance.

5.2 Do accurate sell recommendations predict future credibility?

If the negative relation between sell recommendations and analyst credibility exists because the sell recommendations are *ex post* incorrect on average, the negative relation should not exist for the sell recommendations that are in fact correct. To investigate this idea, we define a good sell recommendation as one for a firm that has a return lower than the market return in the ninety days following the issuance of the sell recommendation. We form the variable *SELLGOOD*, which is a simple count of the number of good sell recommendations. With this variable, we form another interaction term *SELLGOOD*ChExp* and estimate our main regression. Results are reported in Table 8. They indicate that the relations reported in Tables 3 and 4 still hold when we focus on the "good" recommendations. These results suggest that the relation between sell recommendations and analyst credibility does not arise from such sell recommendations being inaccurate predictions.

5.3 Do sell recommendations predict the future of earning forecast?

Third, we examine whether sell recommendations are associated with various properties of the subsequent earnings forecasts that may be related to credibility. Specifically, we examine whether analysts who make sell recommendations issue earnings forecasts that are: (1) *ex post* less accurate relative to other analysts, and (2) further away from expectations relative to other analysts. To examine this possibility, we define *Error* as the absolute value of the difference between the earnings forecast and its subsequent realization, scaled by the stock price (scaling by the median *Error* for each 3-digit SIC industry yields similar results). We also define *Bold* as the absolute value of *ChExp*. We then regress *Error*, *Bold*, and *ChExp* on *SELL* and our control variables. Results reported in Table 9 indicate that *SELL* is insignificantly different from zero in all three regressions. These results suggest that analysts who have issued sell recommendations in the prior year do not issue bolder forecasts that diverge more from the consensus (which may cause the investors to rationally discount their forecasts) and do not make more erroneous forecasts. More specifically, this result does not support the idea that analysts make worse recommendations because they lose access to management information.

5.4 Does ex post accuracy of earnings forecast subsume the effect of prior sell recommendations?

Lastly, we examine if the *ex post* accuracy of the earnings forecast subsumes the effect of the sell recommendations. Here, if past sell recommendations are merely a proxy for poor future forecast accuracy, controlling for the forecast error in our main regression should absorb the effect of sell recommendations. We therefore estimate our main regression from Table 4 and

additionally control for the forecast error and its interaction with $ChExp$ (i.e., $Error*ChExp$). Results are reported in Table 10. Consistent with the idea that less accurate forecasts have smaller effects on investors' expectations, the coefficient for $Error*ChExp$ has a negative sign. More importantly for our study, we find that the magnitude and significance of the coefficient associated with $SELL*ChExp$ are barely affected after controlling for $Error*ChExp$. This result is consistent with the idea that the effect of $SELL*ChExp$ is orthogonal to $Error*ChExp$ and is incrementally significant to the accuracy of the forecast.

6. Conclusions

In this paper, we consider the effects that sell recommendations have on analysts' reputations and credibility. Analysts may trade off the typical costs of issuing sell recommendations with the benefit of building their credibility and reputation as independent-minded analysts. Alternatively, investors may be subject to the confirmation bias and therefore discount analysts' contradictory sell recommendations, assigning lower credibility to analysts who issue such recommendations.

To test the possible impact that sell recommendations have on analyst credibility, we examine whether market reactions to analysts' earnings forecasts are affected by their issuance of prior sell recommendations of the other firms the analyst follows. We find that market reactions to an analyst's forecasts are weaker when conditioned on the analyst's prior sell recommendations. We also find that this effect is concentrated in periods of high market sentiment. In addition, we find that the effect is stronger for glamour firms and for firms with low institutional ownership. Results also suggest that sell recommendations are less frequent in periods of high market sentiment and that the market reaction to these recommendations is

smaller in these periods. These results collectively support our behavioral explanation: analysts who issue sell recommendations may incur the additional cost of a drop in credibility. On the other hand, several additional tests fail to support the idea that prior sell recommendations carry some adverse information about analysts' skills that would rationally explain the effect on analyst credibility.

