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Can Investors Fully Adjust for Known Biases in Manager Communications?

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Abstract: Managerial communications often contain biased information because of managerial incentives and other influences. A common assumption in accounting literature is that if investors are aware of managerial biases, they will be able to fully adjust for those *known* biases when reacting to managerial communications. Drawing on insights from psychology, I experimentally document that investors are *not* able to *fully adjust* for known biases in managerial communications—even when investors know the quantitative amount of the manager's bias. Indeed, investors behave contrary to economic theory as they are unable to fully unravel the effects of known biases when rendering judgments about the firm. My study has implications for researchers, regulators, and investors.

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1. Introduction

Firm managers regularly provide information to current and potential investors. The venues for communicating this information include financial reports, conference calls, and press releases. These communications provide information for investors to make buy, sell, and hold decisions (Leuz and Verrecchia 2000). Although this information can inform investors, the information may be biased. Biased communications can be caused by many factors, including employment contracts tied to financial measures (Bamber, *et al.* 2010), performance expectations set by the market (Bernard and Skinner 1996; Daniel, *et al.* 2002), and financial reporting requirements (Aboody, *et al.* 2004). Although a common assumption is that investors can and will fully adjust for known biases (Dechow and Skinner 2000; Schipper 2007), my study challenges this assumption.

Providing data on the issue of whether investors will be able to fully unravel managerial bias is important for several reasons. First, most analytical models and empirical tests indicate that individuals are rational (i.e., Bayesian) information processors and, thus, will be able to successfully unravel managerial bias in earnings, voluntary disclosures, and other communications (Stein 1989). The literature notes that the only circumstances where unraveling is not likely is when information regarding the bias—such as the details of managerial incentives—is *not* available to investors (Dye 1988) or, if available, the information is too *coarse* to identify the bias (Kanodia, *et al.* 2004). Although these ideas appear to be widely accepted, to my knowledge, they have not been subject to empirical testing. Second, if investors (and others) are *not* able to fully adjust for known biases, their judgments about management and their communications are likely to be very different. For example, if investors cannot fully adjust for managerial incentives, they are likely to overvalue a firm when a highly incentivized manager provides positive news.

In this paper, I develop predictions based on two theories from psychology and then conduct an experiment to test the hypothesis that, in most cases, investors will be unable to fully adjust for *known* biases in managerial communications. Specifically, I first draw on theory indicating that individuals will automatically accept a communication as being truthful as part of the process of comprehending it (Gilbert 1991). This tendency, which I term the belief bias, indicates that individuals have a tendency to believe plausible information, even when other evidence suggests the information is unreliable or false (Evans, et al. 1983; Markovits and Nantel 1989). This result occurs because as individuals comprehend the information, they are overly focused on the content of the information and are not sufficiently attentive to indicators of the veracity of the information (Gilbert, et al. 1993; Burgoon, et al. 2008). I hypothesize that investors will be prone to the belief bias except in one limited circumstance—namely, when the bias in the communication is represented in quantitative terms *and* the investors' judgments also are in the same quantitative terms. In this circumstance, the investors' judgments are scale compatible with information about the bias (Fischer and Hawkins 1993; Tversky, *et al.* 1988; Slovic, et al. 1990). Scale compatibility theory from psychology suggests that investors should be able to fully adjust for managerial bias in circumstances where the managerial bias is explicitly quantified (i.e., known and precise) and investors render compatible quantifiable judgments.

I conduct an experiment using a 2×3 between-participants design. Study participants take the role of an investor who is working for an investment management firm and evaluating a company as a potential investment. I manipulate the valence of the company's communication (e.g., including an earnings forecast) at two levels—whether the company manager discloses favorable or unfavorable information that could potentially update the investor's evaluation of

the firm. In addition, I manipulate (at three levels) the degree to which the manager is known to be biased. In the low-bias condition, investors are told that the manager's prior disclosures have not been biased. The other two levels of this manipulation involve situations where investors know that the manager's prior forecasts have always been biased. The two high-bias conditions differ though, in whether the bias is described in qualitative or quantitative terms. In the highbias / qualitative information condition, the bias is described in only qualitative terms. In the high-bias / quantitative information condition, the bias is described, not only in qualitative terms, but also in quantitative terms (i.e., the actual earnings have always been five cents per share different from the manager's forecast). Thus, in this condition, investors should not only recognize that the information is unreliable but they precisely know the extent to which the information has always been biased.

I employ two main dependent measures. One measure asks study participants to generate a quantitative prediction of earnings for the period. In contrast, the second dependent measure asks a qualitative question—namely, how favorable the company's actual earnings will be. While both of these measures allow investors to assess the company's financial prospects for the year, the response scale differs between the two. This difference is important as it allows me to test investor susceptibility to the belief bias when the response scale matches or does not match the information about the manager's bias. An additional measure asks participants how likely they are to buy or sell shares in the company. This measure allows me to test the potential influence that the belief bias can have on investing decisions.

My experimental results reveal that, consistent with my predictions, investors have difficulty unraveling the implications of managerial bias. Further, my results show that this inability may be even stronger than I anticipated. Specifically, I document that investors in the

low-bias conditions render judgments that are consistent with the valence of the company's communication. That is, those receiving a favorable disclosure from the manager with no known biases forecast higher earnings and assess earnings as more favorable than those receiving an unfavorable disclosure. Here, investors (appropriately) believe that the disclosed information accurately reflects the economic realities of the company. For the high-bias conditions, when investors know that the firm manager is biased but are only provided with qualitative information regarding that bias, participants' judgments nevertheless reflect the biased information (i.e., they do not unravel the bias). As predicted, the latter occurs whether their responses are in a quantitative or qualitative form. Surprisingly, though, I find that when investors know that the firm manager is biased and also know the quantitative amount of that bias, investors are still unable to fully unravel the bias even when they are asked to provide a compatible quantitative forecast. In the latter situation, my predictions based on scale compatibility theory would suggest that investors should be able to fully unravel the manager's bias as the numerical amount of the bias is explicitly given (e.g. five cents per share) and the investor provides a revised forecast in a compatible quantitative format. Although study participants know the quantitative magnitude of the bias, they do not fully adjust for the bias in their judgments regarding the company. That is, both their qualitative and quantitative assessments of the firm do not fully account for the known biases in manager communications. This finding suggests the strength of the belief bias and the inherent difficulty in overcoming it.

The results for the investment decision are somewhat mixed. I find that, consistent with their earnings judgments, investors are more likely to invest when given favorable information as compared to unfavorable information when there is either low bias or there is high bias and the qualitative nature of that bias is known. That is, their investment decisions follow their beliefs

about earnings. However, when there is high bias and the precise quantitative nature of that bias is known, investors' decisions for both the favorable and unfavorable conditions do not differ. Further, they reveal that investors are unwilling to buy or sell any shares in the company. Given that the earnings judgments in this high bias / quantitative situation revealed that investors did not fully unravel the bias, it is somewhat surprisingly that these investment decision results do not show a similar pattern. One possible explanation, albeit *ex post*, for this apparent inconsistency between investor judgments and decisions, is based on decision-making research in psychology (Bastardi and Shafir 1998). This research suggests that, when outcomes are uncertain, the range of potential alternative outcomes play a role in an individual's decisions. In my experiment, I believe that the known quantitative nature of the bias becomes a salient reminder of the potential losses that investors might incur by choosing to invest in additional shares (or divest their current shares). Under this condition, participant judgments regarding potential earnings are similar to the high bias condition where only the qualitative nature of the bias is known, but when asked to make an investment choice the potential negative outcomes become a central focus for participants. This focus on negative potential outcomes reduces their willingness to buy or sell shares in the company- at least until they receive further information.

My paper advances the scholarly literature in economics, accounting and psychology. As previously noted, economic theory assumes that the market will fully unravel the effects of managerial bias if two conditions are met (Stein 1989). Specifically, investors must know about the bias and the information about it must be precise so that they can adjust for the bias. I find that even when investors have this information, they are unable to unravel it. Thus, my paper provides important insights regarding the boundaries of this important assumption made by economic scholars. Second, my paper adds to accounting research by providing possible insights

into research findings that appear to be inconsistent with economic intuition (Rogers and Stocken 2005; Piotroski and Roulstone 2004). For example, Barth, *et al.* (2010) show that analysts tend to rely on managers pro-forma earnings guidance despite managers' known incentives to opportunistically eliminate expenses from such guidance. My study suggests that this effect may be due to analysts' inability to fully discount for the known incentives of those managers. Third, my study adds to psychology literature by demonstrating another situation where judgment errors—due to biased information—are difficult to avoid. Gilbert, *et al.* (1993) suggests that unraveling can only occur when an individual devotes sufficient resources to the task, has sufficient logical abilities, and obtains the correct information. My study indicates that judgment errors are extremely difficult to avoid, even when these conditions appear to be met.

My paper has implications for researchers, regulators, and investors. For researchers, my study can allow them to make more-informed predictions regarding the influence of firm communications on investor judgments. For example, knowing that investors will not fully adjust for managerial incentives, researchers should expect investors to overvalue a firm when a highly incentivized manager provides positive news. My results suggest that analytical models in accounting may need to incorporate the impact that these biased communications have on investor judgments. For regulators, my study demonstrates that managerial communications can influence investor judgments despite obvious biases that reduce the reliability of these communications. Given the impact that biased communications can have on investor judgments in limiting the disclosure of unreliable information becomes ever more important. Finally, investors should be mindful of their tendency to underweight the bias found in managerial communications when making judgments.

The remainder of this paper is organized as follows. Section 2 provides the theoretical support for my predictions and hypothesis. Section 3 discusses my experimental methods and results. Section 4 offers concluding remarks.

2. Theory and Predictions

2.1 Economic Theory

Research in economics has long maintained that when investors can anticipate a firm manager's attempts to manage earnings, the investors will appropriately adjust for the earnings manipulation (Jensen 1986). Analytical models indicate that rational investors will fully update their beliefs (i.e., adjust for) expected reporting bias (e.g. earnings management) when the bias is known and when there is sufficient detail to analyze the bias (Stein 1989).

The typical mechanism for this updating is Bayes' theorem. Here, posterior beliefs are a function of prior beliefs and the likelihood ratio (Posterior beliefs = Prior beliefs × Likelihood Ratio). Prior beliefs refer to an individual's beliefs before receiving the new information. The likelihood ratio indicates the diagnosticity of new information for informing an individual's beliefs (Birnbaum and Stegner 1979; Beyth-Marom and Fischhoff 1983). Diagnosticity and, thus, the likelihood ratio are a function of the relevance and reliability of new information. That is, both the relevance and reliability of new information influence the degree to which an individual's prior beliefs should be updated to form his posterior beliefs. When the new information is either completely irrelevant or completely unreliable, the new information is non-diagnostic and an individual's posterior beliefs should be the same as his prior beliefs.

Accounting studies have long suggested that if rational, Bayesian investors know that information is biased and know the magnitude of that bias, they will find the efficient price for the firm (Fama 1970, 1998). That is, managerial bias is only problematic for investors when the

size and/or direction of the bias are unknown (Dechow and Skinner 2000; Richardson, *et al.* 2010). For example, when modeling earnings management (a specific example of bias in managerial communications), analytical researchers assert that all known information is incorporated into investor judgments (Dye 1988; Trueman and Titman 1988; Verrecchia 2001). Thus, these models predict that when investors know of a manager's propensity to bias information, the intended effects of earnings management (i.e. increasing the value of the firm) are unattainable.

Despite the maintained assumption that investors will be able to fully unravel managerial bias, several accounting studies reveal results that are consistent with investors failing to do so. While many of these studies offer different ideas for why this might occur, they are unable to test these ideas or are silent about why investors do not unravel. For example, Bamber, *et al.* (2010) find that firm managers often make predictably optimistic forecasts, but that analysts fail to fully adjust for this predictable bias in their own forecasts. This failure is attributed to a lack of sufficient resources on the part of analysts. Herrmann and Thomas (2005) attribute a similar result to some analysts being less informed, while Abarbanell and Lehavy (2003) are silent as to why analysts do not fully adjust (also see Barth, *et al.* 2010 and Hugon and Lin 2010). Bolton, *et al.* (2006) proposes that when investors are overconfident or inattentive, financially incentivized managers will benefit from opportunistically managing earnings. In their recent review of accounting anomalies, Richardson, *et al.* (2010) suggests that transaction costs can play a large role in non-normative investor behaviors.

In summary, despite fairly widespread acceptance of the assumption that investors will fully adjust for managerial bias, growing evidence suggests that investors are unable to fully

unravel managerial bias. The objective of my study is to provide theory and experimental evidence as to why this occurs.

2.2 Psychology Theory

Although the Bayesian framework is a useful tool in which to consider the impact of bias in a communication, it is silent on *whether* investors will or will not appropriately consider the bias. I turn to psychology to address this issue. Specifically, I draw on theory indicating that as an individual comes to comprehend new information, they automatically believe that information (Gilbert 1991). In this paper, I refer to this tendency as the belief bias (Markovits and Nantel 1989). Psychology research suggests that one of the primary reasons individuals are so susceptible to the belief bias is that believing is an automatic process that occurs as we acquire and learn new information. When comprehension occurs, individuals spontaneously accept the information received as truthful. The process of examining the merits and validity of new information occurs only after initially believing (Gilbert 1991). In other words, comprehension of new information and believing that information are not separable processes; rather, they occur simultaneously. For example, an investor may find an article about a firm's newly implemented manufacturing system that will reduce construction costs. The investor reads the information and, as part of comprehending it, automatically believes that the new system will reduce costs.

At first blush, this belief bias seems logical and rational (and, thus, does not seem to be a bias at all). However, the problem is that the information provided may be unreliable or even completely incorrect. Additional information or contemplation may suggest that an individual ought to reduce their belief in the information. Adjusting or reducing one's belief is not an automatic process and only occurs after the initial comprehension and belief that the information is truthful (Gilbert, *et al.* 1993). Even then, this deliberative process of challenging one's belief

does not necessarily override the initial belief (Wilson, *et al.* 2000). In other words, the initial, automatic belief can persist even in the presence of contrary evidence.

This belief bias is important as it can cause important changes in subsequent behavior. For example, new information often is interpreted so that it seems consistent with prior, albeit erroneous, beliefs (Russo, et al. 1996; Jones and Sugden 2001). Thus, individuals do not always question the content or source of new information, particularly without compelling and salient evidence that would suggest reassessing the initial information. Without ready access to contradicting information, an individual is prone to accepting the initial information as the truth and makes little attempt to find evidence contrary to his belief. For example, when a salesman details the superior features of a particular product, potential buyers often fail to adequately consider the salesman's incentives to only discuss favorable features of the product, ignoring the product's subpar characteristics (Gilinsky and Judd 1994). Thus, the potential buyer believes that the product is better than actually warranted. In this situation, the buyer fails to fully account for the bias caused by the salesman's incentives even though the incentives are known to produce a less reliable description of the product. In summary, the belief bias is a psychological phenomenon in which individuals have a tendency to believe information they learn even when additional evidence ought to cause one to question the reliability of that information (Evans, et al. 1983).

The belief bias is an innate tendency that has proven robust across multiple scenarios (Gilbert 1991). For example, individuals are influenced by feedback, even when that feedback is known to be invalid (Ross, Lepper, and Hubbard 1975). That is, individuals provided with positive (negative) feedback for a specific task, will assess their abilities are more (less) favorable on the task, despite knowing that the feedback provided is invalid. People seem to

have a propensity to begin by believing and only secondarily question the validity of information. It is perhaps not surprising that the effect has proven to be strong. Prior research has demonstrated that errors caused by innate (i.e., hard-wired) tendencies are rarely mitigated by incentivizing individuals (Camerer and Hogarth 1999).¹ Because the belief bias is a memory-based error (i.e., the individual cannot retract from memory the initial understanding of the communication), it is unlikely that incentives to increase one's effort or instructions to "think hard about the biased source" would succeed in eliminating the error (Arkes 1991). When individuals are unaware of the bias, increasing effort or thinking more about the task presented may increase confidence in the judgments. However, without knowledge of the bias, the cognitive bias will remain.

Drawing on other research in psychology—namely research on what is called the scalecompatibility effect (Slovic, *et al.* 1990; Tversky, *et al.* 1988)—I posit that there may be specific situations where the belief bias does not occur. Specifically, when the investor has information about the quantitative magnitude of the bias and his evaluation of the firm is in a compatible quantitative format (i.e., earnings forecast), then he may be able to fully correct for the known bias. For example, if an investor knows that earnings are biased upwards by five cents, he should adjust his own forecast downward by five cents as compared to the manager's forecast. I posit, however, that this full correction can only be possible where scale compatibility exists. That is to say, although the belief bias may not occur when the scales are compatible (i.e., quantitative measure of bias and quantitative response scale), I expect that the bias will always influence investor judgments if the response scale is not compatible. Accordingly, when making

¹ In accounting and finance, it is commonly argued that any errors in individuals' judgments will cancel out in a multi-person market setting. However, biased individual judgments have been previously shown to persist for extended periods and in the aggregate, resulting in biased market prices (Ganguly, *et al.* 1994).

qualitative assessments regarding a firm's earnings (e.g., favorability judgments of the

company's earnings), the investor's judgments will continue to demonstrate the belief bias.²

Taken together, this discussion leads to the following two-part hypothesis which is

graphically depicted in Figure 1:

Hypothesis 1a: Investors' judgments, both qualitative and quantitative, about the firm's future prospects will be higher (lower) in the favorable (unfavorable) conditions when managerial communications have low bias as compared to high bias.

Hypothesis 1b: Investors will only be able to fully adjust for biased information received from firm managers when the investors are provided with the quantitative value of manager's bias and are asked to make (scale-compatible) quantitative judgments about the firm's future prospects.

Insert Figure 1 here

3. Experiment and Results

3.1 Design and Participants

I conduct an experiment using a 2×3 between-participants design to test my hypothesis. Participants take the role of investors working for an investment management firm and are evaluating a specific company as a potential investment. Participants receive a press release provided by the chief executive officer (CEO) of the company. I vary, at two levels, whether the press release includes information that is favorable or unfavorable for the company's current year earnings. This information suggests to investors that an updated earnings forecast may be required. I also vary, at three levels, the extent of the manager's bias in the information being

² That scale compatibility is the key construct (and not the quantitative nature of the bias) is illustrated by a recent study on college admissions. Moore, *et al.* (2010) show that college admissions staff cannot fully unravel the influence that grade inflation has on an applicants' incoming grade point average, even though the admission officers have complete knowledge regarding the distribution of grades from the applicants' prior college. That is, they can unravel the grade inflation. Despite this ability, they nevertheless tend to admit those with higher (inflated) grade point averages. In other words, this study suggests that having access to the quantitative magnitude of the bias is insufficient to eliminate the cognitive bias.

communicated. In the low bias condition, investors are told that the prior managerial forecasts have provided fairly accurate information. In the two high bias conditions, investors are told that the manager has always issued biased forecasts. Specifically, they learn that the manager has always issued inaccurate forecasts and that these forecasts have always been either optimistic or pessimistic. As explained in more detail below, the two high bias conditions differ in whether or not the information about the bias includes the specific quantitative magnitude of the bias. The two information favorableness conditions and three bias conditions are crossed with participants being randomly assigned to the six experimental conditions.³

Participants are 150 Masters in Business Administration students enrolled in a top-20 business program. Sixty-two percent of these participants have previous experience with investing in common stock. In addition, participants in my study have on average 4.9 years of prior work experience and they have completed an average of 3.6 finance courses and 2.7 accounting courses. I believe that my participants possess the requisite accounting and financial knowledge to proxy for investors in my experimental task (Elliott, *et al.* 2007).

3.2 Materials, Manipulations, and Questions

Participants are provided with background information regarding the company being considered as an investment. The background material includes the consensus analyst forecast for the company from the *prior* month of \$1.26 per share. Participants are then given the press release from the company's chief executive officer (CEO). In the favorable (unfavorable) information conditions, the CEO's updated forecast is \$1.31 (\$1.21) for the year. Further, in the

³ I purposely do not employ a $2 \times 2 \times 2$ experimental design, where favorable/unfavorable information, low/high bias, and quantitative/qualitative information are varied as independent variables. Adding the extra two cells that my current design is omitting (i.e., low bias with quantitative information about bias) would not provide additional insights to my research objective.

favorable (unfavorable) condition, the CEO also provides several reasons why that the earnings per share forecast should be higher (lower) than the consensus forecast.

There are several important features of this favorable/unfavorable information manipulation. First, each of the reasons the CEO provides is stated in a way that suggests the reasons are based on the beliefs or expectations of company management. This approach allows the reasons to remain plausible in explaining potential updates to the company's earnings per share forecast without conveying the reasons as externally verifiable facts, such as emerging economic trends or known cost reductions (Hutton, *et al.* 2003). Using externally verifiable facts would not measure investors' responses to managerial beliefs but rather their responses to relevant and previously unknown facts. Since the information represents the beliefs of management, this information is subject to any managerial biases that exist. Second, the favorable and unfavorable conditions explanations are, to the extent possible, symmetric. For example, in the favorable conditions the CEO explains: "We believe that the company's profit margins will improve." Alternatively, in the unfavorable conditions the CEO explains: "We believe that the company's profit margins will weaken."

After reading the press release, participants are provided with the bias manipulation. I operationalize the bias by manipulating the historical accuracy of the CEO's forecasts. Specifically, in the low bias condition, the investor knows that the CEO has provided fairly accurate forecasts in the past. In the high bias / qualitative information condition, the investor is told that the prior forecast updates have always been fairly inaccurate. Finally in the high bias / quantitative information condition, the investor knows that the CEO's updates have always been fairly inaccurate and that the actual earnings have always differed by exactly \$0.05 per share. In

both of the high bias conditions, the CEO is known to have provided forecasts that were consistently biased in the same direction.⁴

After being presented with this information, all participants then respond to the two primary dependent measures. First, they provide a qualitative assessment of the company's earnings for the current year on a scale from 0 (very unfavorable) to 100 (very favorable). Next, using an open-ended scale, they provide their own forecast for company's current-year earnings per share (a quantitative measure). In addition, I ask two questions regarding decisions that the participants would likely make regarding the company's stock. These questions provide information regarding how the belief bias may influence investment decisions. First, I ask participants to consider how likely they would be to buy or sell shares in the company. For this question, participants respond on a scale with endpoints of -50 (very likely to sell) and 50 (very likely to buy). The mid-point on the scale, zero, is labeled as "not at all likely to buy or sell." Participants were also asked a second question regarding their potential investment decision. This second question asks participants how many shares they would buy or sell given they had enough funds to buy 10,000 shares of the company.

I also ask participants a series of additional questions that capture participants' beliefs about the company and management of the company. These questions are used to further verify the underlying theory regarding the belief bias. Finally, I ask several manipulation check questions and also collect demographic data.

⁴ For two reasons, I do not use financial incentives to operationalize the bias manipulation. First, it is difficult, if not impossible, to manipulate managerial incentives and also retain a fully crossed experimental design. That is, incentives leading to high bias for favorable forecasts (e.g., bonus paid based on expected stock price) are typically different from those incentives leading to high bias for unfavorable forecasts (e.g., stock options with a strike price based on expected stock price). In my design, I am able to use the same type of bias in both the favorable and unfavorable information conditions. Second, manipulating financial incentives does not allow me to argue that the bias is completely uninformative. That is, to test whether investors fully adjust for bias in managerial communications, the bias must render the disclosed information entirely unreliable. Even when managers have financial incentives to bias, the information they report may contain some degree of information content.

3.3 Manipulation Checks

To check the favorable versus unfavorable forecast manipulation, I asked participants whether the CEO's press release provided positive or negative information about the firm. Ninety-seven percent of participants responded correctly to this question. Further, the correct responses were significantly associated with the experimental condition ($\chi^2 = 138.46$, p < 0.01), indicating the effectiveness of this manipulation. To check the level of bias (low bias, high bias / qualitative information, and high bias / quantitative information), I asked two questions—first, whether the firm's CEO has historically been accurate or inaccurate and, second, whether the participants knew the precise magnitude of the CEO's prior misstatement (whether his forecast had always been different by \$0.05 from the actual realization of earnings). Ninety-one percent and ninety-five percent of participants responded to the first and second questions, respectively. These correct responses are also associated with experimental condition ($\chi^2 = 133.65$, p < 0.01 and $\chi^2 = 116.14$, p < 0.01), suggesting that my bias manipulation was effective.

3.4 Hypothesis Test Results

To test my hypothesis, I employ a 2×3 between-participants' analysis of variance (ANOVA). I estimate this model separately for the qualitative and quantitative dependent measures and for the likelihood of that each investor will buy or sell shares in the company.⁵

Panel A of Table 1 provides the means and standard deviations by condition for participants' judgments. Panel B provides the ANOVA results. Panel C details results from the simple-main effects tests. These tests provide the most direct evidence for my hypothesis. Figure 2 graphically displays these results.

⁵ Recall that I asked two questions capturing an investment decision. Not surprisingly the results from these two questions are highly correlated, so the results are similar. Using the second investment decision question does not change any of the inferences made in this paper. For that reason, I limit the discussion to the question asking participants about the likelihood of buying or selling shares in the company.

Insert Table 1 and Figure 2 here

Recall that my hypothesis indicates an interaction between the favorability of information and bias. In particular, I expect investor' judgments to be more favorable (unfavorable) when managers provide favorable (unfavorable) information under conditions of low bias as compared to high bias (H1a). While I expect investors' judgments to be influenced less when the bias is high as compared to when the bias is low, I do not expect that they will always be able to fully unravel the influence of managerial bias (H1b). The only circumstance where I hypothesize that investors will be able to fully unravel the managerial bias is when the quantitative value of the bias is known and investors render a compatible quantitative response. With this overall prediction, I expect significant simple main effect tests between the favorable/unfavorable information conditions for each level of bias for all of the dependent variables with one exception—namely, the high bias / quantitative condition where the investor renders a quantitative response (i.e., an EPS estimate) that matches the quantitative nature of the bias information. That is, if the effects of scale-compatibility allow investors to fully unravel, there will be no difference between the favorable and unfavorable condition when the bias is precisely known (i.e. in the high bias / quantitative conditions).

As shown in Table 1, the ANOVAs for both earnings measures and the investment decision reveal statistically significant interactions (all *p*-values ≤ 0.02), consistent with my predictions. Turning first to investors' qualitative earnings judgments, recall my hypothesis suggests that although investors will respond to the bias in the information provided by the CEO, their judgments will never show full adjustment for the managerial bias. That is, the qualitative earnings judgments in the favorable and unfavorable conditions will never be statistically equivalent. To test this idea, I examine the simple main effects of favorable/unfavorable

information holding constant the level of bias. As expected based on psychology theory concerning the belief bias, the simple main effects are significant for each bias condition (all *p*-values ≤ 0.01). These qualitative judgments are more positive in the favorable than the unfavorable information conditions whether there is low bias (69.12 versus 39.68), high bias with only qualitative information about the bias (63.28 versus 43.44), or high bias with quantitative information about the bias (63.20 versus 51.44). Importantly, even when investors know the precise amount of bias that is always included in the manager's forecast (i.e. the high bias / quantitative information conditions), investors' qualitative judgments do not sufficiently adjust for the bias.

Turning next to investors' quantitative earnings judgments—that is, their EPS judgments—I again observe an interaction between bias and favorability of the information from the CEO (F = 5.05, p = 0.01). Examining the simple main effect tests shows, as expected, a difference in investors' responses to favorable and unfavorable information for low bias (\$1.30 versus \$1.22) and high bias when the bias is described in only qualitative terms (\$1.28 versus \$1.23) (both *p*-values < 0.01). Surprisingly, though, I also observe a significant simple main effect for the high bias / quantitative condition. That is, investors' quantitative EPS forecasts differ between the favorable and unfavorable conditions even when the precise quantitative nature of the bias is known (\$1.28 versus \$1.23) (p < 0.01). This result is surprising as scalecompatibility theory suggests that full unraveling should occur in this situation. This result does not support my hypothesis, but does suggest that the belief bias represents a powerful force on investor judgments.

Finally, I examine the results for two decision-oriented questions. Recall that these two questions asked participants how likely they were to buy or sell shares and also how many shares

they would buy or sell (assuming they had sufficient funds to buy 10,000 shares). Responses to these two questions were highly correlated (correlation coefficient of 0.89) and the pattern of results is virtually identical. Accordingly, I limit the discussion here to the question asking participants about the likelihood of their buying or selling shares in the company. As shown in Panel A of Table 1, once again I find a significant interaction between bias and favorable/ unfavorable information using this investment decision as the dependent variable (F = 6.95, p <0.01). As with the previous measures, I examine the simple main effects to investigate the degree to which investors are able to adjust for known biases in information provided by the CEO. I find that, holding constant the level of bias and comparing responses to favorable versus unfavorable information, investment decisions significantly differ for the low bias (10.00 versus -9.12) and high bias / qualitative (11.48 versus -9.28) conditions (both p-values < 0.01). However, in the high bias / quantitative condition, the investment decisions were not statistically different between the favorable and unfavorable information conditions (1.04 versus -0.52, p =0.70). These findings seem at odds with the prior results. That is, although I did not observe full unraveling in the quantitative earnings judgments, participants' investment decisions may, in a limited circumstance, fully adjust for known managerial biases. I will return to this result in section 3.6.

3.5 Path Analysis

Recall that my predictions are based on the idea that investors are likely to automatically believe information presented by firm managers, even though other information suggests that it is biased. These investors are, in most instances, unable to fully unravel the effects of the bias. To test that it is, in fact, the believability of information driving my results, I estimate a path model using structural equation modeling techniques. Path analysis is a widely accepted method

of modeling and testing the effects that manipulated variables have on dependent variables (see Towry 2003; and Koonce, McAnally, and Mercer 2005 for examples of similar testing in accounting research). Importantly, path analysis allows me to simultaneously test both the direct and indirect effects within the model. Figure 3 shows the general form of the model that I am testing.

Insert Figure 3 here

In my model, there are two potential indirect pathways from my independent variables (favorability of information, level of bias, and the interaction of favorability and bias) to earnings judgments. The belief bias would suggest that earnings judgments are primarily influenced by the believability of manager explanations (i.e. the content of the message) and not by the credibility of the manager (i.e. a judgment concerning the veracity of the message). Thus, I include both of these pathways in my model but expect, based on the belief bias, that only the indirect pathway through the believability of manager explanations will be statistically significant.

To conclude that investors are unable to fully adjust their earnings judgments because of the believability of manager explanations, I must observe a significant indirect effect from the interaction of my independent variables (favorability × bias) to the earnings judgment via link 1 and link 2 (as shown in Figure 3). A significant indirect link from favorability × bias to the earnings judgment via link 4 and link 5 would indicate that the credibility of the manager mediates, at least in part, the relationship observed between those variables. In addition, a significant result for link 3 would represent a direct effect from favorability × bias to the earnings judgment. Observing a significant direct effect does not necessarily contradict the belief bias;

however, it suggests there may be factors in addition to believability of manager explanations that impact investor judgments.

To measure the believability of manager explanations, I asked participants to indicate the degree to which the reasons provided by the CEO in the company's press release were believable. The 101-point response scale had endpoints of 0 (not at all believable) and 100 (very believable).⁶ To appropriately analyze this response, I reverse scored the believability responses in the unfavorable conditions. For example, a strong belief in the unfavorable CEO information condition (i.e., a believability measure recorded as 80) is coded with a negative sign (i.e., -80). This reverse scoring is necessary to capture the hypothesized correlation between stronger believability in management's information (whether it is favorable or unfavorable information) and more extreme (favorable or unfavorable) earnings judgments. To construct a measure of the credibility of the manager I aggregate participant responses from two separate questions. Participants assess both the trustworthiness and competence of the CEO on a scale from 0 to 100. The endpoints from the trustworthiness (competence) scale were not at all trustworthy (competent) and very trustworthy (competent). Participant ratings from these two questions are equally weighted in calculating the credibility measure, consistent with prior research in accounting (Mercer 2005).

Results for these believability and credibility measures are tallied in Panel A of Table 2, with the corresponding statistics shown in Panel B.

⁶ I acknowledge that this measure relies on participants having knowledge of their beliefs and then accurately reporting those beliefs. Arguably, both of these tasks may be difficult as beliefs are difficult to quantify and subconscious beliefs may exist that are, by their very nature, difficult to measure or report. To the extent that these factors influence this variable, it works against my finding significant results in this path model as measurement noise would be increased.

Insert Table 2 and Figure 4 here

I estimate the model described previously two times—once for the qualitative earnings judgment and once for the quantitative earnings judgment with results regarding the significance of each path in the two models described in Figure 4. Turning first to the qualitative earnings measure, I begin by testing the fit of the model. I find an acceptable model fit as the chi-square test of model fit demonstrates a *p*-value above 0.05 ($\chi^2 = 0.82$, p = 0.36) and the comparative fit index (CFI) of the model is 1.00, above the accepted cutoff value of 0.95 (Hu and Bentler 1999).

Results for the indirect effects of the favorability × bias interaction to the qualitative earnings judgment via the believability of manager explanations are consistent with predictions based on the belief bias (Links 1 and 2 together are significant at p = 0.06). This finding is consistent with my theory, suggesting that the believability of managerial explanations plays a significant role in investor's qualitative judgments. Also consistent with my theory, the indirect effect via the credibility of the manager is not significant (Links 4 and 5 together are insignificant at p = 0.31). Finally, the favorability × bias interaction has a significant direct effect on the qualitative earnings judgments (p = 0.02, link 3), suggesting that additional processes may also mediate this pathway.⁷

Now turning to the model using the quantitative earnings measures, I again find that the chi-square test of model fit indicates an acceptable fit ($\chi^2 = 0.82$, p = 0.36). The comparative fit index (CFI) of the model is also at an acceptable level of 1.00. I find that the pattern of results for the quantitative earning judgments is similar to, albeit somewhat weaker than, the qualitative

⁷ I collect participants' self-reported ratings for other factors that are known to influence investor judgments. These variables include the risk associated with the company and the ease of forecasting future earnings for the company. Based on the theory developed in this paper, I do not expect to find (and do not find) that any of these variables significantly mediate the relationship between my independent variables and investor judgments.

judgment results just discussed. The indirect effects from favorability × bias to the quantitative earnings judgment is statistically weaker (Links 1 and 2 together have a p = 0.14 as compared to p = 0.06 using qualitative earnings judgments). The indirect effect via the credibility of the manager is clearly insignificant (Links 4 and 5 together, p = 0.62).

In summary, my findings using path analysis are largely consistent with the predictions based on the belief bias. Investors' inability to fully adjust for known managerial bias appears to be driven by the believability of the information provided. Investors do not adequately adjust their judgments for the unreliability in information even when the factors causing that unreliability (e.g., managerial biases) are fully known.

3.6 Possible Reconciliation of Results for Judgments and Investment Decisions

Recall that my results show that unraveling does not occur even in the situation where I hypothesized that it would—namely, the high-bias / quantitative conditions where the participants' responses were in a quantitative format. There, I observe that quantitative judgments in the favorable information condition are more favorable than those in the unfavorable condition. Although this result is inconsistent with my predictions, I did also document behavior that appears consistent with complete unraveling when I examine investment decision results. As shown in Figure 2, participants' decisions regarding investing in shares or divesting their current shares are statistically identical and do not depend on the favorableness of the information.

This finding is unexpected but not necessarily inconsistent with prior findings in decision-making research. Specifically, as participants are making their investment decision, the quantitative value of the bias is a salient reminder that gains or losses from investments are uncertain. Recall that the quantitative value of the bias (i.e. managers forecasts are always off by \$0.05/share) is only known in the high bias / quantitative conditions. As an *ex post* explanation

for the apparent discrepancy between participants' earnings judgments and investment decisions in this condition, I conjecture that when participants are asked to make their investment choice, this salient feature highlights the potential negative alternative outcomes that could result. Specifically, for the favorable condition investing in shares today may result in a future loss (perhaps because of unpredictable changes to the company's operating environment) even though my initial judgments suggest increasing my current level of holdings in the company. Similarly, participants in the unfavorable condition would consider the potentially negative consequences should they sell their current shares only to see the share price of the company subsequently increase. Importantly, these negative alternatives are not considered until participants are asked for their investment decisions. Thus, they do not influence participants' judgments regarding expected earnings for the company (which do not fully adjust for the known bias), they only reduce participants' willingness to buy or sell shares in the company at the present time. Note that while the current investment decisions are shown to be less extreme, the biased judgments found may still persist and influence future decisions. This is consistent with prior research in decision-making suggesting that the nature of the potential alternatives being considered will influence an individual's decisions. This is particularly important when there is uncertainty regarding the information used in making those decisions (Bastardi and Shafir 1998).

4. Conclusion

A long-standing assumption in both economics and accounting is that investors will fully adjust for known biases in reported information. My study challenges this assumption. I show that investors underweight the impact that managerial bias has on information communicated and, in all cases studied, are unable to correct their judgments for this innate tendency. Relaxing the assumption that investors will fully adjust for managerial bias, I hope to assist researchers in

developing more predictive models and in providing additional explanations for empirical findings. Understanding how investors respond to managerial communications also has important implications for regulators and investors. One of primary roles of regulators is to ensure useful information is provided to market participants. My study serves to emphasize the importance of managers providing reliable information and cautions against the tendency of investors to underestimate or ignore important biases in financial reporting settings.

The belief bias can have a significant influence on investor judgments. I show that this bias even overwhelms the potentially debiasing impact of scale compatibility. It would appear that the influence of the belief bias is extremely difficult to reverse. Even in cases where one would expect participants to be the least susceptible (i.e. the bias is known with precision and the response scale matches the bias scale), investor judgments do not unravel for this bias. My results indicate that this inability of investors to unravel biases can play a significant role in investment decisions. Specifically, when investors place an inordinate amount of emphasis on unreliable information, it influences their qualitative assessments of firms. I demonstrate that these qualitative assessments have a significant impact on investment decisions. In my study, these qualitative assessments have a much stronger influence on investment decisions than do investors' quantitative earnings assessments.

Finally, my study adds to the evidence suggesting that investors are unable to fully unravel managerial bias. While acknowledging that prior studies offer some plausible reasons for investors' inability to fully adjust, I show that even when the typical constraints to investors unraveling abilities are lifted (e.g. investors have all information about the firm and managerial biases, they have sufficient time and resources, and there are no transaction costs), investors will still fail to fully adjust for managerial bias. A fruitful area of future research may be in exploring

any avenues that may help investors to overcome the influence of this pervasive bias. Additionally, future research could help bring clarity to the noted discrepancy between investor judgments and investment decisions. Determining when these judgments are most likely to be misaligned and whether the differences noted persist in future decisions may provide extremely fertile grounds for further research.

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Figure 1: Predicted results—investors' qualitative earnings judgments (favorability of earnings) and quantitative earnings judgments (EPS estimates) regarding the current year's earnings by experimental condition



I. Qualitative Earnings Judgments

II. Quantitative Earnings Judgments

This figure pictorially represents my experimental predictions for the two earnings judgments participants are asked to make. The first (second) diagram shows the expected results for the qualitative (quantitative) earnings measure. These diagrams are used to test my hypothesis as described below.

Hypothesis 1a suggests that when the managerial bias is unknown (i.e. in the low bias conditions for both diagrams above) investor judgments are influenced by the type of information communicated, either favorable or unfavorable information.

Hypothesis 1b details how investors will be unable to adjust for the known bias in managerial communications, except in one specific instance. Investors may fully unravel the bias when they know the precise magnitude of the bias and then make compatible quantitative judgments regarding the company's earnings per share (i.e. in diagram II above for the high bias / quantitative information conditions).

Figure 2: Actual results- investors' qualitative earnings judgments (favorability of earnings), quantitative earnings judgments (EPS estimates), and investment decisions (likelihood of investment) by experimental condition



I. Qualitative Earnings Judgments

II. Quantitative Earnings Judgments

III. Investment Decision



These diagrams display the actual results from my experiment and indicate that investors are unable to fully adjust for known bias in manager communications for any earnings-related judgment. See table 1 for descriptions of the variables and statistical tests corresponding to each of these measures Figure 3: Structural Equation Model as Predicted by the Belief Bias



Figure 3 depicts the causal model as predicted by the belief bias. The belief bias suggests that investors focus on the believability of managerial explanations and pay insufficient attention to the reliability of those explanations. Thus, the model predicts that the believability judgments will significantly impact earnings judgments while judgments concerning the credibility of management will not significantly impact earnings judgments.

Figure 4: Structural Equation Model Results



Figure 3 provides a graphical representation of the relevant results of the path analysis employed in this study. Two independent models were analyzed. The first includes the qualitative earnings measure as the earnings judgement variable and the second includes the quantitative earnings measure as the earnings judgment variable. Structural equation analysis was performed using mPlus software. The findings support my predictions and provide evidence that investors' judgments are influenced by the belief bias. Direct effects from the independent variables (level of bias and information favorability) to all dependent measures are included in the analysis of the model. To reduce the clutter in the diagram these variables are not included above.

TABLE 1: Main Experimental Results

	Qualitative Earnings Measure		Quantitati Mea	ve Earnings asure	Likely to Buy or Sell Shares		
	Favorable Forecast	Unfavorable Forecast	Favorable Forecast	Unfavorable Forecast	Favorable Forecast	Unfavorable Forecast	
Low Bias / Qualitative	69.12 (13.47) (n=25)	39.68 (17.17) (n=25)	1.30 (0.02) (n=25)	1.22 (0.02) (n=25)	10.00 (14.86) (n=25)	-9.12 (16.94) (n=25)	
High Bias / Qualitative	63.28 (16.76) (n=25)	43.44 (12.13) (n=25)	1.28 (0.04) (n=25)	1.23 (0.03) (n=25)	11.48 (11.17) (n=25)	-9.28 (15.17) (n=25)	
High Bias / Quantitative	63.20 (16.71) (n=25)	51.44 (15.24) (n=25)	1.28 (0.03) (n=25)	1.23 (0.04) (n=25)	1.04 (14.77) (n=25)	-0.52 (11.92) (n=25)	

	PANEL A:	Descrip	otive Statistics-	-Means (S	Standard	Deviations)	
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PANEL B: Main ANOVA Results

Source	Qualitative Earnings			Quantitative Earnings				Likely to Buy or		
	Measure			Measure			Sell Shares			
	Two-tailed		Two-tailed					Two-tailed		
	df	Statistic	<i>p</i> -value	df	Statistic	<i>p</i> -value	df	Statistic	<i>p</i> -value	
Favorability of Forecast	1	F=65.79	< 0.01	1	F=155.4	< 0.01	1	F=35.11	<0.01	
Level of Bias	2	F=0.89	0.41	2	F=0.45	0.64	2	F=0.05	0.95	
Favorability × Bias	2	F=4.15	0.02	2	F=5.05	0.01	2	F=6.95	<0.01	

	Qualitative Earnings Measure			Quantitative Earnings				Likely to Buy or		
				Measure			Sell Shares			
			Two-tailed			Two-tailed			Two-tailed	
	df	Statistic	<i>p</i> -value	df	Statistic	<i>p</i> -value	df	Statistic	<i>p</i> -value	
Comparing Unfavorable versus Favorable Forecast:										
Low Bias / Qualitative	1	F=45.91	< 0.01	1	F=94.36	< 0.01	1	F=22.42	< 0.01	
High Bias / Qualitative	1	F=20.85	< 0.01	1	F=42.04	< 0.01	1	F=26.43	< 0.01	
High Bias / Quantitative	1	F=7.33	0.01	1	F=29.07	< 0.01	1	F=0.15	0.70	
Comparing Across All Levels of Bias:										
Favorable Forecast	2	F=1.22	0.30	2	F=4.16	0.02	2	F=3.91	0.02	
Unfavorable Forecast	2	F=3.82	0.02	2	F=1.35	0.26	2	F=3.08	0.05	

PANEL C: Planned Contrast and Simple Main Effect Tests

Table 1 shows descriptive statistics and analysis for the three dependent measure questions discussed in my results. In my 2×3 experiment, I manipulate the information favorability of a company's press release (favorable or unfavorable) and level of bias for the company's CEO (low bias, high bias / qualitative, and high bias / quantitative). The qualitative earnings question asks participants to rate the favorability of the company's current net income. The quantitative earnings question asks participants to provide an earnings per share estimate for the company's current year. Lastly, the third question asks participants to indicate how likely they would be to buy or sell shares in the company based on the information provided.

PANEL A: Descriptive Statistics—Means (Standard Deviations)									
	Believability Expla	y of Manager nations	Credibility of Manager						
	Favorable Forecast	Unfavorable Forecast	Favorable Forecast	Unfavorable Forecast					
Low Bias / Qualitative	65.13 (17.31) (n=24)	-66.48 (17.17) (n=25)	64.68 (13.61) (n=25)	-68.04 (14.26) (n=25)					
High Bias / Qualitative	58.52 (17.12) (n=25)	-66.20 (16.56) (n=25)	49.22 (16.74) (n=25)	-46.84 (12.11) (n=25)					
High Bias / Quantitative	45.24 (22.26) (n=25)	-56.68 (23.71) (n=25)	48.64 (14.88) (n=25)	-47.67 (15.73) (n=24)					

TABLE 2: Believability of Manager Explanations and Credibility of Manager Measures

PANEL B: ANOVA Results

Source		elievability Explan	of Manager ations		Credibility of Manager		
		Statistic	Two-tailed <i>p</i> -value	df	Statistic	Two-tailed <i>p</i> -value	
Favorability of Forecast	1	F=1433	<0.01	1	F=2045	<0.01	
Level of Bias	2	F=0.87	0.42	2	F=0.52	0.59	
Favorability × Bias	2	F=8.10	<0.01	2	F=25.92	< 0.01	

Table 2 shows descriptive statistics and analysis for the believability of manager explanations and the credibility of manager measures discussed in my results and analyzed in my structural equation model. The believability question asks participants to rate the believability of the CEO's explanations provided in the company's press release on a scale from 0 (not at all believable) to 100 (very believable). The credibility measure is an aggregate measure from two questions in the experimental materials. Participants assess the trustworthiness and competence of the CEO on a scale from 0 (not at all trustworthy/competent) to 100 (very trustworthy/competent). These two scores are equally weighted in calculating the credibility score, consistent with prior research in accounting (Mercer 2005). I reverse score both of these measures in order to use the ANOVA results to demonstrate a pattern of results consistent with the earnings judgments as recorded in table one.

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