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Metaphor in Stock Market Commentary:
Consequences and Preconditions of Agentic Descriptions of Price Trends

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Abstract

We investigated the consequences and preconditions of two types of metaphors in stock market commentary. *Agent* metaphors describe price trends as actions of an animate, self-propelled actor, whereas *object* metaphors describe them as movements of an inanimate object caused by external physical forces. Study 1 examined the consequences of commentary for lay investors' judgments. Agent metaphors, compared with object metaphors and non-metaphoric descriptions, caused investors to expect price trend continuance. The remaining studies examined preconditions, the features of a trend that cause commentators to use agent versus object metaphors. We hypothesized that the rate of agentic metaphors would depend on the trend direction (upday vs downday) and steadiness (steady vs unsteady). Two archival studies tracked the metaphoric content in end-of-day CNBC commentary as function of daily price trajectories. As predicted, agent metaphors were more likely for uptrends than downtrends and especially so when the trends were relatively steady. This held for both bull (Study 2) and bear market periods (Study 3). Study 4 replicated these findings in a laboratory study where participants took the role of a stock market commentator. We discuss implications of these findings for the literatures on metaphoric cognition and financial judgment.

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In recent years, there has been a great deal of research on the cognitive psychology of investors. Patterns of behavior that defy rational models have been elucidated by identifying the cognitive heuristics with which investors process financial information (e.g., Barberis & Thaler, 2003; Camerer, 1987; Fong & Wyer, 2002; Nelson et al, 2000). Yet investors do not make judgments in a social vacuum; they are highly influenced by messages from other people, such as stock market commentators (Shiller, 1999). Hence, understanding investor behavior may require not only cognitive but also social psychological analysis.

There have been a few studies that have looked at investors and commentators in tandem. In early research on this question, Andreassen (1987) noted that a salient feature of reporting on the stock market is indirectly expressed causal attributions. He focused on one form of indirect explanation; namely, pairing price trends with news about changed business conditions (for example, “the Nasdaq rose 50 points today on news of improved employment figures”). In an experiment manipulating the presence of such news in a stock trading game, Andreassen (1987) found that participants exposed to news did worse—they bought (high) after updays and sold (low) after downdays. Recently, DiFonzo and Bordia (1997; 2002) found similar effects from exposing investors to mere rumors rather than definite news. In sum, there is evidence from several past studies that when commentators imply that a trend reflects changed business conditions, this leads investors to expect that the trend will continue the next day.

In the current research, we follow this social psychological approach of studying investors in tandem with commentators. Yet we explore a more subtle mechanism through which

commentators' verbal behavior may affect investors' judgments. We propose that investors' expectancies may be shaped by the language with which commentators describe price trends, even when commentators make no explanatory reference to business conditions. Social psychologists have long documented that causal attributions can be conveyed implicitly through the language with events are described (Brown & Fish, 1983; Semin & Fielder, 1988). Connotations of causality are particularly salient in metaphoric descriptions, which impose schemas from other domains onto an event (Gibbs, Bogdanovich, Sykes, & Barr, 1997; Slobin, in press). Gibbs (1992), for instance, has found that authors' metaphors tend to be inherited by their readers, when readers subsequently talk about the described event. Many studies have found that people's metaphors about a phenomenon shape their biases in problem solving (Gentner & Gentner, 1983; Kempton, 1986; Weick, 1985). In this way, reading a commentator's metaphoric description may shape an investor's causal models of a price trend, affecting expectations about its likelihood of continuing the next day.

What kinds of metaphors matter in stock market commentary? The most noticeable metaphors in the financial pages are the one's self-consciously used to make particular points (such as describing a trend as "a stampede of bulls" or "a dead cat bounce"). However, beyond these fixed metaphoric expressions, there is a great deal of implicit metaphoric description in which price movements are described in concrete, spatial terms. As Lakoff (1992) argues, in these implicit metaphors abstract increases to a quantity are described as movements of an entity upward from a ground plane. Much of this consists of two general types. First, and most central to our analysis, are agent metaphors, metaphors that describe price activity as the behavior of an animate creature. Examples of such metaphors are "the Nasdaq climbed higher," "the Dow fought its way upward," and "the S&P searched for a bottom." We contrast these with the

category of object metaphors, metaphors that describe price activity as movements of inanimate objects, buffeted by external physical forces. Examples of this second category are “the Nasdaq dropped off a cliff,” “the Dow fell through a resistance level,” and “the S&P bounced back.” We posit that agent and object metaphors reflect two basic kinds of casual schemas that people draw upon in metaphoric processing of price trends.

From the literature on causal attribution, we derive hypotheses about the distinctive consequences and preconditions of these two types of metaphors. Research in the social and sports domains, for instance, suggests that observers who attribute an outcome to an actor’s agency tend to overpredict the degree to which the outcome will continue in the future (Gilovich, Vallone, & Tversky, 1985; Ross & Nisbett, 1991). In the stock market domain, therefore, it seems plausible that agentic interpretation may engender stronger expectations that a given day’s uptrend or downtrend will continue on the following day. Turning to preconditions, it is useful to consider past research on visual displays indicating that certain trajectory features differentially evoke agent as opposed to object causal schemas (Heider & Simmel, 1944; Leslie, 1995; Michotte, 1946). Based upon such work, it seems plausible that certain features of price trajectories, such as the direction and steadiness of a trend, might also determine the type of metaphor evoked when interpreting such movements. Specifically, it seems likely, as we will discuss shortly, that agentic metaphors might be more prevalent in the context of uptrends, particularly uptrends of a relatively unambiguous nature.

In the current studies, we used several methods to test our hypotheses. In addition to conducting laboratory studies that placed participants in the roles of stock market commentator and investor, we analyzed historical data, tracking the content of media commentary over different historical periods to assess whether metaphor rates depended on daily price trajectories.

Before describing the our specific hypotheses and studies in more detail, however, it is worth reviewing some background points about stock market commentary.

Background on Stock Market Commentary

Economic research reveals that day-to-day trends in the stock market follow a random walk, meaning that today's trend does not predict tomorrow's trend (Malkiel, 1996).

Nevertheless, media commentators display an overwhelming tendency to focus largely on the short-term, daily trends. Why might this be so?

Andreasson (1987) suggested that this short-term focus is related to expectations of relevance (Grice, 1975). Newspaper reporters with a daily column may feel obliged to focus on what's changed since their last report. The pressure of expectations may be even worse for television reporters. Stock market reporters on television adopt a style much like their sport news peers, a colloquial run-down on the day's events, with flashing stock charts substituted for home run highlights reel. Yet why do commentators not only report but also *interpret* daily trends? Again, this may be largely a matter of expectations. The *CNBC Marketwatch* tagline promises, "*The story behind the numbers.*" Under this banner, commentators cannot just say "it was another random walk today"; they are supposed to make sense of the trends, to provide a meaningful interpretation.

Commentators' predicament of having to interpret chance-based outcomes helps us understand the tendencies toward indirect expression of attributions noted by prior researchers. By juxtaposing price change information with plausibly explanatory news (Andreassen, 1987) or rumors (DiFonzo & Bordia, 1997, 2002), commentators meet audience expectations for explanation without committing themselves to direct "because" statements that would be hard to defend). Yet there is no reason to assume that this is the only way or the most pervasive way that

commentators solve their predicament (and influence investors' judgments). We propose that commentators pervasively rely on implicit metaphors when describing price trends. Metaphoric description is a way of guiding the reader's interpretation without having to hazard guesses about the relevance of specific changes to business conditions. As we shall see, agent and object metaphors convey distinctive causal expectancies. Let us now derive hypotheses about this from the literature on causal schemas and attribution.

Consequences of Agent and Object Metaphors

Research on problem solving has found that imposed metaphors tend to powerfully shape human judgment. People who think that their home thermostat works like a gas pedal (that it's a valve rather than a switch) make the mistake of turning it to higher-than-desired temperatures to heat the house more quickly (Kempton, 1987). Electricians make different mistakes in solving problems depending on which of two common metaphors they use to reason about electricity in wires, flowing water in pipes or teeming crowds in corridors (Gentner & Gentner, 1983). In sum, metaphorical encodings impose causal schemas from a different domain. Different biases about a topic arise from different from metaphorical encodings.

How do agent versus object metaphors affect reasoning about price trends? A central premise of attribution theory is that perceivers use qualitatively different theories or schemas to attribute actions of persons versus movements of objects (Heider, 1958). When perceivers apply their "naïve theory of action" (or in our terms, the agency schema), they trace observed trends to enduring dispositions of the actor. Hence, they expect the actor to continue this behavioral trend in the future; the direction of movement should resume after an interruption. By contrast, when perceivers assume they are viewing an inanimate object (the object schema), they trace observed movements to external mechanical forces (e.g. the impact of collisions, ground resistance,

gravity) rather than internal dispositions. Hence, they should not expect that past movements are predictive of future movements.