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Appendix

Variable Definitions:

| | |
|-----------------------|--|
| <i>BHR3d</i> | three-day buy and hold abnormal return surrounding the analyst's forecast |
| <i>SELL</i> | The number of sell recommendations issued by the analyst in the prior year for firms other than the firm for which an earnings forecast is made |
| <i>ChExp(1)</i> | The difference between the analyst's earnings per share (EPS) forecast and actual value of the EPS of this quarter, scaled by the stock price on the forecast day |
| <i>ChExp(2)</i> | The difference between the analyst's earnings per share (EPS) forecast and his/her last EPS forecast for this quarter and this firm, scaled by the stock price on the forecast day |
| <i>ChExp(3)</i> | The difference between the analyst's earnings per share (EPS) forecast and any last EPS forecast for this quarter and this firm, scaled by the stock price on the forecast day |
| <i>ChExp(4)</i> | The difference between the analyst's earnings per share (EPS) forecast and the median of last three EPS forecasts for this quarter and this firm, scaled by the stock price on the forecast day |
| <i>ChExp(5)</i> | The difference between the analyst's earnings per share (EPS) forecast and the median of last three EPS forecasts for this quarter and this firm or the actual EPS value of the same quarter of last year if there is no prior forecast, scaled by the stock price on the forecast day |
| <i>Logsale</i> | Logarithm of net sales (Compustat data item 12) |
| <i>ROA</i> | Income before extraordinary items / total assets (Compustat data item 18 / data item 6) |
| <i>Book-to-Market</i> | $(\text{total asset} - \text{total liabilities}) / (\text{fiscal year close price} * \text{common shares outstanding}) = (\text{Compustat data item 6} - \text{data item 181}) / (\text{data item 25} * \text{data item 199})$ |
| <i>Debt-to-Asset</i> | Total liabilities/total assets (Compustat data item 181/data item 6) |
| <i>Count</i> | The number of days between the forecast date and the actual value report date |
| <i>Order</i> | The ratio of the number of forecasts before the forecast of interest and the total number of forecast for the firm in the forecast quarter |
| <i>Coverage</i> | The number of analysts covering the firm in the given forecast quarter |
| <i>BrokerSize</i> | The number of analysts working in the same brokerage firm as the analyst |

| | |
|------------------------|--|
| <i>LopPrice</i> | Logarithm of the stock price on the forecast day |
| <i>MSell</i> | The number of sell recommendations issued by the analyst in the given calendar quarter |
| <i>MCoverage</i> | The number of firms the analyst following in the given calendar quarter |
| <i>MBrokerSize</i> | The size of analyst's employer in the given calendar quarter. |
| <i>MLogSale</i> | The median of LogSale of firms the analyst issues an EPS forecast to in the given calendar quarter |
| <i>MROA</i> | The median of ROA of firms the analyst issues an EPS forecast to in the given calendar quarter |
| <i>MBook-to-Market</i> | The median of Book-to-Market of firms the analyst issues an EPS forecast to in the given calendar quarter |
| <i>MCount</i> | The median of Count of the analyst in the given calendar quarter |
| <i>MOrder</i> | The median of Order of the analyst in the given calendar quarter |
| <i>MLogPrice</i> | The median of LogPrice of firms the analyst issues an EPS forecast to in the given calendar quarter |
| <i>BUY</i> | The number of buy recommendations issued by the analyst in the prior year for firms other than the firm for which an earnings forecast is made |
| <i>Error</i> | The absolute value of the difference between the earnings forecast and its subsequent realization |
| <i>SELLGOOD</i> | The number of good sell recommendations issued by the analyst in the prior year for firms other than the firm under consideration; A sell is good if the firm has a return lower than the market return in the 90 days following the sell recommendation |

Table 1: Descriptive statistics

| | <i>Sell</i> | <i>BHR3d</i> | <i>abs(BHR3d)</i> | <i>ChExp</i> |
|---------------|-------------|--------------|-------------------|--------------|
| Mean | 0.223 | -0.001 | 0.050 | -0.001 |
| Median | 0 | -0.001 | 0.031 | 0 |
| Std Deviation | 0.781 | 0.071 | 0.055 | 0.005 |

Sell is the number of sell recommendations issued by the analyst in the previous year for other firms followed by the analyst. *BHR3d* is the 3-day market return around the analyst forecast. *Abs(BHR3d)* is the absolute value of *BHR3d*. *ChExp* is the analyst forecast minus the expectations at the time of the forecast, scaled by price. For the purpose of Table 1, the expectations are proxied by the median forecast of the last three forecasts.

Figure 1: Percentage of sell recommendations for US firms by year

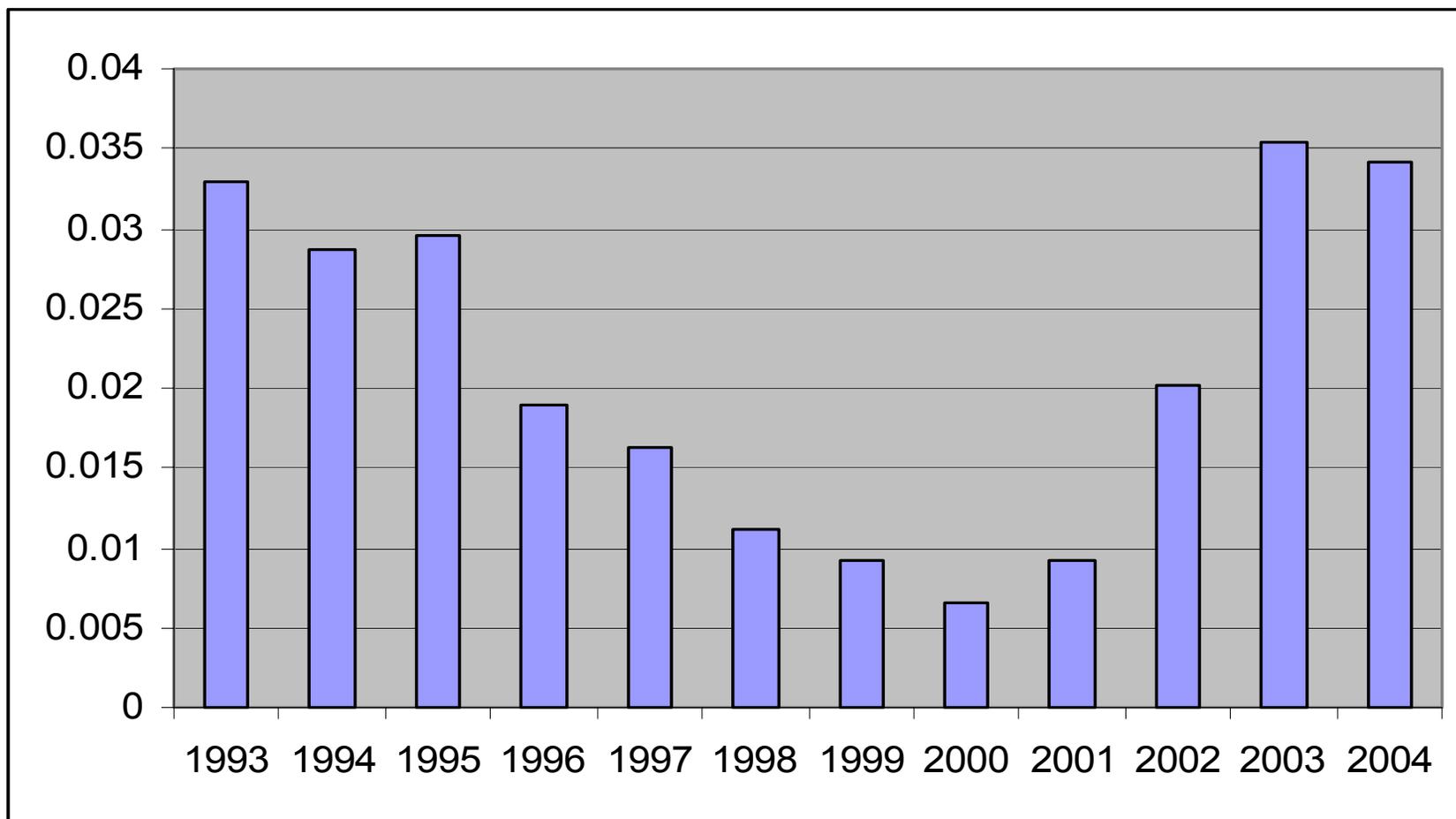


Table 2: Pearson Correlations

| | <i>BHR3d</i> | <i>Sell</i> | <i>Ch RATIO</i> | <i>Log Sale</i> | <i>Book-to-Mkt</i> | <i>ROA</i> | <i>Debt-to-Ass.</i> | <i>Count</i> | <i>Order</i> | <i>Cover</i> | <i>Broker Size</i> | <i>Breadth</i> |
|-------------------|--------------|-------------|-----------------|-----------------|--------------------|------------|---------------------|--------------|--------------|--------------|--------------------|----------------|
| <i>Sell</i> | 0.00 | 1.00 | | | | | | | | | | |
| <i>ChExp</i> | 0.07 | 0.01 | 1.00 | | | | | | | | | |
| <i>LogSale</i> | 0.02 | 0.02 | 0.02 | 1.00 | | | | | | | | |
| <i>Bk-to-Mkt</i> | 0.00 | 0.04 | -0.06 | 0.01 | 1.00 | | | | | | | |
| <i>ROA</i> | 0.03 | -0.01 | -0.09 | 0.30 | -0.18 | 1.00 | | | | | | |
| <i>D-to-A</i> | 0.01 | 0.01 | 0.05 | 0.47 | 0.02 | -0.09 | 1.00 | | | | | |
| <i>Count</i> | 0.02 | -0.01 | 0.03 | -0.01 | -0.02 | -0.03 | -0.05 | 1.00 | | | | |
| <i>Order</i> | -0.02 | 0.01 | -0.01 | 0.34 | -0.15 | 0.10 | -0.01 | -0.32 | 1.00 | | | |
| <i>Coverage</i> | -0.01 | 0.01 | 0.00 | 0.53 | -0.23 | 0.15 | 0.04 | 0.06 | 0.64 | 1.00 | | |
| <i>BrokerSize</i> | 0.00 | -0.10 | -0.02 | 0.20 | -0.02 | 0.01 | 0.14 | 0.08 | -0.02 | 0.13 | 1.00 | |
| <i>Breadth</i> | 0.01 | 0.11 | 0.02 | 0.07 | 0.08 | 0.03 | 0.08 | 0.01 | -0.07 | 0.00 | 0.08 | 1.00 |
| <i>LogPrice</i> | 0.12 | -0.02 | 0.12 | 0.45 | -0.36 | 0.42 | 0.08 | -0.02 | 0.23 | 0.39 | 0.12 | 0.05 |

All correlations are significant at less than 1% level except the relation between *Sell* and *BHR3d*, which is not significant at conventional levels.

Sell is the number of sell opinion issued by the analyst in the previous year for other firms followed by the analyst. *ChExp* is the analyst forecast minus the expectations at the time of the forecast, scaled by price. For the purpose of Table 2, the expectations are proxied by the median forecast of the last three forecasts, *Logsale* is the log of sales. *ROA* is the return on assets. *Book-to-Market* is the book to market ratio. *Debt-to-Assets* is the debt-equity ratio. *Count* represents the number of days between the forecast date and the earnings announcement date. *Order* is the ratio of the number of forecast before the forecast of interest and the total number of forecasts for the firm and quarter. *Coverage* is the log of the maximum number of analyst covering the firm in a given year. *BrokerSize* is the log of the number of analysts in the broker firm the analyst working for in the given quarter. *Breadth* is the log of the number of firms the analyst follows in the given quarter. *LogPrice* is the log of stock price. All variables are winsorized at the 1% level.

Table 3: Market reaction to earnings forecasts, conditioned on SELL**Panel A: Panel specifications**

| | 1 | 2 | 3 | 4 | 5 |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | BHR3d | BHR3d | BHR3d | BHR3d | BHR3d |
| <i>SELL</i> * <i>ChExp</i> | -0.027 (-2.07) | -0.073 (-2.07) | -0.095 (-2.57) | -0.114 (-3.06) | -0.130 (-3.69) |
| <i>SELL</i> | 0.000 (1.17) | 0.000 (2.06) | 0.000 (0.93) | 0.000 (1.00) | 0.000 (0.96) |
| <i>ChExp</i> | 0.318 (26.60) | 1.976 (56.99) | 2.220 (59.46) | 2.508 (64.40) | 2.377 (63.37) |
| n | 573,810 | 371,869 | 569,532 | 569,532 | 574,104 |
| Adj. R ² | 19.67 | 24.72 | 20.94 | 21.32 | 21.21 |

Panel B: Fama-McBeth specifications

| | 1 | 2 | 3 | 4 | 5 |
|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | BHR3d | BHR3d | BHR3d | BHR3d | BHR3d |
| <i>SELL</i> * <i>ChExp</i> | -0.032 (-2.44) | -0.170 (-3.60) | -0.186 (-4.73) | -0.189 (-4.60) | -0.185 (-4.58) |
| <i>SELL</i> | -0.000 (-0.24) | -0.000 (-1.58) | -0.000 (-0.92) | -0.000 (-1.10) | -0.000 (-1.07) |
| <i>ChExp</i> | 0.352 (11.47) | 1.743 (14.10) | 1.944 (15.51) | 2.132 (15.00) | 2.039 (14.47) |
| n | 53 | 53 | 53 | 53 | 53 |
| R ² | 0.46 | 3.19 | 2.10 | 2.60 | 2.48 |

The dependent variable is the 3-day market return around the analyst's forecast. *Sell* is the number of sell recommendations issued by the analyst in the previous year for other firms followed by the analyst. *ChExp* is the analyst forecast minus the expectations at the time of the forecast, scaled by price. Prior expectations are measured (in columns 1 to 5, respectively) by (1) realized earnings in the same quarter in the prior year, (2) the previous forecast for the same analyst for this firm, (3) the previous forecast by any analyst, (4) the median forecast for the last three forecasts, and (5) the median of the last three forecast or last year realization if there is less than three prior forecasts. *SELL* * *ChExp* is the interaction of *SELL* and *ChExp*. All variables are winsorized at the 1% level.

In panel A, standard errors are corrected for heteroskedasticity and clustering of observations by firm. Analyst-firm and year fixed effects are included but not tabulated. In Panel B, standard errors are estimated using a Fama-McBeth [1973] procedure.

