Metaphors and the market: Consequences and preconditions of agent and object metaphors in stock market commentary

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Abstract

We investigated two types of metaphors in stock market commentary. *Agent* metaphors describe price trajectories as volitional actions, whereas *object* metaphors describe them as movements of inanimate objects. Study 1 examined the consequences of commentators' metaphors for their investor audience. 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 price trend that evoke agent vs. 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 a function of daily price trajectories. As predicted, agent metaphors occurred more frequently on updays than downdays and especially so when the trends were relatively steady as opposed to unsteady. This held for both bull (Study 2) and bear market periods (Study 3). Study 4 replicated these findings in a laboratory experiment where participants took the role of stock market commentator.

Much recent research has sought clues about market behavior in the cognitive psychology of investors. Patterns of judgment and decision making that defy rational models have been elucidated by identifying the heuristics with which naïve investors process financial information (e.g. Barberis & Thaler, 2003; Camerer, 1987; Fong & Wyer, 2003; Nelson, Bloomfield, Hales, & Libby, 2001). Yet investors do not make judgments in a social vacuum. Recent behavioral finance evidence suggests they can be dramatically influenced by other people—friends who comment about the market (Hong, Kubik, & Stein, 2004) and also market commentators in newspapers (Huberman & Ragev, 2001; Liang, 1999) and on television (Busse & Green, 2002). This suggests that to understand market behavior we need to study the psychology of commentators in conjunction with that of investors.

The current research takes this approach by focusing on metaphor in market commentary. We use the term "metaphor" in the broad Aristotelian sense of describing an event in terms transferred from another domain (Heath, 1996). Whereas literary scholars focus on creative metaphors that authors use for stylistic effect, cognitive scientists study conventional metaphors that ordinary people use when making sense of abstract events in more concrete, familiar terms (Lakoff, 1993). Notwithstanding their moments of wit (e.g. "In late trading, Caterpillar inched higher"), market commentators primarily traffic in conventional metaphors. Market indices or stocks are explicitly compared to a charging

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bull, a falling brick, or a bobbing cork. Or the metaphor is conveyed implicitly through verbs phrases that render market fluctuations in terms of movements from other domains ("The S&P slipped downhill," "the Nasdaq flirted with the 2000 mark," "The Dow vaulted higher"). In the prior literature, a few obscure linguistic studies have identified metaphors in newspaper market commentary (Schmidt, 2002; Smith, 1995) in the tradition of analyzing the rhetoric of economic writing (McCloskey, 1985). These analyses suggest that certain kinds of metaphors, such as those that anthropomorphize the market, occur across several languages and cultures; however, they do not probe the psychological questions of what conditions spur commentators to generate such metaphors and how investors' judgments are affected.

To develop a psychological model of how market metaphors operate in the minds of commentators and investors, we distinguish two types of market metaphors that reflect two basic causal schemas. Evidence from various fields of cognitive science (Pinker, 1997) suggests that humans have particularly rich and accessible schemas for interpreting movements in two domains: (1) the actions of animals and people, and (2) the movements of inanimate objects such as rocks or tools. When imposed on price trajectories, these schemas give rise respectively to agent and object metaphors. *Agent* metaphors describe price movements as action, as the volitional, internally-driven behavior of an animate entity. This type encompasses anthropomorphic description as well as description of the market as like an animal. Some examples are "the Nasdaq climbed higher," "the Dow fought its way upward," and "the S&P dove like a hawk." *Object* metaphors describe price movements as object trajectories, as events in which inanimate objects are 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 seek to identify the antecedent conditions and consequences of these two types of market metaphors. What kinds of price movements tend evoke these types of metaphoric description? How does exposure to these metaphors then affect investors' judgments about future price trends? Hypotheses about these issues can be derived from the literature on the two underlying causal schemas. For instance, social psychologists have documented that the schemas we use to attribute others' behavior ("action schemas") lead us to exaggerated expectations that observed behavioral trends will continue (Ross & Nisbett, 1991). Hence, given that agent metaphors reflect these schemas, investors processing the day's market trends in terms of agent metaphors should exhibit the same bias—exaggerated expectations of trend continuance.

Before deriving the hypotheses more systematically, it is worth reviewing some basic features of the research setting: the stock market, the journalists who cover it, and their audience of investors. After introducing the setting, we develop our argument concerning the distinctive consequences of commentary featuring agent metaphors as opposed to object metaphors or no metaphors. The next section then develops our argument concerning the distinctive antecedents—the price trends that evoke each type of metaphor.

The stock market setting

It is well established in economics 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, investors form expectations about short term market trends and trade on them. Research tracking portfolios of investors finds that the more they trade actively—trying to time the buys and sells in relation to short-term trends—the worse their overall returns (Barber & Odean, 2000). If not the experience of success, what then makes investors confident that they can interpret and predict short-term trends? One contributor, we suggest, may be market commentary.

Financial journalists, whether print or television, do not merely report market trends but also explain them. Consider, for instance, the tagline of the show *CNBC Marketwatch*: "The story behind the numbers." Under this billing, reporters cannot merely report. The amount of increase or decrease or say "it was another random walk today." They are supposed to provide their audience with a *story*—an explanation of *why* the market moved the way it did. Of course, commentators eschew direct "because" statements (which would be hard to defend). Instead they imply attributions indirectly, such as by juxtaposing price trends with explanatory references to business conditions (e.g. "GM rose 3 points today on news of a strike settlement."). These hinted explanations undoubtedly make market reports more engaging; however, they may lead the audience to unwarranted expectations about tomorrow's trend.

Past research has examined the effect of commentators' attributions to business conditions. In a stock trading game, Andreassen (1987) manipulated whether daily price trend information was accompanied by explanatory "news" about business conditions. He found that news led participants to perform worse. News-condition participants bought (high) after updays and sold (low) after downdays, presumably because they tended to attribute the price trend to the changed business condition and hence expected it to continue the next day. Recently, DiFonzo and Bordia (1997, 2002) found the same effect from exposing investors to indefinite "rumors" rather than definite news, which ruled out alternative accounts of the effect in terms of the

information-value of news. Taken together, these studies highlight that people seek to attribute price trends to stable causes, and they follow indirect attributional messages in stock commentary.

Aside from explanatory references to business conditions, there may be other ways that commentators convey causal attributions. Even without hazarding a reference to business conditions, commentators may provide hints about the causes of price trends through metaphoric language. Agent metaphors ("The Nasdaq climbed higher") imply that the observed trend reflects an enduring internal goal or disposition and hence it is likely to continue tomorrow. By contrast, object metaphors ("The Nasdaq was pushed higher") do not imply that it reflects an internal force that will manifest itself again tomorrow. This is the crux of our argument–that agent-metaphor descriptions affect investors differently than object-metaphor descriptions and non-metaphorical descriptions. To develop the argument in more detail we turn now to the psychological literature on metaphoric language and metaphoric encoding.

Distinctive consequences

In considering the consequences of metaphors, it is worth distinguishing metaphoric description (using terms from another domain to talk about an event) from metaphoric encoding (using schemas from another domain to think about an event). Psycholinguistics research finds that a writer's metaphorical descriptions can prime his or her reader to engage in metaphorical encoding (Galinsky & Glucksberg, 2000; Gibbs, Bogdanovich, Sykes, & Barr, 1997; Slobin, 2003). For example, in one experiment exposure to particular metaphors for love (e.g. love is a journey) made participants more likely to answer subsequent questions about love in terms of the primed metaphoric schema (Gibbs, 1992).

It is perhaps not surprising that exposure to metaphors shifts people's subsequent descriptive language. But do metaphoric encodings also affect the way people make practical judgments? Suggestive evidence that this is the case comes from studies of people's metaphoric thinking about technological devices. For instance, a high fraction of Americans believe that their home thermostat works like a gas pedal (they metaphorically model it as a valve rather than a switch) and, accordingly, engage in the erroneous tactic of turning it to higher-than-desired temperatures when they want to heat the house quickly (Kempton, 1986). Consequences of metaphoric encodings have also been documented in the reasoning of experienced technicians: electricians make different patterns of mistakes on wiring problems depending on which of two conventional metaphors they use when thinking about electricity in wires—flowing water in pipes, or teeming crowds in corridors (Gent-

ner & Gentner, 1983). The two metaphors impose different schemas onto electricity problems, and each schema carries its own distinctive biases.

Now let us return to agent vs. object metaphors for market trends. Attribution theory (Heider, 1958) holds that schemas for physical object causality and personal action causality differ in the primary locus of causation. Object causality schemas trace movements primarily to external forces, whereas action schemas trace movements to enduring internal properties. Hence action schemas create a bias to expect that observed trends will continue. For example, when asked to forecast someone's future social behavior, people over-predict the degree to which it will be consistent with the sample of behavior that they have observed (Ross & Nisbett, 1991). Likewise, when judging sports performances, people trace observed trends (several baskets in a row) to internal properties of the actor ("the hot hand") and over-predict the chances that the trend will continue (Gilovich, Vallone, & Tversky, 1985).[1] As in social and sports judgments, we propose that action schemas give rise to this bias in stock market judgments. More formally, we propose

Hypothesis 1. The presence of agent metaphors in commentator descriptions of a price trend influences the judgments of their investor audience, making investors more likely to expect that the given trend will continue than they would be otherwise.

The first hypothesis assumes that commentators' metaphoric descriptions beget corresponding metaphoric encodings in the minds of their investors. Yet are there some conditions where investors are less susceptible to such encodings? Metaphor research, for instance, has found that people can inhibit activation of the literal meanings of metaphors when they are made conscious that figurative language is being used (Galinsky & Glucksberg, 2000). A possibility is suggested by Lakoff's (1993) argument that the groundwork for many conventional metaphors is the mapping of abstract quantities into spatial positions (e.g. more is up), so abstractions become more like perceptions. Lakoff (1993) contends that the stock chart is an artifact that reifies a spatial

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[1] Why do people have this tendency if it leads to biased predictions? It may be that attributing properties of persons is necessary for navigating the social world, and hence it becomes habitual from a young age, even though it leads to errors in many situations where others' behavior does not primarily 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 (Pinker, 1997). Attributing agency to predict future behavior may have enhanced survival chances in this environment, and thereby evolved as an automatic response, even if the modern world presents many situations in which the resulting bias is problematic.

mapping of price movements into trajectories, and that representing a trend as a spatial trajectory fosters its interpretation in terms of metaphors. Studies have found that particular action concepts are associated with particular kinds of dynamic trajectories (Michotte, 1946) and even with static trajectory-like diagrams (Richardson, Spivey, Barsalou, & McRae, 2003). This suggests that investors might be more likely to encode a price trend in terms of action schemas when they receive price information in the customary chart format rather than in a table of numbers. Hence, a qualification of the prior generalization is

Hypothesis 2. The effect of agent-metaphor commentary on continuance judgments will be reduced when price trends are presented as a table of numbers rather than a trajectory-like graph.

Distinctive antecedent conditions

If agent and object metaphors produce different consequences, then it is important to identify the antecedent conditions that give rise to them. Our argument about the eliciting conditions for these types of metaphors, again, turns on the premise that they reflect the activation of two different causal schemas. A longstanding finding is that specific trajectory features in stimulus displays evoke processing in terms of schemas for animate action (Heider & Simmel, 1944) as opposed to inanimate mechanics (Michotte, 1946). Some trajectory features automatically evoke impressions of animacy, most likely because they are reliable cues to distinguishing animals from objects in the environment. For instance, an ascending trajectory is highly diagnostic of animacy, whereas a descending trajectory is somewhat diagnostic of inanimacy.

To consider what this suggests about the preconditions for metaphoric language about price trends, we turn to a pilot study by Andreassen (1987) that sampled 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. In other words, these were days when a stock underwent a dramatic uptrend or a dramatic downtrend. The descriptions of price 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) "American South African Investor *rose*…."
(11/3/1970) "In the glamour group, Telex *climbed*…"

(6/2/1980) "ERC Corp. stock *soared*…"

The descriptions of 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 first that there is a great deal of metaphoric language in the description of these dramatic ups and downs, some agent metaphors referencing internal force ("leaped" and "climbed") and some object metaphors referencing external physical forces such as gravity ("plummeted" and "fell"). Yet more importantly, notice that two metaphor types are not randomly distributed with respect to vertical direction of the trend: agent metaphors tend to be evoked by uptrends whereas object metaphors tend to be evoked by downtrends.

We propose that metaphors vary by trajectory direction because upward trajectories are linked in people's minds with animacy and action. How does this link originate? One source is learning from direct experience in the environment. Based on the law of cognitive structure activation, action schemas would come to be activated by the stimulus of an upward trajectory (Higgins, 1996; Sedikes & Skowronski, 1991). In an example of such a learned association, Schubert (2005) finds that perceivers associate higher positions in space with social status. Because of perceivers' experience in a world where height is diagnostic of status, height becomes a stimulus feature that automatically activates concepts for status.

Alternatively, or in addition to learning from experience, the link between ascending trajectories and animacy may reflect evolved neural mechanisms. Humans have evolved to pick up regularities in the natural environment (Leslie, 1995). Responses to trajectories are hardwired in many species; 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).[2] Increasing evidence suggests that humans are hardwired to distinguish

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[2] 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.

animate, goal-directed movement from object movement. Stimulus displays in which a moving shape ascends over an obstacle are processed as action, even by infants who have had little opportunity to learn from experience (see Scholl & Tremoulet, 2000). Mechanisms to recognize animates as opposed to inanimates based on trajectories would have been highly adaptive for early human hunter-gatherers, so sensitivity to these trajectory features may be hardwired into our neural system.

Regardless of its source, this link means that people should be more likely to have the impression of animacy and action from something ascending than something descending. Uptrend stimulus trajectories should automatically trigger schemas for animate action and downtrends should trigger schemas for inanimate motion, regardless of whether the trajectories are encountered on sand dunes or stock charts. Hence, uptrends should evoke agent metaphors, and downtrends should evoke object metaphors.[3] A main effect hypothesis about metaphor evocation, then, is as follows:

Hypothesis 3. The more upward the direction of a price trend, the higher will be the rate of agent metaphors and the lower the rate of object metaphors in market commentary.

Is direction the only relevant feature of trajectories in determining which kind of schemas and metaphors they evoke? In addition to the overall direction, another salient feature of price charts is the *steadiness* of the trend. Unsteadiness can be defined as the degree to which there are salient reversals along the way to the overall directional trend. We propose that unsteadiness dampens the impact of the overall trend direction. Again, our rationale is that unsteadiness, in combination with direction, is diagnostic of animacy in the natural environment.

To see this, picture the contrast between two upward trajectories: something in the distance ascending steadily from the ground into the sky, and something ascending unsteadily, occasionally dropping downward before resuming upward. The former, steady trajectory gives a stronger impression of agency because it is pure ascent (like a raptor taking flight) whereas the second is a mix of ascending and descending movements (like a leaf blowing in the wind). Now picture two more: something sliding steadily down a distant mountain slope, and something heading down a distant slope but with occasional uphill reversals. The latter, unsteady descent shows some sign of agency in its reversals (it could be

a skier who turns uphill now and then) whereas the steady descent shows no signs of life whatsoever (it is falling like a rock). These examples, taken together, give the intuition that the more unsteady a trend, the less its overall vertical direction determines impressions of animacy or agency. Spelling this out, we propose

Hypothesis 4. In the context of uptrends, unsteadiness should decrease agent (and increase object) metaphor rates, whereas in the context of downtrends it should increase agent (and decreases object) metaphor rates.

Overview of present studies

Our studies of consequences and preconditions of metaphors focused on market indices (Dow, Nasdaq, and S&P)[4] rather than individual stocks. A skeptic might argue that agentic descriptions of individual stocks (e.g. "Apple picked up its pace") are references to actions of their CEOs or employees, not metaphors for the price change. Yet no one could argue that descriptions of a market index ("the Nasdaq picked up its pace") refer to coordinated actions by all the employees of the hundreds of indexed firms. Hence, commentary about market indices, rather than about individual stocks, is more unambiguously metaphorical.

Study 1 investigated the consequences of commentator metaphors on investor expectancies of trend continuance. Participants took the role of investors and interpreted daily price trends to predict the next day's trend. We manipulated whether or not they were exposed to agent-metaphor descriptions of the current day's trend, and whether this trend was presented in a standard stock chart or in a table of numbers. We found, as hypothesized, that expectancies of trend continuance were higher in the agent-metaphor condition than elsewhere, yet this effect of the commentator's language was diminished when the price trends were presented numerically instead of graphically.

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 indices' daily financial performance, we found support for the hypothesized main effect of price trend direction and its interaction

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[3] 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.

[4] 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 4000 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 US economy, also known as "the S&P").

with a measure of price trend steadiness. Study 3 replicated these results in a different historical period. Study 4 replicated these relationships in a laboratory experiment, which enabled direct manipulation of the price trajectories that participants (in the role of stock commentators) described.

Study 1

Our first study investigated the consequences of metaphoric commentary on the investor audience. We predicted that agentic description would lead investors to encode price trends agentically and hence expect trend continuance. Participants were given the task of studying one day's price activity and then predicting the next day's trend. They were presented with detailed quantitative information about the price activity as well as a brief description of the trend by a market commentator. The primary experimental manipulation was the content of this commentary. We tested whether agent-metaphor content, compared to object-metaphor content or non-metaphorical content, would give rise to stronger expectancies of trend continuance.

A second manipulated factor was the format in which the quantitative price trend information was presented– chart or table. The standard chart format graphs price activity as a spatial trajectory and hence fosters encoding it in terms of action schemas. The table format was designed to convey precisely the same information as in the chart, yet numerically rather than spatially. We predicted that the chart format would facilitate encoding of the price trend metaphorically. Hence, the format factor should interact with the metaphoric content factor.

This interaction-effect hypothesis is useful for distinguishing our account from an alternative account of why investors are affected by agent metaphors. A skeptic might argue that investors who read "the Nasdaq climbed higher" and then judge that the uptrend will continue tomorrow are not encoding the event metaphorically (in terms of schemas for volitional action); rather these investors are merely taking the commentator's agentic language as a positive signal of the commentator's conviction the trend is meaningful. If so then investors' increased predictions of trend continuance, after hearing agentic metaphors, might reflect a perfectly rational adjustment. However, if investors' response to agent metaphors reflects this rational signal-reading process, the effect should occur equally in the graph and table conditions. It is only our account, in terms of metaphoric encoding, that predicts the effect should be stronger when the trend is presented spatially in a graph than numerically in a table.

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 that 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 description of the trend by a market commentator on an end-of-day television program. They would be asked three questions related to expectations about tomorrow's trend.

The three questions were designed to tap expectations in different ways. Specifically, they 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. These are distinct, non-synonymous measures of expectancies, so they allow several tests of the hypotheses. By measuring these separately, we can examine whether participants' judgments are driven by their perception of the commentator's views.

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 randomly selected Nasdaq charts 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 between-groups manipulations were content and format. The commentary content (agent-metaphor, object-metaphor, or no-metaphor) that appeared with each stimulus pattern are listed in Appendix A. The format manipulation held constant the information: in
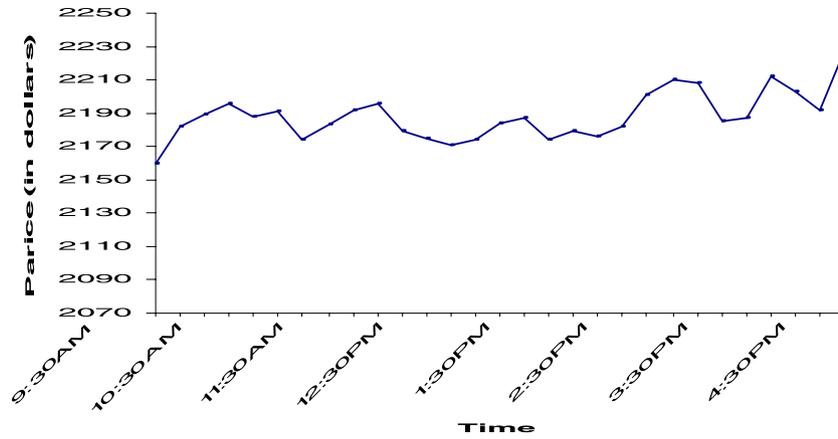
	9:30 AM	9:45 AM	10:00 AM	10:15 AM	10:30 AM	10:45 AM	11:00 AM	11:15 AM	11:30 AM	11:45 AM	12:00 PM	12:15 PM	12:30 PM	12:45 PM	1:00 PM
	2160	2182	2189	2196	2188	2191	2174	2183	2192	2196	2179	2175	2171	2174	2184

Fig. 1. Graphs and Table formats for price trend information in Study 1 (for the Table format only half the day is shown here).

both graphs and tables, price was presented at 15-min intervals and arrayed along the horizontal axis of the page. An illustration of the varying formats and the commentary content for a given stimulus day is provided by Fig. 1.

Results

Hypothesis testing

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 continuance after updays (ratings >4) and after downdays (ratings <4). To capture a participant's overall tendency to expect continuance, we computed difference scores (upday–downday). As expected, this measure of continuance bias tended to be stronger in the agent-metaphor condition than in the other two conditions (object-metaphor condition and the non-metaphor condition), and these non-agent conditions did not differ from each other.

Hence, to test hypotheses we pooled the two non-agentic conditions for a $2 \times 2 \times 2$ mixed model ANOVA

Table 1
Ratings of next day closing price as a function of direction, metaphor, and format conditions (Study 1)

Expectancy ratings	Mean ratings				Difference score	
	Updays		Downdays			
	Graph	Table	Graph	Table	Graph	Table
Commentator-focused						
Agent metaphor	5.32	5.00	2.81	3.42	2.51*	1.58*
Object metaphor	4.33	4.56	3.80	3.67	.53	.89
No metaphor	4.30	4.58	3.83	3.76	.47	.82*
Audience-focused						
Agent metaphor	5.57	5.08	2.26	3.13	3.11*	1.95*
Object metaphor	4.87	4.91	3.06	2.71	1.81*	2.20*
No metaphor	4.69*	4.73	3.12	3.02	1.57*	1.71*
Self-focused						
Agent metaphor	4.73	4.71	3.22	3.64	1.51*	1.05*
Object metaphor	4.28	4.35	3.73	3.60	.55	.75
No metaphor	4.37	4.53	3.95	3.60	.42	.93*

Note. Cells show means (SD's). Ratings >4 indicate expected uptrends; ratings <4 indicate expected downtrends. Asterisks in difference score column indicate scores significantly different from 0.

with repeated measures on the Direction factor. That is, we submitted each of the three expectancy ratings to a model that crossed Commentary Content (Between groups: agentic vs. non-agentic) × Format (Between groups: Graph vs. table) × