

## Who Believes the Hype? An Experimental Examination of How Language Affects Investor Judgments

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### ABSTRACT

This paper investigates the effect of vivid language on investor judgments. Recent research finds that investor judgments are significantly influenced by disclosure tone (positive versus negative). Holding tone constant, we investigate investors' reactions to vivid versus pallid information. Drawing on theories from psychology, we predict that investors will be sensitive to the differences between vivid and pallid language when the underlying information is preference inconsistent, but not when the information is preference consistent. Results of two experiments support our prediction. Vivid language significantly influences the judgment of investors who hold contrarian positions (i.e., short investors in a bull market and long investors in a bear market). Interestingly, vivid language has limited influence on the judgment of investors who hold positions consistent with the general tenor of the market. Our results provide evidence regarding *when* vividness matters and *when* it does not in financial contexts, thereby contributing to both psychology and a growing

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literature on disclosure tone in financial reporting. In addition, our results also speak to concerns raised by regulators and academics asserting that vivid language can inflate bubbles and incite panics.

### *1. Introduction*

Although we often think of financial reporting in terms of numbers, language is, in fact, the medium through which companies communicate much of the information on their past and projected future performance. Annual reports include management discussion and analysis, and companies' financial numbers are extensively discussed in earnings announcements, shareholder meetings, conference calls, and the financial press. Though traditional research has largely focused on numerical financial information, recent efforts have begun to explore the broader realm of non-numerical information that accompanies financial statements (e.g., Baginski, Hassell, and Kimbrough [2004]). A related line of research is the burgeoning literature using computational linguistic analysis to explore how the tone of the printed and spoken words in financial reporting conveys information incremental to that contained in the financial statements (e.g., Tetlock [2007], Tetlock, Saar-Tsechansky, and Macskassy [2008], Demers and Vega [2010], Feldman et al. [2010], Mayew and Venkatachalam [2009], Li [2010])). As these studies suggest, the "soft" words used in financial reporting contain information that is not completely subsumed by the "hard" numbers produced by the financial accounting system.

In this paper, we contribute to the literature on tone and non-numerical information by investigating the influence of vivid language on investor judgments. By vivid language, we mean language that is "(a) emotionally interesting, (b) concrete and imagery-provoking, and (c) proximate in a sensory, temporal, or spatial way" as opposed to being more bland, sterile, or less emotionally charged (Nisbett and Ross [1980], p. 45). Because words are inherently less objective than numbers, concerns have been raised that this subjectivity in language gets used (or abused) in ways that unduly influence the behavior of investors and exacerbate swings in investor sentiment during bull and bear markets (Sorley [1998], Shiller [2000], Ball [2009], U.K. Treasury [2009])). Our research responds to these concerns by examining how vivid language influences investor judgments.

The idea that vividly presented information can be more persuasive and impact judgments more strongly has its roots in psychology (Nisbett and Ross [1980]), and prior psychological studies have examined the effects of vividness in a wide variety of contexts. However, despite the intuitive appeal of how vivid language can affect judgments, the results of these studies are mixed (see Taylor and Thompson [1982], Smith and Shaffer [2000] for reviews), and so fail to provide clear evidence suggesting that vivid language can cause or exacerbate swings in investor sentiment. Moreover, these studies have typically focused on nonfinancial settings, in which important institutional features inherent in financial markets that may

affect investor judgments (e.g., monetary stakes) are absent. In this paper, we draw on more recent theoretical advances in psychology to argue that, in financial contexts, vivid language can interact with investment position to exacerbate swings in investor judgments, though not necessarily in the way implied by conventional wisdom.

Specifically, research in psychology has shown that directional preferences can influence how information gets processed (Kunda [1990]), and recent research in accounting and finance has provided clear evidence that the positions investors and traders hold cause them to be motivated reasoners (Hales [2007], Ko and Hansch [2009], Seybert and Bloomfield [2009], Han and Tan [2010], Thayer [2010]). One of the important findings in this literature is that attention is not uniformly applied to all pieces of information. Instead, people exhibit “motivated sensitivity” to information; that is, people become sensitive to, and tend to scrutinize, information that is *inconsistent* with their directional preferences, but tend to accept, with relatively little scrutiny, information that is *consistent* with their preferences (Ditto and Lopez [1992], Ditto et al. [1998], Dawson, Gilovich, and Regan [2002], Ditto et al. [2003]). Drawing on this research, we predict that the motivation to scrutinize information will cause investors to be more sensitive to differences in language (e.g., whether the language is vivid or pallid).

To examine how motivated sensitivity to information influences investor beliefs, we conduct two experiments in which participants receive both numerical and non-numerical information about a company. The numerical information is presented in the form of detailed financial statements and analyst forecasts, whereas the non-numerical information consists of a series of news flashes. Participants are randomly assigned to a long- or short-investment position in the company, which creates directional preferences for hearing good or bad news about the company. Holding the numerical information constant, we manipulate whether investors receive vivid or pallid news flashes about the company in which they have a position. We then elicit participants’ forecasts of the company’s future earnings growth and compensate them based on the accuracy of their forecasts.

In our first experiment, we present participants with predominantly positive news flashes, reflecting the information environment that can occur in a bull market.<sup>1</sup> In this setting, we expect to see little difference in the beliefs of participants assigned to long positions, regardless of whether the preference-consistent positive news is presented using vivid or pallid language. In contrast, we expect to see a stronger influence of vivid language on participants assigned to short positions. Because positive news about

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<sup>1</sup>While we acknowledge that many macroeconomic and market-level factors could contribute to bull versus bear markets, we use bull and bear markets largely as an expositional convenience when referring to situations in which the prevailing news content has a predominantly positive or negative tone, respectively.

the company they have shorted is inconsistent with their preferences, psychological theory on motivated sensitivity predicts that participants with short positions will more deeply process the information in the news flashes than will participants with long positions, causing their judgments to be more sensitive to the subtleties of the language chosen to express the news. While we expect short investors who receive pallid positive news about the company to discount that information and continue to hold relatively pessimistic views about the company's future prospects, we expect short investors who receive vivid positive news about the company to be more influenced by that information, making it more difficult for them to maintain a pessimistic view about that company's future prospects. To be clear, we are not predicting a main effect of vivid/pallid information. Instead, we are arguing that long and short investors will be differentially affected by vivid/pallid information, such that a specific, ordinal interaction will be the key test of our theory.

The results of our first experiment are consistent with our predictions. The growth forecasts of long investors are equally high, regardless of whether the preference-consistent positive news about the company is depicted using vivid or pallid language. In contrast, the growth forecasts of short investors are affected by vividness: they forecast significantly higher earnings growth for the company when the preference-inconsistent positive news about the company is presented vividly than when it is presented pallidly. While these results support the concern that vivid language can contribute to positive investor sentiment in a bull market, note that vivid language does not influence sentiment by directly inflating the expectations of long investors (whose reasoning processes will permit them to see *any* positive news as good news without the need to consider the nuances of word choice). Instead, we see that vivid language affects investor sentiment by making it harder for short investors to hold pessimistic beliefs about the prospects of the company.

While the results of our first experiment are consistent with motivated sensitivity theory, an alternative explanation is that holding a short position might induce investors to scrutinize information for reasons other than motivated sensitivity. In other words, the pattern of results we observe could be attributed to a long/short effect rather than a preference-consistency effect based on motivated sensitivity. To address this alternative explanation, we conduct a second experiment. Our second experiment follows a design parallel to that of the first experiment, only changing the nature of the news flashes so that they contain predominantly negative information, reflecting the information environment in a bear market. If the theory and predictions supported in our first experiment extend to this setting, then we would expect the same reaction as in experiment 1, albeit in reverse. Specifically, we predict and find that short investors forecast the same level of earnings growth for the company, regardless of whether the preference-consistent negative news is depicted using vivid or pallid language. In contrast, long investors forecast significantly lower earnings

growth for the company when the preference-inconsistent negative news about the company is presented vividly than when it is presented pallidly. Once again, these results indicate that vivid language can contribute to negative investor sentiment in a bear market, although not in the manner suggested by conventional wisdom. Vivid language does not act primarily by stoking the pessimistic beliefs of short investors, but instead, by making it harder for long investors to hold optimistic beliefs.

Understanding the impact of language on investor judgments is important for several reasons. First, we contribute to the emerging stream of literature that examines the role of non-numerical information in financial communication. This research finds that the non-numerical information accompanying financial statements impacts security prices in a nontrivial manner (e.g., Hutton, Miller, and Skinner [2003], Baginski, Hassell, and Kimbrough [2004]). While these studies attempt to focus on non-numerical information, it is difficult (or impossible) with archival data to control for all of the numerical information accessible to investors. In our context, we hold constant detailed numerical information and can attribute differences across treatments to the joint effect of language and investment position.

Second, this paper extends the research on linguistic tone in financial communication. Recent studies have examined linguistic content in the context of media coverage (Tetlock [2007], Tetlock, Saar-Tsechansky, and Macskassy [2008]), management disclosures (Demers and Vega [2010], Feldman et al. [2010], Li [2010], Rogers, Van Buskirk, and Zechman [2010]), and conference calls (Mayew and Venkatachalam [2009]). Whereas these studies look at the differential effects of positive/negative tone, our paper holds constant the tone within each experiment (optimistic in experiment 1 and pessimistic in experiment 2).<sup>2</sup> We then show that vividness plays an incremental role in influencing investor beliefs, suggesting an additional factor for future work on tone to consider. Extending the research on tone to include vividness helps sharpen the predictive and explanatory power of these models (Koonce and Mercer [2005]).

Our research also speaks to concerns that vivid language may exacerbate bubbles in a bull market and accelerate panics in a bear market. We provide evidence that vivid language influences investor beliefs, as suggested by others, but does so primarily by affecting the judgments of investors holding positions contrary to the prevailing tenor of recent news. That is, vividness may have little effect on investors who are commonly believed to be more susceptible to it (e.g., long investors in bull markets), but will have a

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<sup>2</sup>Although few studies in accounting or finance have looked directly at language vividness, Larker and Zakolyukina [2010] use a related concept, language extremity, to predict deception in conference calls. In addition, Elliott, Hodge, and Sedor [2010] show that online video announcements of restatements can elicit stronger reactions than their written (and, therefore, arguably more pallid) counterparts.

pronounced effect on investors who are believed to be less susceptible (e.g., short investors in bull markets). Therefore, investors who hold contrarian positions should be particularly sensitive to the impact of vivid language. As we discuss in section 5, these findings may help explain the counter-intuitive findings of Lamont and Stein [2004] that short interest tends to decrease (rather than increase) during market run-ups.

In section 2, we derive directional hypotheses about the individual and joint impact of language vividness and position on investor judgments and discuss how those hypotheses relate to extant research in psychology and economics. We describe the details and results of experiment 1 in section 3. We describe the details and results of experiment 2 in section 4, and section 5 concludes.

## 2. *Theory and Hypotheses*

### 2.1 BACKGROUND

Numerous recent studies examine, in a broad sense, how markets and individual investors react to non-numerical information (e.g., Hutton, Miller, and Skinner [2003], Baginski, Hassell, and Kimbrough [2004]). Within this literature, a stream of research explores the impact of linguistic tone in financial communication. For example, Mayew and Venkatachalam [2009] analyze the linguistic content of conference calls and find that managers who exhibit negative affect (pessimistic tone) are less likely to meet or beat earnings expectations over each of the three subsequent quarters compared to managers who exhibit positive affect (optimistic tone). Relatedly, a number of studies examine stock market reactions to different tones of management disclosures (Demers and Vega [2010], Feldman et al. [2010], Li [2010], Rogers, Van Buskirk, and Zechman [2010]) and related media coverage (Tetlock [2007], Tetlock, Saar-Tsechansky, and Macskassy [2008]). In this paper, we extend these studies by experimentally investigating how investors are influenced, not just by tone, but also by the way in which that tone is conveyed—in particular, whether the tone (positive or negative) is conveyed in vivid or pallid language.

We draw on a broad definition of vivid language as language that “excite[s] the imagination to the extent that it is (a) emotionally interesting, (b) concrete and imagery-provoking, and (c) proximate in a sensory, temporal, or spatial way” (Nisbett and Ross [1980], p. 45). In the context of financial decision making, there are many examples of vivid information. Companies with positive performance might be described as “shattering” or “blowing away,” rather than “exceeding,” analyst expectations. Growth may be described as “explosive” as opposed to “strong.” And one only needs to watch a few minutes of certain market-oriented cable talk shows to get a sense for the extremity and colorfulness of the commentary that is routinely generated within that genre. Many financial blogs use similar tactics in an attempt to generate interest and following, but the strategic use of language

is not limited to the financial media. Analyst reports and commentary can be similarly extreme and colorful, and research also suggests that companies themselves carefully choose language to underplay some aspects of their performance while attempting to highlight other areas (Davis, Piger, and Sedor [2008], Li [2008]).

In considering the role that vivid language can have in influencing investor beliefs, concerns have been voiced by both academics and regulators (Shiller [2000], Ball [2009], U.K. Treasury [2009]). Regardless of whether it is a concern about “irrational exuberance” in the context of a market bubble or a lack of investor confidence during a crisis, language has historically been one of the elements people point to when trying to assign blame for a large swing in investor sentiment. One way to interpret these claims is that the language of a message (beyond the factual content) can unduly influence investor judgments and behavior (Sorley [1998], Langevoort [1999]). However, despite the abundance of vivid information that exists in the domain of financial reporting and the high-level criticism of companies, analysts, and the financial press, the question remains as to whether the choice of language used to describe financial events will influence the judgments of investors and other capital market participants, especially when the underlying quantitative information is held constant.

We use laboratory experiments to test the effects of vivid language on investor judgments. Using an experimental methodology allows us to hold constant the underlying numerical information that might otherwise influence investor judgments. In addition, by randomly assigning participants to different treatments, we can avoid many of the inferential problems that can be caused by endogeneity when using archival data. In the next sections, we consider the extant psychological evidence on whether vivid language can influence judgments and behavior, and we then develop our specific hypotheses in light of more recent research on motivated reasoning.

## 2.2 HYPOTHESES DEVELOPMENT

*2.2.1. Psychological Research on Vividness Effects.* The study of how vivid language influences information processing has a long history in psychology, dating back to the early 1950s. Nisbett and Ross [1980] suggest that vivid information can be more persuasive and impact judgments more strongly than pallid information. This idea has been examined in a wide variety of contexts. However, despite the intuitive appeal that vivid language influences information processing, supporting evidence is surprisingly scarce (Nisbett and Ross [1980]). Taylor and Thompson [1982], in their survey of the literature, conclude that “the existence and mediation of the so-called vividness effect . . . is weak, if existent at all” (p. 178).<sup>3</sup> Given the lack of

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<sup>3</sup>See Smith and Shaffer [2000] for a more recent discussion of the mixed findings related to vividness effects.

clear and convincing evidence that vivid language influences judgments, it seems that the concerns of regulators and academics—namely, that vivid language can exacerbate swings in investors’ beliefs in line with the overall tenor of the market—might, in fact, be unwarranted.

However, it is important to note that Taylor and Thompson [1982] did find some instances of vividness effects (see also Kisielius and Sternthal [1986], Hosman [2002]), particularly when there is a clear contrast between vivid and pallid information and when the information is being attended to (McGill and Anand [1989]). Either way, standard economic theory would predict that any such effects should have little impact in the context of financial decision making because capital market participants have strong incentives to see through the hype (whether it is management’s spin on earnings performance, an analyst report written to pique investor interest, or a piece from the financial press designed to increase readership). By comparison, individuals in other settings, such as consumer decision making, may not have such strong incentives for accuracy, and may also have little psychological motivation to scrutinize information, as we discuss next.

*2.2.2. Research on How Investors Process Information.* Even though capital market participants have incentives to be accurate, as just noted, incentives can sometimes be a double-edged sword. On the one hand, accuracy incentives can drive market participants to seek out information to better inform their decision-making process. On the other hand, those same financial ties can also bind market participants by causing them to care about outcomes they are evaluating and removing their ability to act as neutral, impartial evaluators of information. It is well documented in psychology that the motivated reasoning induced by having directional preferences can bias judgments (see Kunda [1990] for a review). Importantly, recent research in accounting and finance has provided clear evidence that the positions investors and traders hold cause them to be motivated reasoners—even though those same positions also create incentives for evaluating information in an unbiased manner (Hales [2007], Ko and Hansch [2009], Seybert and Bloomfield [2009], Han and Tan [2010], Thayer [2010]).

One of the more recent findings in the psychological literature on motivated reasoning is that directional preferences influence not only the decisions people make (Kunda [1990]) but also how information gets processed (Ditto and Lopez [1992], Ditto et al. [1998], Ditto et al. [2003]). According to these studies, individuals do not process all of the information available to them with the same level of cognitive effort. Instead, individuals often accept information that is consistent with their preferences at “face value” without in-depth thinking, whereas they expend more cognitive effort scrutinizing information that is inconsistent with their preferences (Ditto and Lopez [1992], Ditto et al. [1998], Ditto et al. [2003]). In other words, individuals exhibit asymmetric, motivated sensitivity in information processing, being relatively insensitive to preference-consistent

information and more sensitive to preference-inconsistent information. For example, Ditto et al. [1998] find that individuals perceive favorable results of a medical test (i.e., results indicating good health) to be equally reliable, regardless of the probability of false reading, but perceive unfavorable results (i.e., results indicating bad health) to be less reliable when the probability of false reading is high than when it is low.