There is plentiful evidence from judgment research that agentic encoding is associated with heightened expectancies of trend continuance. As noted earlier, research has found that people regularly overpredict consistency in other people's social behavior (Ross & Nisbett, 1991). Likewise, people trace short-term trends in sports performances to internal properties of the actor ("the hot hand") and expect continuance (Gilovich et. al., 1985). As in the social and sports domains, we propose that agent schemas will affect expectancies in the stock domain.¹ More formally, we hypothesize:

H1: Investor expectancies of trend continuance are heightened by agent-metaphor as opposed to object-metaphor or non-metaphorical descriptions.

Preconditions of Agent versus Object Metaphors

If agent and object metaphors differ in their consequences, it is important to understand the conditions that give rise to them. We argue that commentators are prompted to generate these metaphors by trajectory cues in price trends. This is the least obvious step in our argument, so let us review it in some detail. Price trends are trajectories, in the sense of movements over time. In this respect, the chart of the Nasdaq index on a given day may resemble the flight path of a butterfly or blowing leaf. We contend that people are hardwired to respond to features of trajectories and that these responses may arise in their processing of price trajectories. This view leads to predictions about the kinds of price trajectories that should be more likely to give rise to agent metaphors as opposed to object metaphors.

The premise that trajectory features trigger cognitive responses is well-established in psychology. Many species have neural mechanisms that respond to particular trajectory features

in visual stimuli; the frog, for example, protrudes its tongue in response to stimulus displays that resemble the zig-zagging trajectories of flies (Lettvin, Maturana, McCulloch, & Pitts, 1959). Frog evolution “designed” its flytrap to detect features of fly trajectory, rather than color, size, or shape, because the trajectory feature is more useful in distinguishing flies from non-flies. At least this is true in the frog’s natural ecology; in Lettvin’s lab, by contrast, frogs lap in vain at abstract displays. As we shall see, people making sense of stock charts may be in a predicament something like that of the frogs in Lettvin’s lab, victims of their automatized responses to trajectory cues.

In humans, trajectory features trigger interpretations of causality. Michotte (1946) found displays of shapes moving along a ground plane give rise to impressions of mechanical or physical causality when one shape begins moving just as another shape makes contact with it. By contrast, when a shape initiates movement without contact, it is perceived as animate. Impressions of animacy or agency come from trajectories that suggest self-propelled movement. More recent studies have focused on movements on a vertical as well as horizontal axis. Trajectories that move generally downward are more likely to be judged inanimate, whereas reversed displays showing a generally upward trend are more likely to be judged animate (Morris, 1993). Strong impressions of agency are evoked by displays in which a moving shape lifts off of the ground plane to surmount an obstacle (see Scholl & Tremoulet, 2000). Studies have found that even infants respond to trajectory cues indicative of agent and object causality (Leslie, 1995). This suggests that humans have hardwired mechanisms linking trajectory features with encodings of agent and object causality. Would such mechanisms have been adaptive? Consider, for instance, that in the evolutionary environment something that initiated upward movement as almost invariably animate rather than inanimate, so this mechanism would have

helped early humans in quickly parsing their visual environment. An ascending bird would have been recognized as animate (and hence able to restart motion after a stop) and a falling coconut as inanimate (and hence unable to restart its motion after a stop).

The same automatic triggering of causal schemas by trajectory cues may occur when market commentators quickly makes sense of price trajectories. Upward trajectories should be more likely to trigger impressions of agent causality, and downward trajectories should be more likely to trigger impressions of object causality.² A main effect hypothesis about metaphor evocation, then, is as follows:

H2: The more upward the direction of price trends, the higher the rate of agent metaphors and the lower the rate of object metaphors.

In addition to trend direction, another salient feature of price charts is trend steadiness, reflecting the price volatility. This variable may qualify the impact of overall direction. Let's explore this interaction effect inductively by considering a series of trajectory patterns. First, let's contrast two upward trajectories. Suppose first that you see something in the distance ascend steadily from the ground upwards into the sky. Now suppose you see something ascend on unsteadily, occasionally dropping downward before resuming a more upward direction? Which gives a stronger impression agency? You probably have a stronger impression of agency from the first trajectory, like that of raptor taking flight. The second trajectory is like that of a butterfly yet is also like that of a leaf blowing in the wind. On our analysis, the steady upward trajectory provides more consistent cues to agency because there are no downward reversals that suggest the lack of agency.

To continue the exercise, let us now contrast two downward trajectories. Suppose you see something sliding down a distant mountain face on a steady descending path. Now suppose you

see something descend unsteadily, with occasional swerves upward before continuing downward. You probably have a stronger the least sense of agency from the steady downward path whereas the unsteady path shows some signs of life. Whereas the steady trajectory is like a falling a rock, the unsteady trajectory may be a skier. On our analysis, the steady downtrend contains no cues to agency (no upward movements). The unsteady downtrend, by contrast, contains minor upward movements that provide some hint of agency. Taken together, our reasoning about steadiness in uptrends and downtrends leads us to the following interaction-effect hypothesis:

H3: In the context of uptrends, unsteadiness decreases agent (and increases object) metaphor rates, whereas in the context of downtrends it increases agent (and decreases object) metaphor rates.

Clues from a Past Study

Though we know of no prior studies of the language with which commentators describe price trends, some anecdotal evidence can be gleaned a pilot study reported by Andreassen (1987). In this study, Andreassen sampled references to economic conditions to explain price changes in individual stocks in a *Wall Street Journal* column in selected years. Though not the focus of his analysis, Andreassen (1987, Table 1) presented the descriptions of the 5 most positive and 5 most negative daily price changes from his sample. It is worth noting the prevalence of metaphoric language. The five largest up-trends (date shown) were:

(6/3/1980) “Financial Federation *leaped...*”

(4/12/1960) “United Stores second preferred lead the market in activity, *advancing...*”

(8/20/1965) “Americian South African Investor *rose....*”

(11/3/1970) “In the glamour group, Telex *climbed...*”

(6/2/1980) “ERC Corp. stock *soared*...”

The descriptions of the five largest down-trends, by contrast, were:

(11/20/1975) “Marine Midlands Banks *slid*...”

(6/20/1980) “City Investing was the Big Board’s most active stock, *dropping*...”

(4/1/1960) “Polaroid *plummeted*...”

(4/20/1960) “The most active stock was Ampex, which *dropped*...”

(11/4/1975) “A big casualty among blue chips was United Technologies, which *fell*...”

Notice that some descriptions clearly portray the stocks as entities engaging in agentic action (“leaped” and “climbed”). Others portray the stocks as objects at the mercy of external physical forces such as gravity (“plummeted” and “fell”). And, importantly, the agent-causality metaphors appear more frequently for up-trends, whereas the object-causality metaphors appear more frequently for down-trends. Though merely anecdotal, this evidence supports our main-effect hypothesis (H2) that agent and object metaphors are differentially evoked by upward versus downward trends.

Overview of Current Studies

In the current research, we first examined how metaphors affect lay judgment and then we investigated the conditions that elicit metaphors. Throughout all our studies, we focused on market indices (Dow, Nasdaq, and S&P)³ rather than individual stocks. A skeptic might argue that agentic descriptions of individual stocks (e.g. “Apple picked up its pace”) are implicit references to their CEOs or employees. Yet no one could argue that descriptions of a market index (“the Nasdaq picked up its pace”) are references to all the employees in the indexed firms. Hence, a focus on market indices is a more conservative test of the hypothesis that agentic metaphors guide judgments about price trends.

Study 1 investigated the consequences of commentator metaphors on investor expectancies of trend continuance. Participants took the role of investors and interpreted daily price trend in order to predict the next day's trend. We varied across conditions the language with which the day's price trend was described (agent metaphor, object metaphor, or non-metaphorical). We then tested the key prediction that expectancies of trend continuance are fostered by agent metaphors as opposed to object metaphors or non-metaphorical descriptions. We also varied whether the price trend was presented in the form of graphical chart or table of numbers.

The remaining studies investigated the conditions that give rise to agent and object metaphors. Study 2 analyzed daily commentary about major indices in an end of market day TV program on CNBC. By correlating metaphor content with the daily price change, we found support for the hypothesized main effect of trend direction and its interaction with trend steadiness. Study 3 replicated these results in a different historical period. Study 4 replicated these relationships in laboratory experiment that enabled a manipulation of price trajectories. Importantly, this final study tested our trajectory-cue account of metaphor evocation against an alternative, motivated reasoning account.