Table 4: Market reaction to earnings forecasts, conditional on SELL

| | <i>BHR3d</i> | <i>BHR3d</i> |
|-----------------------|--------------------|-------------------|
| <i>Sell*ChExp</i> | -0.084 (-2.29) | -0.149 (-3.93) |
| <i>Sell</i> | 0.000 (2.08) | -0.000 (-0.40) |
| <i>ChExp</i> | 2.189 (57.83) | 1.849 (14.89) |
| <i>Logsale</i> | -0.006 (-13.40) | -0.002 (-6.84) |
| <i>ROA</i> | -0.019 (-7.78) | -0.008 (-2.89) |
| <i>Book-to-Market</i> | 0.037 (42.25) | 0.014 (8.49) |
| <i>Debt-to-Asset</i> | 0.030 (16.75) | 0.007 (3.59) |
| <i>Count</i> | 0.000 (14.21) | 0.000 (4.54) |
| <i>Order</i> | -0.000 (-5.31) | 0.000 (0.57) |
| <i>Coverage</i> | -0.012 (-31.07) | -0.005 (-7.10) |
| <i>BrokerSize</i> | -0.001 (-1.77) | -0.000 (-2.63) |
| <i>Breadth</i> | 0.000 (0.69) | -0.000 (-2.09) |
| <i>LogPrice</i> | 0.025 (63.22) | 0.014 (14.13) |
| N | 567,497 | 53 |
| R ² | 22.97 | 3.62 |

The dependent variable is the 3-day market return around the analyst forecast. *Sell* is the number of sell recommendations issued by the analyst in the previous year for other firms followed by the analyst. *ChExp* is the analyst forecast minus the expectations at the time of the forecast, scaled by price. Prior expectations are measured by the median forecast for the last three forecasts. *Sell*ChExp* is the interaction of *Sell* and *ChExp*. All variables are winsorized at the 0.5% level.

LogSale is the log of sales. *ROA* is the return on assets. *Book-to-Market* is the book to market ratio. *Debt-to-Assets* is the debt-equity ratio. *Count* represents the number of days between the forecast date and the earnings announcement date. *Order* is the ratio of the number of forecast before the forecast of interest and the total number of forecasts for the firm and quarter. *Coverage* is the log of the maximum number of analyst covering the firm in a given year. *BrokerSize* is the log of the number of analysts in the broker firm the analyst working for in the given quarter. *Breadth* is Log of the number of firms the analyst follows in the given quarter. *LogPrice* is the log of stock price.

In Column 1, standard errors are corrected for heteroskedasticity and clustering of observations by firm. Analyst-firm and year fixed effects are included but not tabulated. In Column 2, standard errors are estimated using a Fama-McBeth [1973] procedure.

Table 5: Market sentiment sub-samples

Panel A: Time series variation – Exuberance Era

| | 1993-1996 | 1997-2001 | 2002-2004 |
|-------------------|-------------------|-------------------|------------------|
| | <i>BHR3d</i> | <i>BHR3d</i> | <i>BHR3d</i> |
| <i>Sell*ChExp</i> | -0.048 (-0.88) | -0.402 (-5.88) | 0.006 (0.09) |
| <i>Sell</i> | 0.000 (-1.16) | 0.001 (2.00) | 0.000 (1.78) |
| <i>ChExp</i> | 1.138 (17.91) | 2.650 (43.66) | 3.126 (42.74) |
| N | 159,014 | 224,503 | 186,015 |
| R ² | 24.67 | 26.87 | 25.97 |

Panel B: Time series variation – High versus low market sentiment periods (Baker and Wurgler, 2006)

| | Low <i>Sent1</i> | High <i>Sent1</i> | High <i>Sent1</i> (outside 1997-2001) |
|---------------------|------------------|-------------------|--|
| | <i>BHR3d</i> | <i>BHR3d</i> | <i>BHR3d</i> |
| <i>Sell*ChExp</i> | 0.006 (0.13) | -0.375 (-6.05) | -0.132 (-1.57) |
| <i>Sell</i> | 0.000 (0.35) | 0.001 (1.29) | -0.001 (-1.69) |
| <i>ChExp</i> | 2.603 (48.38) | 2.457 (41.95) | 1.433 (13.61) |
| N | 317,629 | 251,903 | 72,523 |
| Adj. R ² | 28.51 | 28.25 | 37.83 |

Panel C: Low book-to-market versus High book-to-market during Exuberance era (1997-2001)

| | Low Growth firms | High Growth firms |
|-------------------|-------------------|-------------------|
| | <i>BHR3d</i> | <i>BHR3d</i> |
| <i>Sell*ChExp</i> | -0.251 (-3.28) | -0.758 (-4.68) |
| <i>Sell</i> | 0.002 (1.93) | 0.001 (1.33) |
| <i>ChExp</i> | 2.063 (29.55) | 3.808 (30.57) |
| N | 101,689 | 122,814 |
| R ² | 32.93 | 30.59 |

The dependent variable is the 3-day market return around the analyst forecast. *Sell* is the number of sell recommendations issued by the analyst in the previous year for other firms followed by the analyst. *ChExp* is the analyst forecast minus the expectations at the time of the forecast, scaled by price. Prior expectations are measured by the median forecast for the last three forecasts. *ChExp*Sell* is the interaction of *Sell* and *ChExp*. All variables are winsorized at the 1% level. Standard errors are corrected for heteroskedasticity and clustering of observations by firm. Analyst-firm fixed effects are included but not tabulated.

Table 6: Direct market reaction to sell recommendations.

| | <i>BHR3d</i> | <i>BHR3d</i> |
|-----------------------|--------------------|--------------------|
| <i>Intercept</i> | -0.101 (-10.38) | -0.103 (-10.55) |
| <i>Sent1</i> | 0.005 (1.72) | |
| <i>Sent2</i> | | 0.012 (3.58) |
| <i>Logsale</i> | -0.006 (-6.07) | -0.006 (-5.76) |
| <i>ROA</i> | -0.009 (-0.79) | -0.011 (-0.92) |
| <i>Book-to-Market</i> | 0.032 (6.42) | 0.031 (6.31) |
| <i>Debt-to-Asset</i> | 0.018 (2.68) | 0.017 (2.55) |
| <i>Coverage</i> | 0.001 (5.61) | 0.001 (5.44) |
| <i>BrokerSize</i> | -0.000 (-3.67) | -0.000 (-3.46) |
| <i>Breadth</i> | 0.000 (1.56) | 0.000 (1.28) |
| <i>LogPrice</i> | 0.027 (10.49) | 0.027 (10.22) |
| N | 6,049 | 6,049 |
| R ² | 7.05 | 7.42 |

The dependent variable is the 3-day market return around the issuance of a sell recommendation. *Sent1* and *Sent2* are measures of market sentiment as reported by Baker and Wurgler (2006). *LogSale* is the log of sales. *ROA* is the return on assets. *Book-to-Market* is the book to market ratio. *Debt-to-Assets* is the debt-equity ratio. *Coverage* is the log of the maximum number of analyst covering the firm in a given year. *BrokerSize* is the log of the number of analysts in the broker firm the analyst working for in the given quarter. *Breadth* is Log of the number of firms the analyst follows in the given quarter. *LogPrice* is the log of stock price. Standard errors are corrected for heteroskedasticity and clustering of observations by month.

Table 7: Variations in *SELL*

| | MSell | MSell | MSell | MSell | MSell |
|------------------------|--------------------|-------------------|--------------------|--------------------|--------------------|
| <i>Exub</i> | -0.150 (-14.14) | | | -0.117 (-11.69) | -0.110 (-14.14) |
| <i>Sent1</i> | | -0.89 (-13.97) | | -0.051 (-9.40) | |
| <i>Sent2</i> | | | -0.107 (-14.33) | | -0.057 (-8.03) |
| <i>MPastError</i> | -5.258 (-1.52) | -5.348 (-1.54) | -5.158 (-1.49) | -5.006 (-1.45) | -4.983 (-1.44) |
| <i>MTenure</i> | 0.000 (2.33) | 0.000 (2.09) | 0.000 (1.64) | 0.000 (2.18) | 0.000 (1.97) |
| <i>MBreadth</i> | -0.031 (-2.92) | -0.041 (-3.83) | -0.044 (-4.08) | -0.030 (-2.80) | -0.033 (-3.07) |
| <i>MLogSale</i> | 0.013 (2.74) | 0.012 (2.49) | 0.010 (2.16) | 0.012 (2.41) | 0.011 (2.31) |
| <i>MROA</i> | 0.102 (1.70) | 0.129 (2.13) | 0.151 (2.50) | 0.109 (1.82) | 0.122 (2.03) |
| <i>MB2M</i> | 0.068 (3.14) | 0.103 (4.68) | 0.105 (4.74) | 0.069 (3.22) | 0.074 (3.40) |
| <i>MDebt-to-Assets</i> | -0.033 (-1.06) | -0.024 (-0.75) | -0.021 (-0.66) | -0.021 (-0.67) | -0.022 (-0.70) |
| <i>MCount</i> | 0.000 (0.04) | 0.000 (0.01) | -0.000 (-0.38) | 0.000 (0.06) | -0.000 (-0.16) |
| <i>MOrder</i> | -0.005 (-4.23) | -0.006 (-4.52) | -0.005 (-4.26) | -0.005 (-3.85) | -0.005 (-3.84) |
| <i>MCover</i> | 0.046 (4.83) | 0.059 (6.16) | 0.055 (5.71) | 0.044 (4.61) | 0.043 (4.57) |
| <i>MLogPrice</i> | -0.036 (-4.21) | -0.040 (-4.71) | -0.035 (-4.08) | -0.032 (-3.70) | -0.030 (-3.56) |
| Constant | 0.295 (5.48) | 0.279 (5.14) | 0.289 (5.35) | 0.291 (5.41) | 0.295 (5.50) |
| N | 82,832 | 82,832 | 82,832 | 82,832 | 82,832 |
| R ² | 45.99 | 44.78 | 45.84 | 46.12 | 46.09 |

The dependent variable is *MSell*, the number of sell recommendations issued by the analyst. *MLogSale* is the quarterly median of the log of sales. *MROA* is the quarterly median of the return on assets. *MB2M* is the quarterly median of the book to market ratio. *MDebt-to-Assets* is the quarterly median of the debt-equity ratio. *MCount* represents the quarterly median of the number of days between the forecast date and the earnings announcement date. *MOrder* is the quarterly median of the ratio of the number of forecast before the forecast of interest and the total number of forecasts for the firm and quarter. *MCoverage* is the number of firms followed by the analyst for a given calendar quarter. *MBrokerSize* is the size of analyst's employer during the given calendar quarter. *MBreadth* is the quarterly median of the log of the number of firms the analyst follows in the given quarter. *MLogPrice* is the quarterly median of the log of stock price.

Table 8: Market reaction to earnings forecasts, conditional on *SELLgood*

| | <i>BHR3d</i> | <i>BHR3d</i> |
|-----------------------|-------------------|--------------------|
| <i>Sellgood*ChExp</i> | -0.206 (-3.10) | -0.167 (-2.53) |
| <i>Sellgood</i> | 0.000 (0.13) | 0.000 (1.68) |
| <i>ChExp</i> | 2.502 (65.18) | 2.187 (58.60) |
| <i>Logsale</i> | | -0.006 (-13.39) |
| <i>ROA</i> | | -0.019 (-7.78) |
| <i>Book-to-Market</i> | | 0.037 (42.26) |
| <i>Debt-to-Asset</i> | | 0.030 (16.76) |
| <i>Count</i> | | 0.000 (14.22) |
| <i>Order</i> | | -0.000 (-5.31) |
| <i>Coverage</i> | | -0.012 (-31.08) |
| <i>BrokerSize</i> | | -0.001 (-1.78) |
| <i>Breadth</i> | | 0.000 (0.70) |
| <i>LogPrice</i> | | 0.025 (63.21) |
| N | 569,532 | 567,497 |
| R ² | 21.32 | 22.95 |

The dependent variable is the 3-day market return around the analyst forecast. *Sell* is the number of sell recommendations issued by the analyst in the previous year for other firms followed by the analyst. *ChExp* is the analyst forecast minus the expectations at the time of the forecast, scaled by price. Prior expectations are measured by the median forecast of the last three forecasts. *Sell*ChExp* is the interaction of *Sell* and *ChExp*. All variables are winsorized at the 0.5% level.

LogSale is the log of sales. *ROA* is the return on assets. *Book-to-Market* is the book to market ratio. *Debt-to-Assets* is the debt-equity ratio. *Count* represents the number of days between the forecast date and the earnings announcement date. *Order* is the ratio of the number of forecast before the forecast of interest and the total number of forecasts for the firm and quarter. *Coverage* is the log of the maximum number of analyst covering the firm in a given year. *BrokerSize* is the log of the number of analysts in the broker firm the analyst working for in the given quarter. *Breadth* is Log of the number of firms the analyst follows in the given quarter. *LogPrice* is the log of stock price.

Standard errors are corrected for heteroskedasticity and clustering of observations by firm. Analyst-firm and year fixed effects are included but not tabulated.

Table 9: Forecasts properties conditional on SELL

| | <i>Error</i> | <i>Bold</i> | <i>ChExp</i> |
|-----------------------|--------------------|---------------------|--------------------|
| <i>Sell</i> | 0.000 (0.62) | -0.000 (-0.11) | -0.000 (-0.07) |
| <i>LogSale</i> | -0.001 (-9.74) | 0.000 (9.09) | -0.000 (-9.07) |
| <i>ROA</i> | -0.013 (-15.86) | -0.000 (-1.69) | -0.002 (-10.06) |
| <i>Book-to-Market</i> | 0.007 (20.23) | 0.000 (4.30) | 0.000 (4.01) |
| <i>Debt-to-Assets</i> | 0.000 (0.40) | 0.001 (5.00) | 0.001 (4.67) |
| <i>Count</i> | -0.000 (-0.43) | 0.000 (9.68) | 0.000 (1.90) |
| <i>Order</i> | 0.000 (4.38) | -0.000 (-19.49) | 0.000 (17.43) |
| <i>Coverage</i> | -0.000 (-1.24) | 0.000 (7.32) | 0.000 (-7.62) |
| <i>BrokerSize</i> | 0.000 (2.37) | 0.000 (3.45) | -0.000 (-3.95) |
| <i>Breadth</i> | 0.000 (2.49) | 0.000 (4.87) | -0.000 (-2.44) |
| <i>LogPrice</i> | -0.006 (-40.17) | -0.003 (-101.75) | 0.002 (66.64) |
| N | 572,070 | 567,497 | 567,497 |
| R ² | 65.51 | 56.30 | 37.89 |

The dependent variables are *Error*, *Bold* and *ChExp* in columns 1 to 3 respectively. *Error* as the absolute value of the difference between the earnings forecast and its subsequent realization, scaled by stock price (scaling by the median *Error* for each 3-digit SIC industry yields similar results). *ChExp* is the analyst forecast minus the expectations at the time of the forecast, scaled by price. Prior expectations are measured by the median forecast for the last three forecasts. *Bold* is the absolute value of *ChExp*.

Sell is the number of sell recommendations issued by the analyst in the previous year for other firms followed by the analyst. *LogSale* is the log of sales. *ROA* is the return on assets. *Book-to-Market* is the book to market ratio. *Debt-to-Assets* is the debt-equity ratio. *Count* represents the number of days between the forecast date and the earnings announcement date. *Order* is the ratio of the number of forecast before the forecast of interest and the total number of forecasts for the firm and quarter. *Coverage* is the log of the maximum number of analyst covering the firm in a given year. *BrokerSize* is the log of the number of analysts in the broker firm the analyst working for in the given quarter. *Breadth* is the log of the number of firms the analyst follows in the given quarter. *LogPrice* is the log of stock price.

All variables are winsorized at the 1% level. Standard errors are corrected for heteroskedasticity and clustering of observations by firm. Analyst-firm and year fixed effects are included but not tabulated.

Table 10: Market reaction to earnings forecasts, conditional on *SELL* and *Error*

| | <i>BHR3d</i> |
|-----------------------|---------------------|
| <i>Sell*ChExp</i> | -0.089 (-2.45) |
| <i>Sell</i> | 0.000 (2.07) |
| <i>ChExp</i> | 18.531 (25.34) |
| <i>Error</i> | -0.076 (-7.36) |
| <i>Error*ChExp</i> | -15.955 (-22.33) |
| <i>Logsale</i> | -0.006 (-13.34) |
| <i>ROA</i> | -0.018 (-7.54) |
| <i>Book-to-Market</i> | 0.037 (41.90) |
| <i>Debt-to-Asset</i> | 0.029 (16.58) |
| <i>Count</i> | 0.000 (13.79) |
| <i>Order</i> | -0.000 (-5.68) |
| <i>Coverage</i> | -0.011 (-30.20) |
| <i>BrokerSize</i> | -0.001 (-1.72) |
| <i>Breadth</i> | 0.000 (0.67) |
| <i>LogPrice</i> | 0.025 (62.63) |
| N | 567,497 |
| R ² | 23.16 |

The dependent variable is the 3-day market return around the analyst forecast. *Sell* is the number of sell recommendations issued by the analyst in the previous year for other firms followed by the analyst. *ChExp* is the analyst forecast minus the expectations at the time of the forecast, scaled by price. Prior expectations are measured by the median forecast of the last three forecasts. *Sell*ChExp* is the interaction of *Sell* and *ChExp*. All variables are winsorized at the 0.5% level.

LogSale is the log of sales. *ROA* is the return on assets. *Book-to-Market* is the book to market ratio. *Debt-to-Assets* is the debt-equity ratio. *Count* represents the number of days between the forecast date and the earnings announcement date. *Order* is the ratio of the number of forecast before the forecast of interest and the total number

of forecasts for the firm and quarter. *Coverage* is the log of the maximum number of analyst covering the firm in a given year. *BrokerSize* is the log of the number of analysts in the broker firm the analyst working for in the given quarter. *Breadth* is Log of the number of firms the analyst follows in the given quarter. *LogPrice* is the log of stock price.

Standard errors are corrected for heteroskedasticity and clustering of observations by firm. Analyst-firm and year fixed effects are included but not tabulated.