In a financial setting, Hales [2007] finds results consistent with motivated sensitivity to information. In particular, he finds that investors are motivated to agree unthinkingly with information suggesting they might make money on their investment, but disagree with information that suggests they might lose money. Moreover, in disagreeing, long investors expect earnings to be relatively high and short investors expect earnings to be relatively low. Whereas Hales [2007] examines a single-period setting with exogenous positions, Ko and Hansch [2009] find similar evidence of motivated reasoning in a dynamic investment game that allows for endogenous positions in a multiperiod setting. Building on this work, Thayer [2010] predicts and finds evidence that motivated reasoning influences the amount and type of information investors seek when making judgments regarding their investment, consistent with the theory of motivated sensitivity to information. Given the important role that attention plays in vividness effects, we next turn to the key question of the present study: How will motivated reasoners be affected by vivid information that is either consistent or inconsistent with their preferences?

*2.2.3. How Motivated Sensitivity Interacts with Vividness Effects.* To see how motivated sensitivity to information will influence investor beliefs, we first consider how investors will react to information that is largely positive about the company in which they have taken a position (we will discuss investors' reaction to negative information in section 4). If the investor has a long position, the positive information will be preference consistent and, as such, research on motivated sensitivity predicts that the investor would have little psychological incentive to scrutinize the information (Ditto and Lopez [1992], Ditto et al. [1998]). Without careful scrutiny and processing of the information, long investors may not be able to fully absorb the information (Mazzocco and Brock [2006]) and, as a result, may be insensitive to the subtleties of the language used to convey the information. Therefore, we expect that the beliefs of long investors will be similar, regardless of whether the positive news is presented using vivid or pallid language. Note that this expectation is consistent with some of the prior literature that has had difficulty documenting an influence of vivid language on judgments (Taylor and Thompson [1982], Smith and Shaffer [2000]).

We, however, expect to see a significant difference in the beliefs of investors who hold a short position in the company depending on whether the positive news is presented using vivid or pallid language. Our reasoning involves two steps: first, for short investors, positive news about the company is inconsistent with their preferences. Drawing on the psychological

research discussed above, we expect short investors to deeply process the preference-inconsistent news, causing their judgments to be sensitive to the subtleties of the language chosen to express the news. In other words, we argue that a precondition for vivid information to influence investors' judgments is that they pay attention to and deeply process the information. In a bull market setting, long investors are not particularly motivated to behave in that fashion, whereas short investors are.

Second, as suggested by prior theory on vividness effects, we expect the vivid information to carry greater weight in influencing the judgments of short investors. That is, we expect investors who receive vivid positive news about a company they have shorted to be more influenced by that information than they would be if that information had been presented using a pallid depiction. According to prior theory, there are several potential mechanisms through which vivid language could influence the judgments of these short investors. Nisbett and Ross [1980] posit that vivid information is more available and, therefore, more accessible for judgments than pallid information (see also Moser [1992]). In other words, vivid information, perhaps because of its interesting, unique, and more colorful nature, might facilitate recall among investors who have paid attention to that information. As opposed to being a strictly cognitive effect, Taylor and Thompson [1982] posit that, because vivid information is emotionally interesting and engaging, it can arouse stronger affective responses and, again, make it easier for investors who have paid attention to that information to understand, encode, and later recall that information or bring it to bear on their future decisions. Either way, we expect short investors to be more influenced by vivid positive information than they would if that information was pallid, even though they might find the content of the information undesirable.<sup>4</sup>

In summary, whereas prior research has had difficulty documenting that vivid language affects judgments, we argue that any such effects are likely to be most pronounced when individuals are motivated to process information more deeply. In the context of financial decision making, this leads to the following predictions for investors who receive positive news about the company in which they have a long- or short-investment position:

*H1: Investors assigned to a short position will forecast lower growth in earnings than investors assigned to a long position, despite both receiving the same set of positive news.*

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<sup>4</sup>Research suggests that motivated reasoners do not simply conclude what they prefer to believe. Rather, they try to maintain at least the illusion of objectivity and, as a result, are sometimes forced to accept undesirable conclusions due to the evidence available (Kunda [1990], Dawson, Gilovich, and Regan [2002]). That is, our predictions about the effect of vividness on short investors' judgments are based on the presumption that short investors, while motivated reasoners, are still trying to do the right thing (i.e., be objective) and are viewing information that, while vivid, is not demonstrably incorrect (which, in the real world, would be an invitation for a lawsuit).

*H2: Investors who receive vividly presented positive news will forecast higher growth in earnings than investors who receive a pallid version of the same news, but only when they are motivated to scrutinize the information (i.e., when they are assigned to a short position).*

Although the theory underlying H2 (i.e., motivated sensitivity) presumes that it is the preference inconsistency of positive information that drives short investors to scrutinize the vivid/pallid information, an alternative possibility is that holding a short position would induce investors to scrutinize information for other reasons. For example, if holding a short position is endogenous given an investor's prior beliefs, it might be rational to scrutinize information that was contrary to one's expectations. In addition, short positions, unless hedged, expose investors to greater risk, which might induce them to process information more carefully. Although endogeneity and risk exposure can be ruled out in an experiment using random assignment of investor positions and a carefully designed incentive scheme, holding short positions is still fairly uncommon and might simply induce different behavior from participants. If so, we might find support for H2 but for reasons other than motivated sensitivity to preference-inconsistent information. We, therefore, directly address this alternative explanation in a second experiment, which we explain later.

### *3. Experiment 1*

#### 3.1 EXPERIMENTAL OVERVIEW AND DESIGN

In our experiment, participants are assigned to long or short positions in a real Standard & Poor's 500 (S&P 500) firm, referred to in the experiment as "Alpha." Participants are provided with data selected from the firm's financial statements and news flashes from the financial press, and are then asked to forecast Alpha's year-on-year quarterly earnings growth rate. To examine how directional preferences interact with language vividness to influence investor forecasts, we manipulate two factors between participants, resulting in a  $2 \times 2$  experimental design. The first manipulated factor is investment position: the investor's payoff either increases (hereafter referred to as a "long position") or decreases (hereafter referred to as a "short position") as Alpha's earnings growth outperforms a consensus analyst forecast. The second manipulated factor is the vividness of language used in the news flash: the language in Alpha's news flashes is either vivid (hereafter referred to as the "VIVID" condition) or pallid (hereafter referred to as the "PALLID" condition). As indicated earlier, we predict that the vivid/pallid information will differentially affect the judgments made by long versus short investors (i.e., an interaction effect).

We also provide participants with a comparison firm, referred to in the experiment as "Beta." Beta is a real S&P 500 firm that is similar to Alpha in terms of industry, business model, and earnings performance. In all four conditions of the experiment, we give participants identical numerical financial data about Alpha and Beta. We also provide them with news

flashes about the two firms. Whereas we manipulate the language in Alpha's news flashes to be either vivid or pallid, the language in Beta's news flashes is always pallid. We include this comparison firm to provide a contrast to Alpha's news flashes. When investors process information communicated in different styles of languages, the potential vividness effect is likely to come about as a result of tacit comparison of those languages (i.e., when the reporting language for the focal firm is more vivid than that for other firms). Therefore, we provide the comparison firm Beta as a backdrop for testing the vividness effect associated with the focal firm Alpha, thereby creating a more powerful manipulation of vividness. That said, there is also some external validity for this design choice given that real-world investors typically are exposed to various styles of languages used by the financial press.<sup>5</sup>

### 3.2 NON-NUMERICAL INFORMATION: NEWS FLASHES

Once the participants finish going through the instructions for their task, the first information that they encounter is five pairs of news flashes about Alpha and Beta. Each pair of news flashes presents one news flash about Alpha and one news flash about Beta at the same time. Participants are allowed to consider the information for as long as they choose.

The news flashes are prepared in the following manner. We searched the financial press during the period preceding the quarter to be forecasted, and selected five news excerpts for each firm based on three criteria: (1) the excerpts should be indicative of the two firms' positive performance; (2) the excerpts should cover similar financial issues and reflect similar levels of performance for the two firms; and (3) the excerpts should be written in vivid language. In other words, all instances of the vivid languages we use in our experiment are authentic and have previously appeared in the financial press. Next, we create the pallid version of each of these original, vivid excerpts by rephrasing the excerpt, replacing the vivid expression in the excerpt with a pallid version of the same economic event.

For the VIVID conditions of the experiment, each of the news flash pairs matches a vivid news item for Alpha with a pallid news item for Beta covering a similar financial issue. For the PALLID conditions, we replace each of the vivid news items for Alpha with the pallid version of that item, resulting in five new pairs of news flashes. Thus, the only vivid information that participants see is in the VIVID conditions and relates to the target firm Alpha.<sup>6</sup>

For example, participants in the VIVID conditions receive the following as one of the five news flash pairs:

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<sup>5</sup>Empirical evidence suggests that some journalists report financial news in a more neutral and plainer language than others (Maat [2007]). Therefore, we believe that our characterization of the variability in reporting as vivid versus pallid is reasonable and is empirically supported.

<sup>6</sup>In contrast, we do not use the original, vivid Beta excerpts in this experiment. As mentioned previously, we use Beta as a comparison firm in order to create a strong manipulation of vividness. However, we would not expect our results to be any different if we had made Beta the focal firm and used Alpha for comparative purposes.

*Alpha (vivid original):* Alpha's sales jumped in the fourth quarter of 2008, compared to the same period a year ago. Analysts viewed this performance as very impressive.

*Beta (pallid version):* Beta reported higher revenues compared to previous quarters. Beta's revenues exceeded the expectations of most analysts.

In contrast, participants in the PALLID conditions receive the following:

*Alpha (pallid version):* Alpha's sales increased in the fourth quarter of 2008, compared to the same period a year ago. Analysts viewed this performance as positive.

*Beta (pallid version):* Beta reported higher revenues compared to previous quarters. Beta's revenues exceeded the expectations of most analysts.

The complete set of news flashes for each condition is contained in appendix A.

### 3.3 NUMERICAL FINANCIAL DATA

After viewing the news flashes, participants in all four experimental conditions are provided with identical sets of detailed numerical financial data. The data include Alpha's and Beta's balance sheets and income statements for the most recent eight quarters prior to the quarter being forecasted. In addition, participants were told that the analysts following Alpha had, on average, forecasted upcoming quarterly earnings growth of 3.93%. Participants also saw the individual growth forecasts of the eight analysts that comprised the consensus, which ranged from -5.58% to 10.74%. All financial data reflect real information about the firms.

We chose to present the detailed numerical financial information second because we felt that participants would want the numerical information in close temporal proximity to when they would be generating their own forecasts. Because this information was held constant across treatments and could detract from the influence of the news flashes, this design choice could make it more difficult for us to detect support for our predictions.

### 3.4 INVESTORS' INCENTIVE STRUCTURE

Participants are paid a fixed \$5 for participation. In addition, they are given an incentive to accurately forecast Alpha's earnings growth rate and an incentive associated with their investment position in Alpha. To preclude confounding effects of participants' risk attitudes, these incentives are operationalized in the form of earning lottery tickets for a chance of winning a

\$50 bonus (i.e., regardless of their risk attitude, all participants should have identical incentive to maximize the chance of winning the \$50 bonus).<sup>7</sup> Specifically, participants can earn lottery tickets from three sources. First, each participant automatically receives 80 lottery tickets for completing the experiment. Second, each participant's forecast of Alpha's earnings growth rate is compared with Alpha's actual earnings growth rate, and the forecast accuracy of all participants is ranked from high to low. Participants in the first, second, third, and fourth quartile of the ranking receive, respectively, an additional 60, 40, 20, and 0 lottery tickets. That is, the more accurate the forecast, the more lottery tickets the participant earns.

Third, each participant has a stake in Alpha's earnings growth, depending on how Alpha's actual earnings growth rate compares to the consensus analyst forecast of 3.93%. For participants in the long position, if Alpha's actual earnings growth rate is higher (lower) than the consensus analyst forecast, they earn (lose) one lottery ticket for every 0.2% by which Alpha's actual earnings growth rate exceeds (falls below) the consensus analyst forecast, up to 60 tickets. For participants in the short position, if Alpha's actual earnings growth rate is lower (higher) than the consensus analyst forecast, they earn (lose) one lottery ticket for every 0.2% by which Alpha's actual earnings growth rate falls below (exceeds) the consensus analyst forecast, up to 60 tickets. That is, if Alpha's earnings growth outperforms the consensus analyst forecast, participants in the long position will earn additional lottery tickets, whereas participants in the short position will lose lottery tickets.

Given this incentive structure, participants can earn a maximum of 200 lottery tickets. After the study is completed, we randomly draw a number between 1 and 200, inclusive, for each participant. Participants earn the \$50 bonus if their total number of lottery tickets is greater than or equal to that randomly drawn number, so the odds of winning the \$50 bonus increase 0.5% with each additional lottery ticket.

### 3.5 PARTICIPANTS AND EXPERIMENTAL PROCEDURES

Seventy-two M.B.A. students participated in our experiment. On average, participants had 4.2 years of work experience and had taken four accounting or finance courses. We randomly assigned participants to the four experimental conditions, with 18 in each condition. The experiment was computerized and conducted in a research laboratory. Upon arrival, each participant was given a participant ID. After participants entered their participant ID in the computer, experimental instructions, which described the task and incentive structure, were presented on a series of screens. After reading the instructions, participants completed a quiz to ensure that they fully understood the experiment, their task, and their incentive structure.

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<sup>7</sup>See Davis and Holt [1993, Chapter 2] for a more in-depth discussion of inducing risk preferences with lotteries.

Participants could not proceed further unless they answered all questions correctly.<sup>8</sup>

Next, participants saw the five pairs of news flashes displayed over five consecutive screens (i.e., one pair per screen). Again, participants in the VIVID conditions saw Alpha's original news flashes, which used vivid language, and the pallid version of Beta's news flashes. Participants in the PALLID conditions saw pallid versions of both firms' news flashes. Within each pair, the two firms' news flashes were always shown on the same screen simultaneously. After reading all news flashes, participants were given the opportunity to review the two firms' financial statements and the analysts' forecasts of Alpha's earnings growth rate. Once participants were finished reviewing this information, they provided their forecast of Alpha's earnings growth rate.

To conclude, participants completed a postexperimental questionnaire and were paid the \$5 participation fee before leaving the laboratory. Several days after the experiment, the lottery for each participant was conducted and those who won the \$50 bonus were paid in cash. Participants took approximately 30–40 minutes to complete the experiment and earned \$30 on average.

### 3.6 RESULTS

*3.6.1. Manipulation and Other Checks.* In addition to requiring the successful completion of a quiz to ensure understanding of the experimental procedures and incentives, we also test the effectiveness of key design features by examining participants' evaluations of the information they saw. In the postexperimental questionnaire, participants rated which firm's news flashes contain more vivid information on a 7-point Likert scale, with endpoints 3 = "Alpha is more vivid" and -3 = "Beta is more vivid." One-sample *t*-tests show that the rating across the VIVID conditions (1.58) is significantly higher than zero ( $p < 0.001$ ),<sup>9</sup> suggesting that participants perceived Alpha's news flashes to be more vivid than Beta's; in contrast, the rating across the PALLID conditions (0.31) is not significantly different from zero ( $p = 0.215$ , two tailed), suggesting no difference in participants' perception of the vividness of the two firms' news flashes. Further, the rating in the VIVID conditions is significantly higher ( $p < 0.001$ ) than the rating in the PALLID conditions. These results indicate that our vividness manipulation was successful.

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<sup>8</sup>Based on these procedures, we believe that participants correctly understood the key aspects of the design, such as their investment position and, more generally, the incentives they faced. Of course, if some participants misunderstood their position, that increased noise would likely work against obtaining the particular pattern of results we predict.

<sup>9</sup>Consistent with our directional hypotheses, all *p*-values are one tailed unless otherwise stated, including the specific form of our predicted interactions. For more discussion of the rationale for one-tailed tests of directionally predicted interactions, see McNeil, Newman, and Kelley [1996, p. 137–39].

**T A B L E 1**  
*Participants' Earnings Growth Forecasts: Experiment 1*

News Vividness			
Position	Vivid	Pallid	Mean {S.D.}
Long	6.53	6.42	6.48
	{2.87}	{3.90}	{3.37}
	<i>n</i> = 18	<i>n</i> = 18	<i>n</i> = 36
Short	6.29	3.05	4.67
	{6.25}	{3.11}	{5.14}
	<i>n</i> = 18	<i>n</i> = 18	<i>n</i> = 36
Mean {S.D.}	6.41	4.73	
	{4.79}	{3.88}	
	<i>n</i> = 36	<i>n</i> = 36	

This table contains the mean {standard deviation} of the earnings growth forecasts (in percentages) provided by participants in each of the treatment conditions in experiment 1 (i.e., the “bull market”). Although the underlying quantitative financial information related to the company is held constant across conditions, news related to the company is presented in either a vivid or a pallid form. Participants hold either a long or short position in the company. Crossing these two factors (vividness  $\times$  position) in a  $2 \times 2$  factorial design results in the four conditions reported above.

We operationalize market bullishness by presenting participants with news flashes that have a predominantly positive tone for both Alpha and Beta. To examine how participants viewed the tone of the news flashes, we asked them to indicate their assessment of the overall market prospects for the two firms, using a 7-point Likert scale with endpoints 3 = “Very positive” and  $-3$  = “Very negative.” The mean response is 1.33, and a one-sample *t*-test reveals that it is significantly higher than zero ( $p < 0.001$ ). Therefore, consistent with our intention, participants clearly perceived the information as having a positive tone.