Study 1

Our first study investigated the expectancies that follow from different kinds of metaphoric content in commentary from a media expert. Participants had the task of interpreting one day's price trend and predicting the next day's trend. The price trend information was given in a detailed quantitative form as well as in a summary statement by a market commentator. The experiment varied between groups the metaphoric content of the commentary. We tested the hypothesis that agent-metaphor content would lead to stronger expectancies of trend continuance

than would object metaphor content or non-metaphorical content.

A second manipulated factor was the format in which the quantitative price trend information was presented--chart or table. We predict that the chart format should facilitate encoding of the price trend metaphorically. Lakoff (1993) argues that stock charts are artifacts that reinforce the metaphorical encoding of price changes as movements in space. Hence, the effect of commentary content should be stronger in the chart than table condition. This format manipulation is useful in distinguishing our account from an alternative account—namely, the proposal that agentic content is simply more dramatic than the other kinds and hence is taken as a signal of the commentator's conviction. Although this account might reasonably explain the main effect of commentary content, it cannot explain the interaction effect.

We measured expectancies about future trends in several ways. Participants were asked to rate what the commentators expects, what his audience expects, and what they personally expect. We expected that these measures would be highly related and that the effect of the metaphor on their personal view would be mediated by its effect on their view of the commentator's view.

Method

Participants. Subjects were 64 undergraduates at Cornell University who participated in this study in exchange for \$5 compensation.

Procedure. Participants were given a questionnaire with instructions on the cover page followed by 6 pages presenting information about the performance of the Nasdaq index on a particular day, purportedly days drawn at random from the prior 5 years. The instructions explained it was a study of predicting stock market trends. They would be given information about the intraday price variation of a stock index, along with a comment made about it by a

stock market analyst on an end-of-day television program. Their task was to answer three questions about expectations. Specifically, the questions were:

- 1) *What does the analyst think the market will do tomorrow?*
- 2) *What do people listening to his program guess that the market will do tomorrow?*
- 3) *What do you think the market will do tomorrow?*

All three of questions were answered by rating the expected next-day closing point on a scale relative to the given day's closing point(1=much lower, 4=the same level, 7=much higher).

Continuance bias, the primary dependent variable of interest, would appear on this scale as above midpoint ratings after updays and below midpoint ratings after downdays. The ratings focus on different points in the communication between the market commentator and investors, so they should be highly inter-related.

All participants saw the same 6 stimulus days, in a different random order for each participant. Trend direction was varied within-groups. Three uptrend stimulus patterns were designed based on actual daily trends of the Nasdaq index from the prior year, in which there was an appreciable uptrend (between 40 and 80 points). Downtrend versions of each were created by inverting the direction of variation within the given range, and then introducing slight variations early in the day so that the inversion would not be transparent.

The key independent variable was a between-groups manipulation of commentary content (agent-metaphor, object-metaphor, or no-metaphor). The different phrases that appeared with each stimulus pattern are listed in Appendix A. A second independent variable was a between-groups manipulation of the format of the price trend information. Participants received the intraday price information in either a chart or table format. The granularity and orientation of price information was held constant across formats. That is, in both formats, intraday prices were

presented at 15 minute intervals, demarcated along the horizontal axis of the page. An illustration of the varying formats and commentary for a given stimulus day is provided by Figure 1.

Results

Hypothesis testing. In order to test our key hypotheses, we began by aggregating across the three stimulus days to reach upday and downday summaries for each rating in each condition. As may be seen in Table 1, participants generally expected uptrends after updays (ratings >4) and generally expected downtrends after downdays (ratings < 4). Difference scores (upday – downday) were computed as overall measures of continuance bias. As expected, continuance bias was stronger in the agent-metaphor condition than in the other two conditions (object-metaphor condition and the non-metaphor condition) and these did not differ from each other. We pooled the two nonagentic conditions in order to run Commentary Content (2: Agentic vs. nonagentic) x Format (2: Graph vs. table) x Direction (2: Up vs. down) ANOVAs for each of the three ratings, focusing on the commentator, his audience, and the self.

The commentator-focused rating showed a main effect of Direction $F(1,104)=63.79$, $p<.001$ as well as interaction effects of Commentary Content x Direction $F(1,104)=16.06$, $p<.001$ and, marginally, Commentary Content x Direction x Format $F(1,104)=3.56$, $p=.06$. The audience-focused rating showed, likewise, an effect of Direction $F(1,104)=181.63$, $p<.05$ and interactions of Commentary Content x Direction $F(1,104)=4.89$, $p<.05$ and Commentary Content x Direction x Format $F(1,104)= 4.89$, $p<.05$. Finally, the self-focused rating showed, again, an effect of Direction $F(1,104)= 45.76$, $p<.001$ and an interaction of Commentary Content x Direction $F(1,104)=4.66$, $p<.05$, although the Commentary Content x Direction x Format interaction failed to reach significance $F(1,104)= 1.93$, *ns*. The form of the interaction effects can be illustrated by plotting the difference scores (measuring overall continuance bias) as a function

of Commentary Content and Format—see Figure 2. They reflect that the difference between agentic and nonagentic conditions was greater with the graph format than the table format. This is consistent with our premise that stock charts facilitate metaphoric encoding.

Mediating relationships. We also explored the relationships among the commentary, audience, and self ratings. Given that trajectory direction was varied within subjects, we followed the procedure outlined by Judd, Kenny, and McClelland (2001) for testing mediation using regression analysis with difference scores. We then followed the standard three steps for testing mediation (Baron & Kenny, 1986). First, we checked whether the effect of agentic metaphor content on the self-focused expectancy score was mediated by commentator-focused expectancy score. We began by regressing our proposed mediator (commentator-focused score) and dependent variable (self-focused score) on our two independent variables, trajectory format and commentary content. Commentary content significantly predicted both commentator ($B=-2.00, p<.001$) and self scores ($B=-1.02, p<.001$). We then carried out the third step, regressing the self-focused score on commentary content and format while simultaneously controlling for the commentator-focused score. Upon doing so, the previously significant effect of commentary content on self score was reduced to nonsignificance ($B=.207, p=.47$), whereas our proposed mediator (i.e., the commentator-focused score) remained significant ($B=.613, p<.001$). This suggests that metaphoric content strongly influences the perceived expectancies of the commentator and this ultimately influences investors own expectancies.

Discussion

Results of this first study document that investors are influenced by the metaphoric content of media commentary. Agent-metaphors, compared with object metaphors and nonmetaphorical content, led to stronger expectancies of trend continuance. Moreover, this was

especially strong in the chart rather than table format, which is consistent with our argument that trajectory information facilitates metaphoric encoding. This interaction effect is useful for separating the metaphor/causal schema argument from an alternative account that agentic description is simply more dramatic. Though more dramatic descriptions could explain a main effect, they do not explain the interaction effect.

Given the Study 1 findings that commentators' metaphors give rise to investor biases, it is important to know the conditions under which commentators are most likely to generate certain kinds of metaphors. To the extent that particular kinds of price trends evoke agentic language, these would be conditions where investors may be particularly vulnerable to continuance bias.

Study 2

The second study launched our investigation of the preconditions of agent and object metaphors. Transcripts of an influential end-of-day television program were read in order to extract all references (metaphorical or non-metaphorical) to the day's change in the three major market indices (i.e., Dow, Nasdaq, S&P). We chose a historical period (January – June 2000) in which indices showed substantial volatility but no overall upward or downward movement. We analyzed whether the rates of agent and object metaphors depend on the daily price trend, specifically its direction and steadiness. We expected more agent (and less object) metaphors on updays than downdays, and especially so to the extent that there was a steady directional trend as opposed to volatility.

Method

Procedures. Transcripts of the CNBC television program "Business Central" were collected for January through June, 2000. This show aired on weeknights after the close of the

financial markets (5 p.m. Eastern Time) and provided a review of the day's market activity.⁴ All sentences or clauses having the Dow, Nasdaq, or S&P index as their subject were extracted for coding, resulting in a list of 1,454 descriptions (roughly four mentions per index per day).

A hypothesis-naïve coder worked with the definitions in Table 2, to code each description into one of three categories: non-metaphorical (N=452), object-metaphor (433), and agent-metaphor (569). A second research assistant coded half of descriptors to check reliability, yielding a 79% agreement rate.

---insert Table 2 about here---

To compute the dependent variables, the number of agent-, object-, and non-metaphorical descriptions was counted for each of the 3 indexes for each day. Measures of the proportional share of description constituted by agent- and object-metaphors, respectively, were computed by dividing these counts by the total count of descriptions for each index/day.

The independent variables for trend direction and trend steadiness were computed from the daily price information for each index. Trend direction was measured as the percentage gain--the difference between an index's daily closing price and that of the prior market day, as a percentage of the prior closing value. Uptrends have a positive value and downtrends a negative value. A measure of trend steadiness was the range (daily high – low) as a percentage of the prior closing value. Range, controlling for the daily gain, picks up the degree to which there were dramatic mid-day movements counter to the main movement of the day.⁵

Results

An overview of the findings can be seen in the correlations between the financial measures of gain and range and the measures of metaphor rates--see Table 3. The overall results, pooling together data from the three market indices, appear in the top two rows. Looking first at

the raw count measures of commentary rate, we see that gain has the expected differential relationships to agent-metaphor rate and object-metaphor rate. Range, on the other hand, has a positive relationship to the rate of all kinds of commentary (nonmetaphoric, object metaphor, and agent metaphor), likely reflecting that days with a wider range are simply more newsworthy. Given this pattern, we focused on the proportional measures which tap the relative frequency of particular types of commentary. With the proportion measures, the pattern of associations with gain remain the same--positive with agent metaphors, $r(348)=.27, p < .01$ and negative with object metaphors, $r(348) = -.33, p < .01$. Range, by contrast, is uncorrelated with the proportional rate of agent $r(348) = .05$, and object metaphors $r(348) = .07$. Notice that this configuration of correlations in the overall pooled data is mirrored in the results for each of the indices separately (Nasdaq, Dow, and S&P).

---insert Table 3 about here---

To test hypotheses, the proportional metaphor rates were regressed on measures of trend direction (gain), trend steadiness (range), and their interaction. Agent-metaphor rate showed a main effect of trend direction $b=.57, p < .001$; no effect of trend variability $b=.07, p < .10$; and an effect of their interaction $b= -.32, p < .01; R^2 = .11, F(3, 344)=13.59, p < .001$. Likewise, object metaphors showed a main effect of trend direction $b=-8.22, p < .001$; no effect of trend variability $b=.08, p < .10$; and an effect of their interaction $b= .64, p < .001; R^2 = .19, F(3, 344)=26.46, p < .001$. The form of the interaction was as expected: the effect of overall uptrends vs. downtrends was attenuated at higher levels of trend unsteadiness.

Discussion

Study 2 results showed that rates of agent- and object-metaphors in market commentary depend on trend direction. Also this effect of trend direction was higher for steady than unsteady

trends. Hence the two hypotheses were supported.

However, alternative explanations for the main effect of direction can be raised. A critic might suggest that the historical period sampled was a time when commentators expected the market to rise every day. To flesh out this argument, suppose (a) that commentators use agentic language when the market moves in the direction they expect, and (b) in first half of the year 2000 commentators expected upward trends because they were accustomed to late 90s boom years. In our next study we can test this argument by sampling a later historical period when bull market expectations would have faded.

Study 3

Study 3 replicated the basic method of Study 2. One change was that we sampled a later period in time when *bear* rather than *bull* market trends dominated memories. Rates of the two general kinds of metaphors were tallied and regressed on the two general measures of price change—direction and steadiness—in order to test our hypotheses as in Study 2.

Additionally, we explored more fine-grained relationships in the dependence of metaphors on trajectories. Agent- and object-metaphors were divided into more fine-grained categories corresponding to frequently used verbs (and their synonyms) such as “climbing,” “struggling,” “falling” and “bouncing.” Also, price trajectories were coded into patterns based on their qualitative shapes on intraday price charts.

Method

Procedures. As in Study 2, electronic transcripts of the CNBC television program “Business Central” were collected, in this case for October 30, 2000 through January 31, 2001. This yielded 774 descriptions of the Nasdaq, Dow, and S&P 500 indices. Gain and range were computed from financial information as general measures of trajectory direction and variability.

There was no overall direction of gain or loss in the sample (average daily gain percentage for the three indices was $X = -0.0003$, $SD = 0.0265$, $n = 171$). Descriptions were categorized at the general level as agent-metaphors (268), object-metaphors (150), or non-metaphors (356) by a research assistant. An independent coding by another hypothesis-naïve research assistant on a randomly selected sample of one-fourth of these descriptions showed adequate reliability (84% agreement).

To explore more detailed patterns, the independent variable of price trajectory was then coded at the level of 8 prototypical trajectory types from intraday price charts of each index (these were collected each business day from www.BigCharts.com, though a few days are missing due to clerical errors). Coders sorted charts into 8 categories relying on a verbal definition as well as sketches of stylized prototypes. Charts showing a salient price change were categorized in terms of direction and steadiness, resulting in the categories of steady upwards, unsteady upwards, steady downwards, and unsteady downwards (these four types are the upper panel of Table 4). Charts without a salient directional change were categorized into four types (showing in the lower panel of Table 4): calm (a relatively flat trend), chaotic (a trend with swings in both directions), fall-and-rise (a trend with one salient valley), and rise-and-fall (a trend with one salient peak). An independent hypothesis-naïve coder coded a randomly selected third of the charts, and the reliability was adequate ($\kappa = .76$).

--insert Table 4 about here

The dependent variable was also coded at a more fine-grained level—basic types of metaphorical verbs. Metaphoric descriptions were categorized in terms of an emergent coding scheme developed to capture different subtypes of agent and object metaphors. Each description was coded as to which of the following verbs it most closely resembled: jumped, climbed,

struggled, rallied, followed, tested, edged, recovered, fell, slipped, tumbled, skidded, bounced, and reversed. An independent coding by another hypothesis-naïve research assistant on half the descriptions showed adequate reliability ($\kappa = .82$).

Results

The first purpose of Study 3 was to check whether the results of Study 2 could be replicated in a different historical period. To this end, measures of the proportional rate of agent and object metaphors were regressed on gain, range, and their interaction. For agent metaphors, there was as expected an effect of gain, $b=.33$, $p < .05$; no effect of range gain, $b=.439$, $p > .10$; and the interaction effect fell short of significance, $b=-.23$, $p > .10$; $R^2=.035$, $F(2,167)=2.03$, $p=.112$. For object metaphors, results showed the expected an effect of gain, $b=-.62$, $p < .01$; no effect of range, $b=-.04$, $p > .10$; $R^2=.126$, $F(3,167)=8.06$, $p < .01$; and the expected interaction effect $b=.414$, $p < .01$. In sum, there was strong support for the main effect mixed support for the interaction effect hypotheses.

We also explored the relationship between price trajectories and metaphorical verbs at a more fine grained level. Table 4 shows the most prevalent verbs evoked by each of the 8 trajectory types. In the top panel, many of the most prevalent verbs are identical to those in the *WSJ* descriptions of major uptrends and downtrends that we listed from Andreassen's (1987, pilot study) data. These involve two types— actions by an agent (“jumped” and “climbed”) and object movements dictated by external forces such as gravity and resistance (“fell” and “dropped”). Not surprisingly, different verbs are evoked by the sideways trends in the lower panel, which seem to express primarily horizontal movement (e.g. “edged” or “skidded”). Another type in both panels seem to be verbs that describe tension between an agent's internal goals and external forces (e.g. “struggled” and “rallied”). Though the *Ns* are too small for

significance testing, these seem to be evoked by unsteady trajectories.

Discussion

Study 3 replicated the key main effect, that price gain is associated positively with agent-causality metaphors and negatively with object-causality metaphors. The fact that these results were replicated in a historical period following a sustained market downturn weighs against the alternative account premised on the notion that commentators expect perennial uptrends. However, a variant of this account could still be posited. If commentators generally wish for uptrends, they may be motivated to expect continuance after updays but not downdays.⁶ If so, their penchant for agentic interpretations of uptrends (and not downtrends) may reflect motivated reasoning (Kunda, 1990) rather than the trajectory-triggered schemas. Our next study investigates this by manipulating whether commentators have a motive for upward versus downward trends.

Finally, the predicted interaction-effect fell short of significance on one of the two metaphor rate measures. The mixed results may reflect the fact that our operationalization (range) captures only one component of trend steadiness. In our next study, we directly manipulate trend steadiness (as well as trend direction) in a laboratory experiment. This should allow a much clearer identification of the effects.

Study 4

Our final study was a laboratory experiment that put participants in the role of stock market commentators. They were shown a series of stock charts. Participants were asked to describe each day's activity into a microphone. Their commentary was transcribed and its metaphorical content was coded. Another measure of their metaphoric thinking came from ratings participants made after commenting on the series of charts. They were shown each chart

again and asked to rate the extent to which particular metaphorical phrases fit their description of the trend. For all of the charts, participants rated the extent to which their description was agentic. Additionally, participants rated the similarity of their commentary to several phrases, different sets for updays and downdays. Some were designed to follow up the hints in Study 3 that different kinds of verb types are evoked by steady and unsteady trajectories.

Trend direction and steadiness were varied as within-groups manipulations. In addition, there was a between-groups manipulation of the motives participants held with regard to uptrends or downtrends. This was achieved by varying across groups the cover story about what index was represented by the charts. The stories were pitched to interests of the sample, who were college students in the Silicon Valley region of California. In the uptrend-motive condition, the charts were billed as the Nasdaq index, which was described as an indicator of the local job market. In the downtrend-motive condition, they were billed as the “California Energy Futures index,” which was described as an indicator of the electricity blackouts that were plaguing the area at the time. This manipulation of the motive that participants had for uptrends versus downtrends allowed us to test the role of motivated reasoning in agentic description. If the tendency to describe uptrends as agentic is a matter of wishful thinking, then it should occur in the uptrend-motive condition but not the downtrend-motive condition.

Method

Participants. Participants were 70 undergraduates at Stanford University recruited by an offer of \$10 to participate in a half-hour study concerning judgments about financial markets. Advertisements emphasized that no expertise with financial markets was required.

Procedure. Participants were told that they would be shown charts of the intraday activity of a market index. The cover story describing the market index was varied between-groups to

manipulate motives for uptrends. In the uptrend-motive condition, participants were told they would see charts of the Nasdaq index, an indicator of the local (Silicon Valley) job market. In the downtrend-motive condition, participants were told they would see charts of the “California Energy Futures Index” index, an indicator of the energy shortages and blackouts that had been mounting at the time (Spring of 2001). Participants, who were run individually, were queried verbally to make sure that they understood the described benefit or harm of uptrends.

The charts were presented to participants in booklets with a separate page for each chart. Charts were labeled on the y-axis in terms of percent gain or loss and on the x-axis in terms of half-hours from 9:30am to 4:00pm. The charts were enumerated cryptically (e.g. Day #112, Day #37) and randomly ordered. The 5 charts were designed to represent the trend prototypes that we referred to in the preceding study as steady-uptrend, unsteady-uptrend, steady-downtrend, unsteady downtrend, and chaotic. The goal was to test hypotheses concerning direction and variability, and the chaotic pattern was included as filler. The four focal charts were created by starting with graphs of steady and unsteady decreases, then creating mirror images, and then slightly adjusting the mirror images so that the reversal was not obvious. The 5 were put in a random ordering: Half of subjects saw the graphs in this order and half in the reverse of this order. Upon being presented with the booklet, subjects were asked to read the following instructions, which appeared on the cover-sheet of the booklet:

These are charts of the Nasdaq (Energy-Futures) index activity on 5 days we've selected. For each chart we want you to give an off-the-cuff description or interpretation of the activity, as though you were describing it on the phone at the end of the day to a group of friends.

Participants were then given a few minutes to study each chart, after which they spoke their

description into a microphone. These descriptions were tape recorded, so that they could be later transcribed and content analyzed.

Once participants had finished describing the market activity for the five days, they were given a questionnaire. On its 5 pages the graphs were repeated, along with several verb phrases describing the market index's activity. Participants were told that their task was to rate the extent to which each captured their interpretation of the activity. Most important was a rating of agentic impression; the extent to which the market *was trying to do something*.

Also there were specific items that varied for uptrends as opposed to downtrends. These were used to explore whether steadiness affects the metaphor subtypes evoked. The uptrend list included two of the most prevalent uptrend verbs from Study 3, "jumped" and "climbed." Also we included one expected to be triggered with steady uptrends, "thrust," and one expected to be triggered with unsteady uptrends, "wandered." Likewise, the downtrend list included two prevalent verbs from Study 3, "fell" and "tumbled," as well as one expected with steady downtrends, "dove," and one expected with unsteady downtrends, "searched." Participants rated the extent to which each phrase resembled their interpretations on a 7-point scale (1=not at all; 7=very much).

Content analysis. Tapes of participants' market commentary were transcribed. The overall description of each price chart was rated by two hypothesis-naïve graduate student coders on several abstract dimensions. Coders worked with the paragraph-long transcriptions for each day's description, without seeing the original charts. Unlike the pithy phrases of market journalists ("the Nasdaq jumped mid-day"), participants rambled on in adjectives and similes (e.g. "in the morning the Nasdaq was mellow but then started some crazy surges..."). To assess agentic description, coders rated the extent to which the market movement was described as

active and internally-driven. The agentic pole of the scale was illustrated by “the market climbed upwards,” whereas the nonagentic pole was illustrated by “the market was swept upwards.”

Also, to check an alternative account, coders rated the degree to which the market movement was described as dramatic or extreme.

Results

There were two sets of dependent measures—transcript codings and participants’ scale-ratings. The hypotheses were tested in a MANOVA with Direction (2: uptrend, downtrend) and Steadiness (2: steady, unsteady) as within-participants factors and Motive (2: uptrend-motive, downtrend-motive) as a between-participants factor. Overall, the results paralleled those in Studies 2 and 3. There was a main effect of Direction and an interaction effect of Direction X Steadiness. Moreover, no there were no effects of the Motive manipulation.

The coded measures may be seen in Table 5. For agentic description, there was a main effect of Direction, $F(1,56)=41.91, p<.001$, reflecting more agentic description of uptrends $M=2.73$ than downtrends $M=1.43$. Agentic description also showed an interaction of Direction x Steadiness. $F(1,56)=10.05, p<.005$, reflecting that the difference between uptrends and downtrends was attenuated in the unsteady conditions relative to steady conditions. For dramatic description, there were no effects of direction, steadiness, or their interaction. This suggests that the effects on agentic descriptions are not simply a function of which trajectories appear to be dramatic trends to the commentators.

Turning to the scale-rating measures, the most important one was a general measure of agentic description. There was a main effect of Direction, $F(1,56)=41.91, p<.001$, and an interaction of Direction x Variability, $F(1,56)=10.05, p<.005$. The MANOVA means are plotted in Figure 3. Again we see that uptrends were described more agenticly than downtrends and

this effect was attenuated under the condition of unsteadiness.

In addition to testing our hypotheses about general trajectory cues and agentic description, we also explored patterns at a more fine-grained level by asking participants to rate the extent to which several specific verbs corresponded to their description. The means from these ratings may be seen in Table 6. For updays, “jumped” was endorsed equally for the two trend directions. “Climbed” was rated higher for unsteady than steady trends, perhaps because it calls to mind traversing an uneven surface. As expected, “thrusted” upward was endorsed more for the steady trend and “wandered” upward for the unsteady trend. For downdays, “fell” was endorsed more for steady trends but “tumbled” was not. As expected, “dove” was endorsed more for the steady trend and “searched” for the unsteady trend. In sum, these exploratory results suggest that people endorse different verbs for steady as opposed to unsteady trends.

Discussion

Results of Study 4 supported our hypotheses about the preconditions of agent metaphors. Coded measures from transcripts and participants’ scale ratings showed the predicted main effect of trend Direction and the predicted Direction X Steadiness interaction effect. These laboratory findings complement the early findings from archival analysis of field data.

Also Study 4 results ruled out two alternative explanations: that agentic descriptions are evoked by trends congruent with motives, and that agentic description are evoked by trends that are perceived to be dramatic. An experimental manipulation of motives had no effect on the rate of agentic description. A measure of dramatic description did not show effects parallel to the measure of agentic description.

Finally, Study 4 explored differences in the verbs preferred for steady versus unsteady trends. The findings fit our intuitive predictions about verbs that fit steady versus unsteady

downtrends and uptrends. Compared with steady trends, unsteady trends may be more likely to evoke agentic verbs that posit complex forces or tensions between forces. Yet our findings are merely suggestive. A systematic proposal about verb subtypes associated with steady and unsteady trajectories is a project for future research.

General Discussion

In four studies we have found support for our hypotheses concerning trajectories, metaphors, and biases in stock market interpretations. The first hypothesis links media commentators' metaphors to investors' expectancies. Study 1 documented that agent-metaphor commentary engenders stronger expectancies of trend continuance (than object-metaphor and non-metaphorical commentary). This effect is stronger when price information is received in chart rather than table format. Although alternative accounts may be posited for the main effect of commentary content, only our account in terms of metaphorical encoding explains why participants are more affected by metaphorical content when they are interpreting a graph than a table.

The second hypothesis posits that agentic description is more likely to be evoked by uptrends than downtrends. Accordingly, we found that agent metaphors occur more frequently in descriptions of updays than downdays. This held in an analysis of CNBC transcripts from two time periods, following a bull market (Study 2) and a bear market period (Study 3). It also held in an experiment that measured commentaries of laboratory participants in response to manipulated trajectories (Study 4).

The third hypothesis was that the effect of trend direction on agentic description would be stronger for steady than unsteady trends. Unsteady trajectories include minor movements opposite to the overall direction and hence send a mixed signal. Support for this interaction effect

was attained in our CNBC studies (Study 2 and 3), significantly so in three of four tests. The laboratory experiment (Study 4) used a more direct manipulation of trend steadiness and found the predicted interaction effect on both transcript-coded and self-rated measures of agentic interpretation (Study 4).

Contributions of Current Research

Metaphors in cognition. The current findings contribute to the evidence that people process events metaphorically (Lakoff, 1993). Though past studies have found that metaphors for electricity affect reasoning about a wiring problem (Gentner & Gentner, 1983) and metaphors for love are transmitted from an author to readers (Gibbs, 1992), the metaphors in these studies were relatively delimited.

The current research tests the broader argument that metaphoric processing draws on core domains of innate schemas. Dennett (1995) argues that it is by only recycling such schemas for novel purposes that humans overcome their “representational bottlenecks” to model new domains. Psychological and anthropological theorists (Boyer, 2000; Guthrie, 1993; Wegner, 2002) have argued that agency schemas (or, as they are often called, “implicit theories of person”) underlie reasoning about many complex systems, such as the weather, the supernatural, computers. The evidence for most of these claims, however, is merely suggestive. The current studies add to the evidence that core causal schemas are seedbeds of metaphor in understanding more abstract domains. We have found detailed evidence in support of hypotheses concerning the preconditions and consequences of these types of metaphors. We have documented this using naturalistic field data as well as data from more controlled laboratory studies.

Not only have we advanced the evidence on metaphoric processing by focusing on the important sources of agency and object schemas, but we have examined a novel destination

domain—the stock market. Compared to previously studied domains, such as love, the stock market is one where professional communicators strive for dry precision rather than inspiring poetry, so it is striking that metaphoric description is so prevalent in stock commentary. These results add to other recent evidence that people think about stock market investments in intuitive, qualitative terms. MacGregor, Slovic, Dreman, and Berry (2000) studied individual differences in the thematic images that investors associate to different market sectors (e.g. “strong” versus “weak”), finding that these qualitative associations predict their willingness to invest even after their quantitative assumptions are taken into account (MacGregor, Slovic, Dreman, & Berry, 2000). Our results suggest that one source of these anthropomorphic associations is the process of making sense of price trends or trajectories.

In sum, the current paper advances a novel account of the role of metaphors in stock market communication and cognition. It provides strong empirical evidence for hypotheses about the distinctive preconditions of agent and object metaphors. Using multiple studies with complementary methods, we have documented that agentic description occurs more frequently for updays than downdays, as follows from our account that trajectories cues trigger causal schemas. Our studies rule out many alternative explanations that might be generated for this main effect. It does not depend on that uptrends are more expected, more desired, or more dramatic in the eyes of commentators. Nor is it the case that all metaphor types increase with uptrends; object metaphors decline as follow from our account. Also we found the predicted interaction-effect, reflecting that unambiguous steady uptrends and downtrends have the sharpest effect in triggering agent and object metaphors respectively.

Continuance bias. The current research also contributes to the small stream of studies examining the effects of attributions in stock market commentary on investors. Andreassen

(1987) found that pairing price change with explanatory references to news about business changes leads investors to expect continuance. DiFonzo and Bordia (1997; 2002) showed the same effect with explanatory references to rumors. The current findings are more surprising in that expectancies are conveyed even when commentators have made no explanatory reference to business changes at all. Commentators merely use metaphoric language to describe a price trends and causal expectancies are evoked. By positing the common mechanism of agency schemas, the current research connects biases in the investment domain with that in the social and sports domain.

In behavioral economics, the question of whether investors over-react to trends by expecting continuance or under-react has been debated. There is economic evidence from some markets that investors show an over-reaction bias (Offerman & Sonnemans, 2004). Yet there is also, in other cases, evidence for an under-reaction bias (Forbes, 1996). The current research suggests that over-reaction can depend on the ways that investors make sense of trends, and so this may be an important moderating variable.

Limitations

The current studies leave some open questions that are worth reviewing. Do metaphors in commentary affect expert investors as much as novices? Expert investors, who hold sharp conceptions of the market based on economics, may have an easier time screening out images agentic or physical events than novice investors, whose model of the market is undeveloped. Comprehending others' metaphors requires cognitive strategies for "inhibition of the literal" (Galinsky & Glucksberg, 2000). This suggests that the costs of media metaphors may be borne chiefly by the investors on "Main Street" rather than those on Wall Street. Yet given that trained investors do think qualitatively about investments, it is a question that that can only be answered

empirically (MacGregor, et al, 2000).

Related to the first issue is the larger question of how media metaphors ultimately affect stock prices. One possibility is that investors may be led to believe uptrends are meaningful signals whereas downtrends are not. That is, updays are more likely to be described agentically, and agentic descriptions then foster expectancies of continuance. Shiller (2000) argues that the late 1990s stock market bubble came as media commentary (through channels such as CNBC) became more pervasive than ever before and more investors than ever before made their trading decisions (Shiller, 2000).

However, the matter is undoubtedly more complex because of other biases that operate simultaneously. Research on the “disposition effect” shows that people have a reluctance to sell “losing” stocks but not “winning” stocks. Weber and Camerer (1988) conducted experiments to test that this comes from investors using their purchase price as a reference point and gambling on losses while avoiding risk on gains. Their results did not support an alternative interpretation that investors expect winning stocks to falter. This suggests that expectancies of uptrends do not necessarily beget buy decisions. The disposition effect phenomena may mitigate some consequences of the continuance bias. Future research is needed to fully understand how expectancies of trends affect decision making.

Related Issues for Future Research

The current research spurs a number of questions that fall outside of the current hypotheses yet would be worthy topics for future research.

Subtypes of Metaphors. In the current studies 3 and 4, there are findings that suggest that there may be more finegrained associations between trajectory types and metaphor types. Our hypotheses focused on the basic distinction between agent and object schemas, but there is

evidence that agentic schemas are organized into subtypes (Morris & Murphy, 1990; Wellman, 1990). Future research will have to identify subtype distinctions are relevant to trajectories, perhaps drawing on analyses of force dynamics in verbs (Talmy, 1985).

Another issue is whether there are subtypes with different implications about trend continuance. Most agency schemas imply an enduring goal (“The Nasdaq fought its way higher”), yet some subtypes may imply goal fulfillment (“The Nasdaq reached its yearly high”) and hence may not give rise to expectancies of trend continuance. Some object-causality subtypes may imply continuance, such as schemas for objects moving with a high degree of momentum (McCloskey & Kohl, 1983). Object causality schemas that imply momentum may give rise to expectancies of trend continuance.

Metaphors and Financial Advice. If the metaphors we have identified are truly pervasive, then we might expect that they have permeated paradigms of investing advice. A couple of examples suggest that these traditions of communicating about the market have hit upon agent and object schemas and their connections to trajectories. As a first example, consider the expression in which a small uptrend after a long downtrend is called a “dead cat bounce” (as in, even a dead cat would bounce if you dropped it from that height!). This expression applies an object causality schema (a dead cat) that stands in implicit contrast to an agent causality schema (a live cat). In this way, the expression may play off of the audiences categories in order to drive home the point that trend continuance should not be expected.

More broadly, a connections can be drawn to the “chartist” approach to investing, often called “technical analysis,” which has a continuing popular appeal despite the dearth of economic evidence for its validity. Chartists look for patterns in stock charts (e.g. “a candlestick”) that portend future price trends (see Smith, 1999). The intuitive plausibility of this

approach may owe something to the fact that our brains are hardwired to extract meaning from trajectories in other domains.

As a final example, let's consider the quite different approach of contrarian value investing is advocated in Graham's classic (1959) *The Intelligent Investor*. Graham's strategy in persuading the reader may be another example of playing off of the intuitive tendency of agentic interpretation. Rather than banishing anthropomorphism, Graham encourage the reader to think of the stock market as a person, but a particular type of person, a manic-depressive whose behavior cannot be predicted from one day to the next: *Mr. Market comes to your door every day with an offer to sell a company, sometimes Mr. Market is manic and he asks far more than it is worth; sometimes he is depressed and asks far less than it is worth*. Research on de-biasing finds that people benefit more from training rules framed in terms of everyday causal schemas than abstract statistical concepts such as the random walk (Morris & Nisbett, 1993). Graham's book takes exactly this approach to teaching people to avoid the continuance bias.

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Footnotes

¹ Why do people have this bias, which impedes the predictions in the social and other domains? It may be that attributing properties of persons is necessary for navigating the social world, so it becomes habitual from a young age, even though it leads to errors in strong situations, where others' behavior does not reflect their internal properties. Another answer, from evolutionary psychology, is that many schemas are hardwired into the brain because they were adaptive in the so-called environment of evolutionary adaptedness that existed throughout the Pleistocene era. Attributing agency to predict future behavior may have been enhanced survival chances in this environment, and thus become evolved as an automatic response, even if the modern world presents many situations in which the resulting bias is problematic.

² It is worth clarifying, that metaphors of either sort are logically possible regardless of direction. An uptrend could be encoded as a climbing hiker (agent) or as a leaf blowing in the wind (object); a downtrend could be seen as a diving raptor (agent) or a tumbling boulder (object). Yet *psychologically*, agent metaphors should be evoked by uptrends and object metaphors by downtrends.

³ Three major indices dominate descriptions of market activity: the Dow (the Dow Jones Industrial Average, a price-weighted average of 30 major stocks traded on the New York Stock Exchange and the Nasdaq), the Nasdaq (over 4,000 stocks traded on the Nasdaq exchange, featuring many technology and Internet-related companies), and the S&P 500 (500 stocks covering all major areas of the U.S. economy, also known as “the S&P”).

⁴ The network described the daily show as, “CNBC’s signature evening business newscast live from the floor of the New York Stock Exchange. ‘Business Center’ co-anchors Sue

Herera and Ron Insana report on breaking news, the latest trends influencing the global economy and review the day's top business and financial headlines ...”The show’s anchors and reporters described each day’s market activity, including discussion of individual stocks as well as the major market indices.

⁵ Admittedly, it does not capture all the aspects of unsteadiness that a perceiver might notice, such as the number of directional shifts. We will work toward more complete measures in subsequent studies.

⁶ It’s not clear why commentators’ would have such a motive; many of their constituents are investors who hope to buy on downturns or to collect on “short” bets on market decreases.

Table 1

Ratings of Next Day Closing Price as a Function of Direction and Metaphor Condition (Study 1).

	Mean Ratings		<u>Difference Score</u>
	<u>Up Days</u>	<u>Down Days</u>	
Expectancy ratings:			
<u>Commentator-focused</u>			
Agent Metaphor	5.19 (.86)*	3.06 (.86)*	2.12 (1.49)
Object Metaphor	4.43 (.94)*	3.74 (.93)	.69 (1.78)
No Metaphor	4.42 (.81)*	3.80 (1.11)	.61 (1.71)
<u>Audience-focused</u>			
Agent Metaphor	5.37 (.88)*	2.74 (.93)*	2.63 (1.57)
Object Metaphor	4.89 (.81)*	2.91 (.74)*	1.97 (1.43)
No Metaphor	4.71 (.84)*	3.08 (1.09)*	1.63 (1.74)
<u>Self-focused</u>			
Agent Metaphor	4.72 (.86)*	3.40 (.78)*	1.32 (1.34)
Object Metaphor	4.31 (.75)*	3.68 (.85)*	.64 (1.40)
No Metaphor	4.44 (.61)*	3.81 (1.10)	.63 (1.46)

Note. Cells show Means (SD's). Asterisks indicate means ratings were different from 4.

Ratings > 4 indicate expected uptrends; ratings < 4 indicate expected downtrends.

Table 2
Content Analysis Coding Scheme (Study 2)

<u>Category</u>	<u>Description</u>	<u>Examples</u>
Non- metaphorical	Describes price change as increase/decrease or as closing up/down	The Dow today <u>ended</u> down almost 165 points, or 1 1/2 percent (May 17, 2000)
Object- causality Metaphors	Describes movement as trajectory of an object affected by mechanical forces such as gravity, resistance, external pressures	And as for the S&P 500, it also <u>got caught in the downdraft</u> . (February 25, 2000)
Agent- causality Metaphors	Describes movement as an self-propelled action with or without reference to goals	The NASDAQ index <u>jumped</u> 122 1/3rd points. (February 10, 2000)

Table 3

Correlations of Financial Measures with Rates of Metaphoric Commentary (Study 2).

	<u>Count Measures</u>			<u>Proportion Measures</u>		
	Description Type			Description Type		
	Non-Metaphor	Object Metaphor	Agent Metaphor	Non-Metaphor	Object Metaphor	Agent Metaphor
<i>Overall</i> (<i>n</i> =348)						
<i>Gain</i>	.03	-.24**	.19**	.07	-.33**	.27**
<i>Range</i>	.18**	.33**	.32**	-.11*	.07	.05
<i>Nasdaq</i> (<i>n</i> =121)						
<i>Gain</i>	-.03	-.28**	.19*	.01	-.30**	.31**
<i>Range</i>	.20*	.24**	.18*	.01	.02	-.03
<i>Dow</i> (<i>n</i> =120)						
<i>Gain</i>	.08	-.14	.27**	.06	-.32**	.24
<i>Range</i>	.03	.23*	.27**	-.15	.12	.05
<i>S&P</i> (<i>n</i> =107)						
<i>Gain</i>	.24*	-.50**	.27**	.21*	-.51**	.34**
<i>Range</i>	.02	.02	.13	-.02	-.03	.05

Note: * $p < .05$. ** $p < .01$. Gain measures trend direction and range measures trend variability.

Table 4
*Most Frequent Verb Phrases Evoked as a Function of Coded Trajectory Patterns
 (Study 3).*

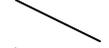
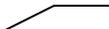
<i>Price-Change Patterns</i> (<i>n</i> =92)	Visual Prototype	<u>1st</u>	<u>2nd</u>	<u>3rd</u>
Steady Uptrend		Jumped 12.4 %	Climbed 10.0 %	Recovered 5.2 %
Unsteady Uptrend		Climbed 9.9 %	Jumped 8.1 %	Rallied 7.6 %
Steady Downtrend		Fell 31.4 %	Tumbled 16.0 %	Slipped 2.4 %
Unsteady Downtrend		Fell 21.0 %	Tumbled 12.5 %	Struggled 4.7 %
<i>Non-Change Patterns</i> (<i>n</i> =92)				
Calm		Slipped 30.0 %	Followed 11.1 %	Climbed 11.1 %
Chaotic		Fell 10.7 %	Edged 9.8 %	Struggled 7.2 %
Fall-and-rise		Skidded 10.0 %	Fell 8.6 %	Bounced 7.1 %
Rise-and-fall		Slipped 12.0 %	Edged 7.6 %	Jumped 6.0 %

Table 5

Transcript Codings as a Function of Trend Direction, Steadiness, and Motive condition (Study 4).

Agentic Description

	<u>Uptrend</u>		<u>Downtrend</u>	
	Steady	Unsteady	Steady	Unsteady
<u>Motive:</u>				
<u>Uptrend wanted</u> ("Nasdaq Index") N=39	2.94	2.71	1.29	1.63
<u>Downtrend wanted</u> ("Energy Futures Index") N=19	2.67	2.39	1.28	1.50

Dramatic Description

	<u>Uptrend</u>		<u>Downtrend</u>	
	Steady	Unsteady	Steady	Unsteady
<u>Motivation Manipulation</u>				
<u>Uptrend wanted</u> ("Nasdaq Index") N=39	3.37	3.37	3.54	3.29
<u>Downtrend wanted</u> ("Energy Futures Index") N=19	3.22	3.28	3.22	3.78

Table 6
Endorsement of Verbs as a Function of Trend Variability (Study 4).

	Trend Steadiness	
	Steady	Unsteady
Uptrend Verbs		
Jumped	3.09	3.00
Climbed	3.43	4.29***
Thrust	5.56	4.72***
Wandered	3.03	3.71**
Downtrend Verbs		
Fell	3.15	2.24***
Tumbled	3.48	3.34
Dove	3.22	2.65***
Searched	2.22	2.74***

Figures

Figure 1
Illustration of Format Manipulation and Commentary Manipulations (Price Information and Accompanying Commentary for Uptrend Version of Stimulus Pattern 1)

Chart format

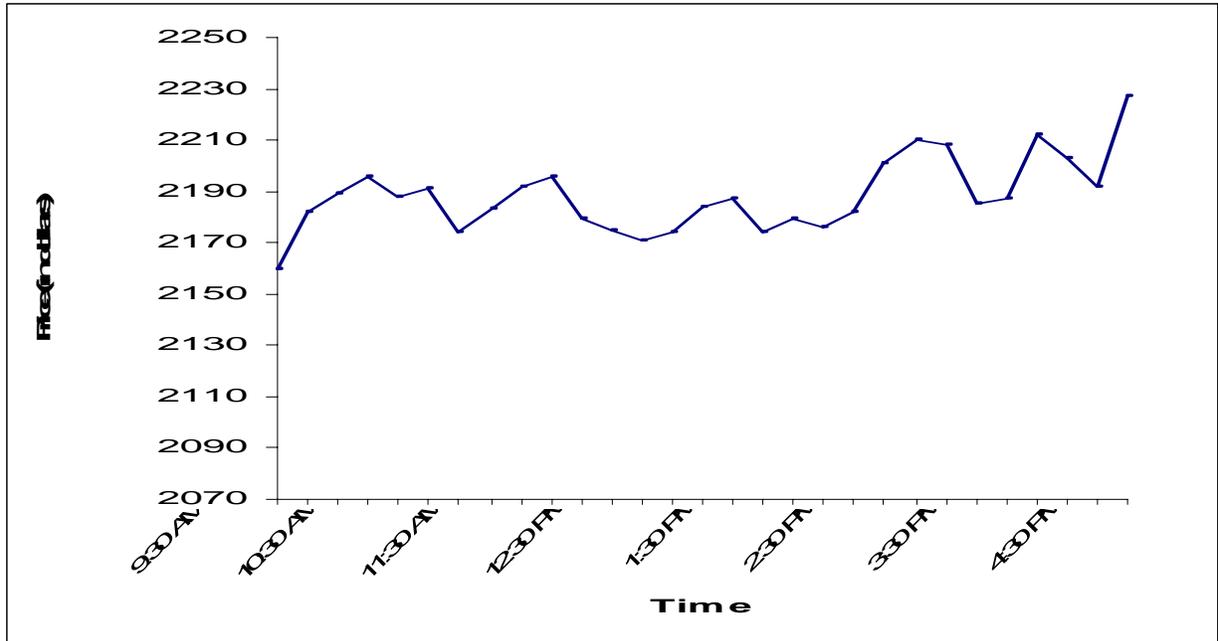
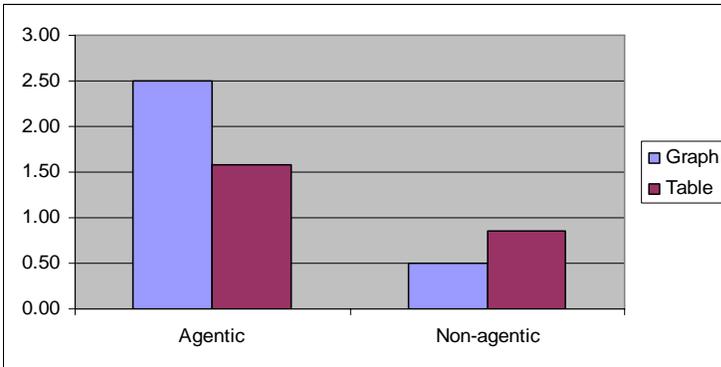


Table format (only half day shown)

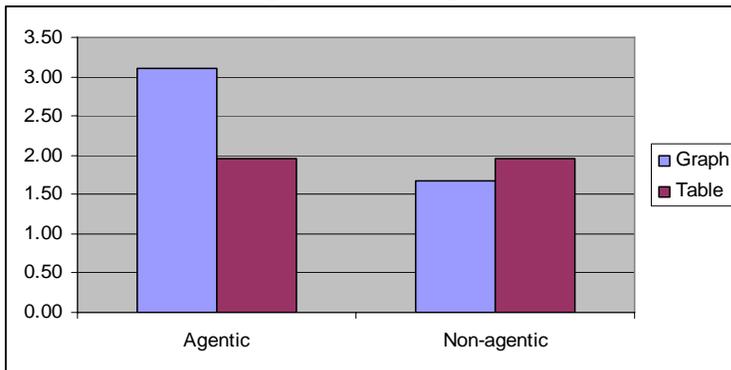
9:30 AM	9:45 AM	10:00 AM	10:15 AM	10:30 AM	10:45 AM	11:00 AM	11:15 AM	11:30 AM	11:45 AM	12:00 PM	12:15 PM	12:30 PM	12:45 PM	1:00 PM
2160	2182	2189	2196	2188	2191	2174	2183	2192	2196	2179	2175	2171	2174	2184

Figure 2
The Interactive Effect of Commentary Content and Information Format

Commentator-focused expectancy rating



Audience-focused expectancy rating



Self-focused expectancy rating

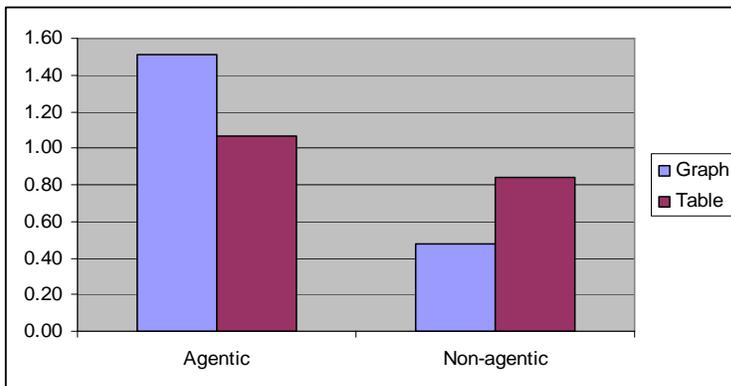
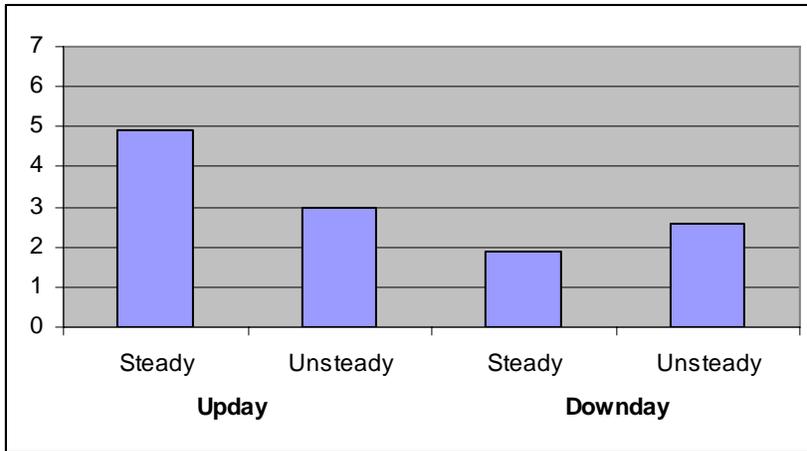


Figure 3
Rated Endorsement of Agentic Description as a Function of Trend Direction and Steadiness
(Study 4).



Appendix A
Sets of Market Commentary Used in Study 1

Stimulus pattern	Direction	Metaphor ?	Analyst Commentary
<u>Item 1</u>	Up1	Agent Object None	This afternoon the Nasdaq started climbing upwards. This afternoon the Nasdaq was swept upward. This afternoon the Nasdaq index posted a gain
	Down1	Agent Object None	This afternoon the Nasdaq started climbing downwards. This afternoon the Nasdaq was swept downward. This afternoon the Nasdaq index posted a loss.
<u>Item 2</u>	Up2	Agent Object None	Today the Nasdaq leaped and bounded higher. After ricocheting back and forth all morning, the Nasdaq bounced higher. Today the Nasdaq index showed increases near the close of the trading session.
	Down2	Agent Object None	Today the Nasdaq leaped and bounded lower. After ricocheting back and forth all morning, the Nasdaq bounced lower. Today the Nasdaq index showed decreases near the close of the trading session.
<u>Item 3</u>	Up3	Agent Object None	After a mixed morning the Nasdaq broke free and headed higher. Today the Nasdaq drifted higher. After volatility in the morning the Nasdaq index ended higher.
	Down3	Agent Object None	After a mixed morning the Nasdaq broke free and headed lower. Today the Nasdaq drifted lower. After volatility in the morning the Nasdaq index ended lower.