**3.6.2. Forecasts of Earnings Growth.** H1 predicts that participants assigned to a long position will forecast higher growth in earnings than participants assigned to a short position. H2 predicts that participants who receive vivid positive news will forecast higher growth earnings than participants who receive pallid positive news, but only when they are assigned to a short position. The results reported in table 1 and depicted in figure 1 are broadly consistent with our predictions. Average growth forecast of participants holding a long position is higher than that of participants holding a short position, and news vividness appears to matter more when participants hold a short position than when they hold a long position.

To test whether participants' growth judgments vary in accordance with our hypotheses, we first conduct an analysis of variance (ANOVA) using news vividness and participants' investment position as the independent variables (see panel A of table 2). Consistent with H1 and H2, we observe that the effects of investment position ( $p = 0.037$ ) and vividness ( $p = 0.049$ ) are qualified by an interaction effect ( $p = 0.062$ ).

In addition, because of the specific nature of our prediction (i.e., involving an ordinal interaction), we use a series of planned contrasts to test the specific form of our prediction rather than relying solely on the effects

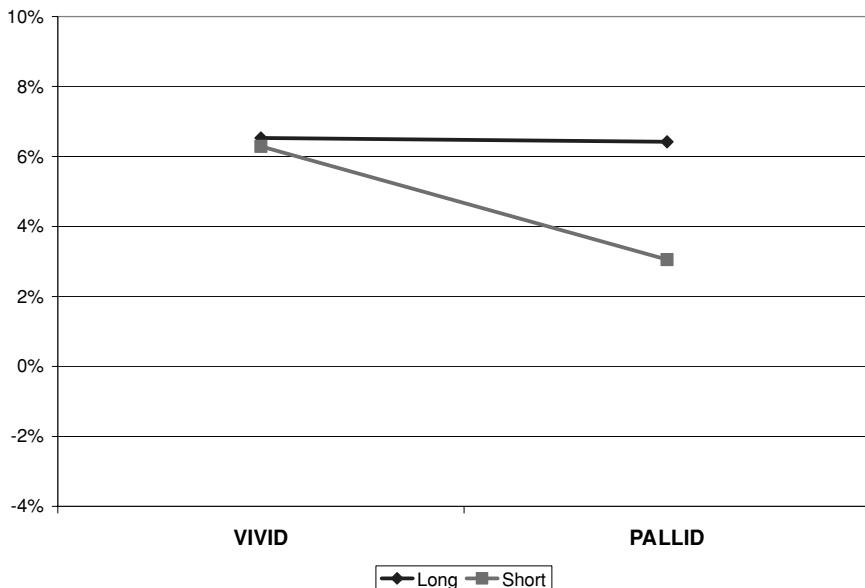


FIG. 1.—Experiment 1: Participants' earnings growth forecasts. This figure plots participants' mean earnings growth forecasts for Alpha in experiment 1 (i.e., the "bull market"). Participants were asked to provide their earnings growth forecasts for Alpha in one of four experimental conditions. Although the underlying quantitative financial information related to Alpha is held constant across conditions, news related to Alpha is presented in either a vivid or a pallid form. Participants hold either a long or short position in Alpha. Crossing these two factors (vividness  $\times$  position) in a  $2 \times 2$  factorial design results in the four conditions reported above.

of the overall ANOVA (Keppel and Wickens [2004], p. 116). As shown in panel B of table 2, the results of the planned contrast are highly significant ( $F_{1,68} = 7.83, p = 0.003$ ), consistent with our interaction prediction.<sup>10</sup> Follow-up tests show that when participants hold a short position, growth forecasts are significantly affected by news vividness ( $t = 1.97, p = 0.013$ ). By comparison, when participants hold a long position, their growth forecasts are not significantly affected by news vividness ( $t = 0.10, p = 0.936$ , two tailed).<sup>11</sup>

Taken together, these results provide strong support for our theory that the use of vivid or pallid language for conveying non-numerical information to investors will matter most when investors find the information

<sup>10</sup>Based on our hypothesis, we use contrast weights of (1, 1) in the VIVID/long and PALLID/long conditions, and (0, -2), respectively, in the VIVID/short and PALLID/short conditions. However, we obtain similar results ( $p = 0.002$ ) when we use an alternative set of contrast weights (1, 1, 1, -3).

<sup>11</sup>Nonparametric tests using the same contrast weights yield inferentially identical results. The results of our follow-up tests of simple main effects are similarly unchanged using nonparametric tests.

**T A B L E 2**  
*Tests of Hypotheses in Experiment 1*

<b>Panel A: Conventional analysis of variance</b>					
Source	Sum of Squares	df	Mean Square	F-Statistic	p-Value
Vividness	50.60	1	50.60	2.80	0.049
Position	59.08	1	59.08	3.27	0.037
Vividness $\times$ Position	43.93	1	43.93	2.43	0.062
Error	1,227.54	68			

<b>Panel B: Planned contrast and follow-up simple effect tests</b>					
	Sums of Squares	df	Mean Square	Statistic	p-Value
<i>Overall contrast</i>					
Participants' growth forecasts will differ significantly based on language vividness when participants hold a short position, but will not differ when participants hold a long position.	141.27	1	141.27	$F = 7.83$	0.003
<i>Follow-up simple effect tests</i>					
<i>Long:</i> vivid positive news will not influence growth forecasts	0.12	1	0.12	$t = 0.10$	0.936*
<i>Short:</i> vivid positive news will increase growth forecasts	94.41	1	94.41	$t = 1.97$	0.013

Panel A contains ANOVA results for the effect of vividness (vivid or pallid) and position (long or short) on participants' growth forecasts. Panel B contains the results of a planned contrast based on contrast weights that capture the specific pattern of the vividness  $\times$  position interaction we hypothesize. Additionally, panel B reports the results of follow-up tests that break down the simple main effects that help identify the specific source of the vividness  $\times$  position interaction we hypothesize. *p*-values are one tailed (unless otherwise specified), reflecting the directional nature of the underlying predictions. Note that, while we do not have a formal prediction for the main effect of vividness, we do not expect vividness to lower participants' forecasts of growth in earnings.

\*Indicates a two-tailed test.

preference inconsistent. However, because tone was positive in this experiment, the vivid/pallid language was only preference inconsistent for investors holding short positions. Therefore, we are unable to rule out the possibility that simply assigning investors to a short position is what makes them more sensitive to the information they are presented. To rule out this alternative explanation and to provide additional assurance for the underlying theory of motivated sensitivity to information, we conduct a second experiment, which we discuss next.

#### 4. Experiment 2

##### 4.1 THEORY AND MOTIVATION

Whereas the context of experiment 1 used predominantly positive information, we turn in this second experiment to a setting with predominantly

negative information. This setting reflects the type of information environment that can occur in a bear market (e.g., as observed in the recent financial crisis). If the theory and predictions supported in experiment 1 extend to a bear market setting, we should see similar results when information has a predominantly negative tone. Recall, however, that, for investors holding short positions, vivid negative information is preference consistent; whereas vivid negative information is preference inconsistent for investors holding long positions. Thus, in contrast to experiment 1, our predictions of how investors with long or short positions will respond to vivid information are reversed in experiment 2.

In particular, in a bear market setting, the theory of motivated sensitivity suggests that the vivid or pallid presentation of news should have relatively little influence on the forecasts of investors holding short positions. This finding would again be consistent with the prior literature that has had difficulty documenting an influence of vivid language on judgments. On the other hand, we would expect to see a stronger effect of language vividness among investors with long positions, for whom negative news is preference inconsistent. Analogous to what we predicted for short investors in experiment 1, we expect long investors who receive pallid bad news about the company to discount that information and continue to hold relatively optimistic views about the company's future prospects, whereas we expect long investors who receive vivid bad news about the company to be more influenced by that information, which makes it more difficult for them to maintain an optimistic view about the company's future prospects.

Formally stated, our predictions for investors who receive negative news about the company in which they have a position are as follows:

- H3:* Investors assigned to a long position will forecast higher growth in earnings than investors assigned to a short position, despite both receiving the same set of negative news.
- H4:* Investors who receive vividly presented negative news will forecast lower growth in earnings than investors who receive a negative pallid version of the same news, but only when they are motivated to scrutinize the information (i.e., when they are assigned to a long position).

#### 4.2 EXPERIMENTAL OVERVIEW AND DESIGN

Experiment 2 uses the same setting, task, and design as experiment 1. That is, participants are provided with financial data and news flashes about the focal firm Alpha and the comparison firm Beta. Participants are asked to forecast Alpha's earnings growth rate, and their incentive structure is the same as that in experiment 1. Two factors are manipulated, resulting in a  $2 \times 2$  design: investment position (long vs. short) and the vividness of news language for Alpha (vivid vs. pallid).

The only difference between experiment 1 and experiment 2 lies in the tone of news flashes for Alpha and Beta. We search the financial press using

the same selection criteria as in experiment 1, except we require the news excerpts to reflect negative aspects of the two firms. As in experiment 1, we create a pallid version of each vivid excerpt. Participants in the VIVID conditions are then presented with five pairs of news flashes similar to the following:

*Alpha (vivid original):* Alpha's earnings plunged in Q4, 2008, compared to the corresponding period a year ago.

*Beta (pallid version):* Beta's revenues for a key product line in Q4, 2008, were lower compared to the corresponding period a year ago.

By comparison, participants in the PALLID conditions see news flashes similar to the following:

*Alpha (pallid version):* Alpha's earnings declined in Q4, 2008, compared to the corresponding period a year ago.

*Beta (pallid version):* Beta's revenues for a key product line in Q4, 2008, were lower compared to the corresponding period a year ago.

The complete set of news flashes for each condition in experiment 2 is contained in appendix B.

Rather than manipulating the tone of the vivid/pallid news flashes, we could have manipulated some of the supplementary financial information, such as the performance reflected in the firms' financial statements, analyst expectations, and/or recent changes in stock market performance. Ideally, in order to have the strongest manipulation of preference consistency, we would have had alignment between the tone of the news flashes and the "tone" of the other quantitative information used in the experiment. In fact, this is largely what we achieved in experiment 1. However, because we (1) wanted to be truthful to participants, (2) wanted to hold constant as much information as possible between the two experiments, and (3) were primarily interested in speaking to the literature on the tone of non-numerical information, we chose to hold constant the detailed quantitative information for the two companies and instead only manipulated the tone of the news flashes across the two experiments. Because the financial statements and analyst forecasts were somewhat optimistic, this design choice limited the strength of our manipulation of preference consistency in experiment 2 and likely made it more difficult to observe support for H3 and H4.

#### 4.3 PARTICIPANTS AND EXPERIMENTAL PROCEDURES

Sixty-five M.B.A. students participated in our experiment and were randomly assigned to each condition. Participants had an average of nine years of work experience and had taken an average of three accounting or finance courses. As explained earlier, the only difference from experiment

1 was that participants saw news flashes that were predominantly negative in tone. Participants took approximately 30–40 minutes to complete the experiment and earned \$30 on average, which includes the \$5 participation fee they were paid upon completion of the experiment.

#### 4.4 RESULTS

*4.4.1. Manipulation and Other Checks.* The manipulation of language vividness and investment position is checked the same way as in experiment 1. Specifically, in the postexperimental questionnaire, participants rated which firm's news flashes contain more vivid information on a 7-point Likert scale, with end points 3 = "Alpha is more vivid" and -3 = "Beta is more vivid." Consistent with our expectation, the rating in the VIVID conditions (1.16) is significantly higher than zero ( $p < 0.001$ ), suggesting that Alpha's news flashes were perceived to be more vivid than Beta's, whereas the rating in the PALLID conditions (-0.48) is not significantly different from zero ( $p = 0.118$ , two tailed), suggesting that the two firms' news flashes were not perceived to be different in vividness. In addition, the rating in the VIVID conditions is significantly higher ( $p < 0.001$ ) than the rating in the PALLID conditions. These results indicate that our vividness manipulation was successful.

To examine how participants viewed the tone of these news flashes, we ask them to indicate their assessment of the overall market prospects for the two firms, using a 7-point Likert scale with end points 3 = "Very positive" and -3 = "Very negative." The mean response is -1.05, which is significantly less than zero ( $p < 0.001$ ), suggesting that participants, indeed, perceived the tone to be negative.

*4.4.2. Forecasts of Earnings Growth.* In this experiment, we predict that participants who receive vivid negative news will forecast lower growth in earnings than participants who receive pallid negative news, but only when they are assigned to a long position. The data presented in table 3 and depicted in figure 2 are again consistent with the prediction that vividness will matter most when it relates to preference-inconsistent information.

Panel A of table 4 contains the results of an ANOVA using news vividness and participants' investment position as the independent variables. Unlike in experiment 1, the main effect of investment position is not significant in experiment 2. However, as in experiment 1, we find that the effects of investment position and vividness are qualified by an interaction effect ( $F_{1,61} = 5.68, p = 0.01$ ), consistent with H4. To more formally test our predictions, we use a series of planned contrasts. As shown in panel B of table 4, the planned contrast is statistically significant ( $F_{1,61} = 3.27, p = 0.038$ ), consistent with our predicted interaction.<sup>12</sup> Follow-up tests show that, when participants hold a long position, growth judgments vary significantly based

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<sup>12</sup>Following our analysis from experiment 1, the above contrast model uses contrast weights of (0, 2) for the VIVID/long and PALLID/long conditions and (-1, -1) for the VIVID/short

**TABLE 3**  
*Participants' Earnings Growth Forecasts: Experiment 2*

News Vividness			
Position	Vivid	Pallid	Mean { S.D.}
Long	1.65	4.71	3.18
	{3.88}	{3.26}	{3.86}
	<i>n</i> = 17	<i>n</i> = 17	<i>n</i> = 34
Short	3.35	1.96	2.63
	{4.24}	{3.64}	{3.94}
	<i>n</i> = 15	<i>n</i> = 16	<i>n</i> = 31
Mean { S.D.}	2.45	3.38	
	{4.08}	{3.67}	
	<i>n</i> = 32	<i>n</i> = 33	

This table contains the mean {standard deviation} of the earnings growth forecasts (in percentages) provided by participants in each of the treatment conditions in experiment 2 (i.e., the “bear market”). Although the underlying financial information related to the company is held constant across conditions, news related to the company is presented in either a vivid or a pallid form. Participants hold either a long or short position in the company. Crossing these two factors (vividness  $\times$  position) in a  $2 \times 2$  factorial design results in the four conditions reported above.

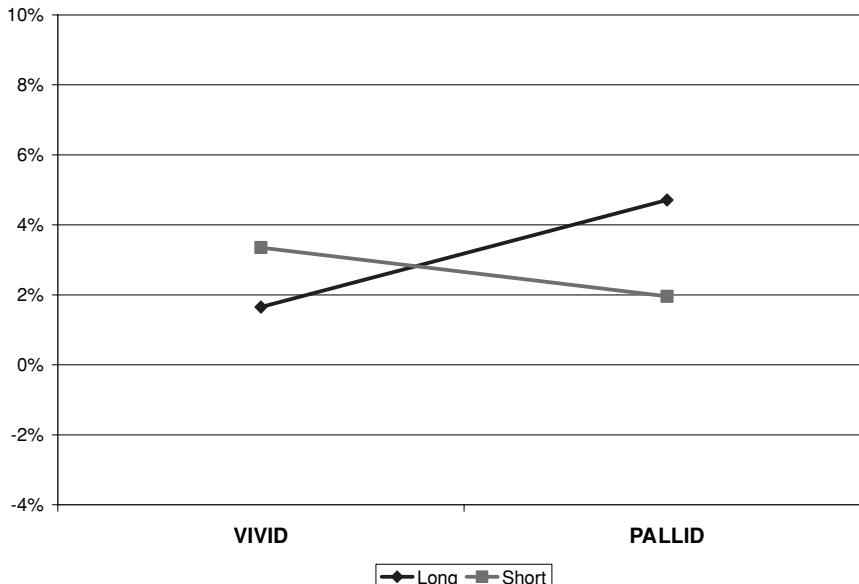


FIG. 2.—Experiment 2: Participants' earnings growth forecasts. This figure plots participants' mean earnings growth forecasts for Alpha in experiment 2 (i.e., the “bear market”). Participants were asked to provide their earnings growth forecasts for Alpha in one of four experimental conditions. Although the underlying quantitative financial information related to Alpha is held constant across conditions, news related to Alpha is presented in either a vivid or a pallid form. Participants hold either a long or short position in Alpha. Crossing these two factors (vividness  $\times$  position) in a  $2 \times 2$  factorial design results in the four conditions reported above.

and PALLID/short conditions, respectively. Our results are similar ( $p = 0.01$ ) if we use an alternative set of contrast weights  $(-1, 3, -1, -1)$ .

**TABLE 4**  
*Tests of Hypotheses in Experiment 2*

<b>Panel A: Conventional Analysis of Variance</b>					
Source	Sums of Squares	df	Mean Square	F-Statistic	p-Value
Vividness	14.07	1	14.073	1.00	0.161
Position	5.07	1	5.069	0.36	0.276
Vividness $\times$ Position	80.12	1	80.12	5.68	0.010
Error	22,863.02	61			

<b>Panel B: Planned Contrast and Follow-Up Simple Effect Tests</b>					
	Sums of Squares	df	Mean Square	Statistic	p-Value
<i>Overall contrast</i>					
Participants' growth forecasts will differ significantly based on language vividness when participants hold a long position, but will not differ when participants hold a short position.	46.18	1	46.18	$F = 3.27$	0.038
<i>Follow-up simple effect tests</i>					
<i>Long:</i> Vivid negative news will decrease growth forecasts	79.56	1	79.56	$t = 2.49$	0.010
<i>Short:</i> Vivid negative news will not influence growth forecasts	14.91	1	14.91	$t = 0.98$	0.308*

Panel A contains ANOVA results for the effect of vividness (vivid or pallid) and position (long or short) on participants' growth forecasts. Panel B contains the results of a planned contrast based on contrast weights that capture the specific pattern of the vividness  $\times$  position interaction we hypothesize. Additionally, panel B reports the results of follow-up tests that break down the simple main effects that help identify the specific source of the vividness  $\times$  position interaction we hypothesize. As in table 2,  $p$ -values are one tailed (unless otherwise specified), reflecting the directional nature of the underlying predictions.

\*Indicates a two-tailed test.

on news vividness ( $t = 2.49$ ,  $p = 0.01$ ). By comparison, when participants hold a short position, their forecasts are not significantly affected by news vividness ( $t = 0.98$ ,  $p = 0.308$ , two tailed).<sup>13</sup>

Taken together, our results indicate that the effect of vividness depends on a significant interaction of the form predicted in H4, even when it is long investors who are receiving the preference-inconsistent information. Importantly, this allows us to rule out that our support for H2 was simply due to investors holding short positions. In addition, by replicating the pattern of the results observed in experiment 1, the results from experiment 2 provide additional assurance that the results in experiment 1 are not due to chance and, by testing whether the results extend to a setting with

<sup>13</sup>As in experiment 1, nonparametric tests using the same contrast weights yield inferentially identical results, and the results of our follow-up tests of simple main effects are again unchanged using nonparametric tests.

predominantly negative information, we provide evidence that our predictions apply to a broad set of market conditions.<sup>14</sup>

#### 4.5 SUPPLEMENTAL RESULTS

To provide some additional insight into the process underlying our predictions, we begin by examining whether motivated sensitivity increased how much attention participants paid to the language used in the news flashes. For this analysis, we use supplemental data from a postexperimental questionnaire. In that questionnaire, we asked participants to write down anything (including just words or short phrases) they could recall from the news flashes for Alpha and Beta. We then coded their free responses to see how many participants specifically commented on the language used in those news flashes.<sup>15</sup> If motivated reasoning prompts participants to scrutinize preference-inconsistent information and to accept preference-consistent information unthinkingly, then we should see more participants commenting on language in the VIVID/preference-inconsistent condition than in any of the other three conditions. A contrast analysis provides strong support for this prediction ( $p < 0.001$ ).<sup>16</sup> In particular, while virtually no one in the PALLID conditions commented on the language in the news flashes, more participants made unprompted comments about language in the VIVID conditions when the news flashes they viewed were preference inconsistent (34%) than when the news flashes were preference consistent (21%;  $p = 0.052$ ), consistent with our underlying theory that motivated sensitivity will influence the extent to which language gets scrutinized.<sup>17</sup>

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<sup>14</sup>To provide a combined view of our results, we merged the data from the two experiments and examined whether there is a 2 (vivid vs. pallid)  $\times$  2 (long vs. short)  $\times$  2 (bull vs. bear market) interaction effect. While an omnibus ANOVA does not find a significant three-way interaction, this should not be surprising because we predict a specific ordinal form of interaction in each experiment. The appropriate test of the significance of a three-way interaction, therefore, should use contrast weights that reflect our predicted pattern of results for the two markets. Upon application of the appropriate contrast weights, we do find a significant three-way interaction ( $p < 0.001$ ). However, these results should be interpreted with caution because they are produced by merging two distinct experiments conducted at different times, and so lacked random assignment across experiments.

<sup>15</sup>Examples of such comments include “Alpha had more exciting statements that made it seem like it was doing better than Beta” (in the bull market) and “the choice of words for Alpha were much harsher than Beta” (in the bear market).

<sup>16</sup>The dependent measure of the contrast test is a dummy variable coded as one if the participant commented on language and zero otherwise. Contrast weights of (+2, 0, -1, -1) are used, respectively, for the cases of VIVID/preference inconsistent, VIVID/preference consistent, PALLID/preference inconsistent, and PALLID/preference consistent.

<sup>17</sup>Interestingly, of the participants in the VIVID conditions who commented on language, in preference-inconsistent conditions these comments were overwhelmingly made when being asked to respond about Alpha (91%), whereas in preference-consistent conditions most of the comments were made when being asked to respond about Beta (57%). Thus, when participants commented on language in the preference-consistent conditions, it may have been as more of an afterthought than in preference-inconsistent conditions, especially since Beta was not the focus of their task or incentives and we asked about Beta second.

In addition, we also analyzed the length of participants' free recall responses by simply counting the number of words recorded by each participant, and we find that participants in the VIVID/preference-inconsistent condition record significantly longer responses than in the other three conditions ( $p = 0.067$ ). These results suggest that participants may encode information more completely and/or recall information more easily when that information is both preference inconsistent and vivid.<sup>18</sup> These effects could arise for cognitive or motivational reasons (such as increased availability or increased affective engagement). Unfortunately, our data do not allow us to more finely detect how vivid information influences the judgments of individuals who paid attention to it. Nevertheless, the above supplemental analyses are important because they provide evidence consistent with our theory that motivated reasoning and vivid information will interact to influence how investors respond to non-numerical information.

## 5. Conclusion

In this study, we conduct two experiments to investigate how investment position interacts with language vividness to influence investor beliefs. Our primary prediction is that investors will be sensitive to the differences between vivid and pallid language only when the underlying information is preference inconsistent. The results of our first experiment are consistent with this prediction. The judgments of long investors in a bull market who received preference-consistent information appear relatively insensitive to vivid versus pallid language. In contrast, the judgments of short investors who received preference-inconsistent information differed significantly depending on whether they receive vivid or pallid information. We confirm this pattern of findings in a second experiment, and show that they generalize to a setting in which the predominant tone of the news flashes is negative rather than positive.

Understanding the impact of vivid language on investors' judgments is important both from a theoretical and a practical standpoint. From a theoretical standpoint, prior research in psychology has produced limited support for vividness effects. We examine vividness in a financial reporting context, predicting and empirically demonstrating *when* vividness is more likely to matter. Our results show that the "elusive" vividness effect is, indeed, elusive for one subset of our participants, but we also find that the vividness effect systematically applies to another subset. The judgments of participants who receive preference-consistent information are not sensitive to vivid versus pallid depiction of the underlying information. However, the judgments

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<sup>18</sup>A third possibility is that participants in the VIVID/preference-inconsistent condition encode as well and recall information as easily as other participants, but are simply more engaged in the task and so provide more detailed responses to the free recall question.

of participants who receive preference-inconsistent information are sensitive to vivid versus pallid depictions of the same underlying information. We extend recent research on the effect of linguistic tone on investor behavior by showing that, holding tone constant (positive or negative), whether the tone is delivered vividly or pallidly can affect investor judgments. As linguistic analysis becomes more sophisticated, future research in this area might examine whether the findings of Mayew and Venkatachalam [2009], Li [2010], Rogers, Van Buskirk, and Zechman [2010], and others are qualified by whether the tone is communicated in a vivid or pallid manner. We also contribute to a growing literature that investigates how motivated reasoning is likely to influence investor behavior, including the search for, and interpretation of, information.

From a practical standpoint, regulators have asserted, arguably based primarily on anecdotal observations, that the language used by the financial press could unduly exacerbate swings in investor sentiment, but we are aware of very little research that supports or rebuts this assertion. We provide empirical evidence that news vividness impacts the judgments of market participants, but not in a way commonly believed. Interestingly, we show that vivid language has a limited influence on investors who are generally believed to be more susceptible to vividness (long investors in a bull market or short investors in a bear market). In contrast, vivid language actually has a greater influence on investors who are commonly believed to be less susceptible to it (contrarian investors). Therefore, such investors may need to be particularly sensitive to the vividness effect.

Several limitations of this study could be addressed in future research. While we document the vividness effect predicted by our theory, experiments are not the best vehicle to demonstrate the magnitude of the effect. Nonetheless, two observations provide assurance of the generalizability of our results: first, to the extent that some design choices (e.g., presenting detailed financial statement information after the news flashes) made it more difficult to detect the predicted effects, we have a stronger test of our theory and hypotheses. Second, our results appear to be consistent with a previously documented empirical regularity in financial markets. Specifically, Lamont and Stein [2004] found that short interest in NASDAQ stocks *decreased* as the stock index reached its peak, which they considered counter intuitive because conventional thinking would suggest that contrarian positions should *increase* as stocks get over valued. Our results may offer a lens through which to interpret such behavior: if the use of vivid language increases during an upswing in investor sentiment, our theory and results suggest that the use of vivid language could contribute to a decline in contrarian positions by making it more difficult for investors to sustain short positions. Future research might explore this relation, for example, by examining whether vividness is more common during market extremes and, if so, whether the Lamont and Stein empirical regularity is more (less) pronounced for firms or industries having particularly vivid (pallid) financial reporting.

Our results are consistent with the notion that vivid information can influence individuals' judgments only when they are motivated to scrutinize the information. Yet our study is not designed to test, for individuals who do scrutinize the information, *how* vividness influences their judgments. As discussed earlier, prior research suggests several mechanisms (including higher availability and stronger affective engagement) that could underlie the vividness effect (Nisbett and Ross [1980], Taylor and Thompson [1982], Moser [1992]). Besides these cognitive and affective mechanisms, another possibility is that different words convey, or could be perceived as conveying, different information. While we were careful to hold constant the economic phenomena described in the two versions of each news flash, it is possible that investors (rationally or otherwise) read into different languages different information about the underlying economic phenomena being referred to, which could translate into differences in expected earnings growth. We should note, however, that an information effect (whether a rational response or an irrational overreaction to language) would suggest, on its own, a main effect of vividness, and so would be insufficient to explain the interaction effects in our experiments. Thus, while this study focuses on *when* vividness effects occur, future research could shed further light on the mechanisms underlying vividness effects by using detailed process measures. For example, it might be useful to systematically record participants' attention, recall, affect, interest, etc., at different stages of the experiment, and analyze their relation with participants' judgments. We did not use such process measures in this study because, while interesting, they could interfere with participants' performance of their decision task, and we believed it was important to begin by testing whether the predicted relations, in fact, exist.

## APPENDIX A

### *Experiment 1 News Flashes*

#### *News Flash #1*

##### VIVID treatment

- 1) *Alpha*: Alpha blew past Wall Street analysts' consensus earnings estimates.
- 2) *Beta*: Beta's earnings exceeded Wall Street analysts' earnings expectations.

##### PALLID treatment

- 1) *Alpha*: Alpha's net income exceeded Wall Street analysts' consensus estimates.
- 2) *Beta*: Beta's earnings exceeded Wall Street analysts' earnings expectations.

*News Flash #2*

VIVID treatment

- 1) *Alpha*: Alpha's sales jumped in the fourth quarter of 2008, compared to the same period a year ago. Analysts viewed this performance as very impressive.
- 2) *Beta*: Beta reported higher revenues compared to previous quarters. Beta's revenues exceeded the expectations of most analysts.

PALLID treatment

- 1) *Alpha*: Alpha's sales increased in the fourth quarter of 2008, compared to the same period a year ago. Analysts viewed this performance as positive.
- 2) *Beta*: Beta reported higher revenues compared to previous quarters. Beta's revenues exceeded the expectations of most analysts.

*News Flash #3*

VIVID treatment

- 1) *Alpha*: Analysts were pleasantly surprised by Alpha's glowing earnings. Analysts felt that such glowing earnings in a weak sector meant that Alpha was strongly positioned to grab market share from weaker rivals.
- 2) *Beta*: Beta exceeded analysts' expectations and improved its financial standing during what many considered to be a slow quarter.

PALLID treatment

- 1) *Alpha*: Analysts' earnings passed analysts' expectations and analysts felt that such positive earnings performance in a slow sector meant that Alpha could gain market share from other firms.
- 2) *Beta*: Beta exceeded analysts' expectations and improved its financial standing during what many considered to be a slow quarter.

*News Flash #4*

VIVID treatment

- 1) *Alpha*: Commenting on Alpha's flexibility, analysts said that Alpha has any number of levers that they could pull both on the revenue and on the cost side, which makes them a formidable competitor in any economic environment.
- 2) *Beta*: Analysts noted that Beta's cash balance had steadily increased over the last two years. Some analysts were of the view that investors did not recognize the value of Beta's cash balances which could impact their stock price positively.

## PALLID treatment

- 1) *Alpha*: Commenting on Alpha's flexibility, analysts said that Alpha has several options both on the revenue and on the cost side, which makes them competitive in all types of economic environments.
- 2) *Beta*: Analysts noted that Beta's cash balance had steadily increased over the last two years. Some analysts were of the view that investors did not recognize the value of Beta's cash balances which could impact their stock price positively.

*News Flash #5*

## VIVID treatment

- 1) *Alpha*: Commenting on Alpha's outlook, the CEO stated that the management of Alpha was very optimistic about Alpha and its future. Exuding confidence, he also stated Alpha was optimistic that an important segment of their business would see a breakthrough in 2009.
- 2) *Beta*: Commenting on their positive results, Beta's CEO stated that customers were attracted to Beta's flagship product both for its functionality and user-friendly features.

## PALLID treatment

- 1) *Alpha*: Commenting on Alpha's outlook, the CEO stated that the management of Alpha had a positive view about Alpha and its future. He also stated Alpha believed that an important segment of their business would improve in 2009.
- 2) *Beta*: Commenting on their positive results, Beta's CEO stated that customers were attracted to Beta's flagship product both for its functionality and user-friendly features.

## APPENDIX B

*Experiment 2 News Flashes**News Flash #1*

## VIVID treatment

- 1) *Alpha*: Alpha's earnings plunged in Q4, 2008, compared to the corresponding period a year ago.
- 2) *Beta*: Beta's revenues for a key product line in Q4, 2008 were lower compared to the corresponding period a year ago.

## PALLID treatment

- 1) *Alpha*: Alpha's earnings declined in Q4, 2008, compared to the corresponding period a year ago.
- 2) *Beta*: Beta's revenues for a key product line in Q4, 2008 were lower compared to the corresponding period a year ago.

*News Flash #2*

VIVID treatment

- 1) *Alpha*: A leading Wall Street analyst chopped his price target for Alpha based on worries that Alpha's stock price reflected a recovery in 2009 that was highly unlikely to materialize. He further stated that he did not uncover a single source that thought that business trends were going to improve in the foreseeable future for Alpha.
- 2) *Beta*: A leading Wall Street analyst lowered his fiscal 2009 earnings and revenue estimates for Beta based on a deepening macro-economic downturn. He was unsure that Beta could count on consumers for a recovery.

PALLID treatment

- 1) *Alpha*: A leading Wall Street analyst lowered his price target for Alpha based on expectations that Alpha's stock price may not recover in 2009. He further stated that he did not see evidence that business trends were going to go up in the near future for Alpha.
- 2) *Beta*: A leading Wall Street analyst lowered his fiscal 2009 earnings and revenue estimates for Beta based on a deepening macro-economic downturn. He was unsure that Beta could count on consumers for a recovery.

*News Flash #3*

VIVID treatment

- 1) *Alpha*: Alpha's management sounded some alarms about the economy in a conference call with analysts. Emphasizing the weakness in the economic environment, the CEO of Alpha said that Alpha was still in uncharted territory.
- 2) *Beta*: Beta's management acknowledged the uncertainty in the economic environment and said that the low visibility made forecasting a challenge.

PALLID treatment

- 1) *Alpha*: Alpha's management expressed some concerns about the economy in a conference call with analysts. Discussing the slow economy, the CEO of Alpha said that Alpha was still in an uncertain environment.
- 2) *Beta*: Beta's management acknowledged the uncertainty in the economic environment and said that the low visibility made forecasting a challenge.

*News Flash #4*

## VIVID treatment

- 1) *Alpha*: Alpha cut more than a half-dozen projects in recent weeks and has also radically curtailed hiring. Analysts said that Alpha's recent moves indicated it was feeling some pain from the economy.
- 2) *Beta*: Analysts stated that new customers for Beta's flagship product accounted for a lower percentage than usual, suggesting that most sales came from existing customers, raising questions about Beta's future sales.

## PALLID treatment

- 1) *Alpha*: Alpha reduced its project portfolio in recent weeks and also reduced hiring. Analysts felt that Alpha's recent moves indicated it was influenced by the economy.
- 2) *Beta*: Analysts stated that new customers for Beta's flagship product accounted for a lower percentage than usual, suggesting that most sales came from existing customers, raising questions about Beta's future sales.

*News Flash #5*

## VIVID treatment

- 1) *Alpha*: Contradicting expectations that Alpha's revenues would stabilize later in the year, an analyst said that the current recession was the worst recession since 1930–32, and stated that the industry is in the very early stages of a long recession.
- 2) *Beta*: Commenting on the outlook of Beta's flagship product, the COO stated that Beta would not provide guidance at a product level. He observed that the economy may slow the adoption rate for their product because their products commanded high monthly fees that could affect customers' decision to sign up.

## PALLID treatment

- 1) *Alpha*: Commenting on expectations that Alpha's revenues would stabilize later in the year, an analyst said that the industry is in the early stages of a long recession.
- 2) *Beta*: Commenting on the outlook of Beta's flagship product, the COO stated that Beta would not provide guidance at a product level. He observed that the economy may slow the adoption rate for their product because their products commanded high monthly fees that could affect customers' decision to sign up.

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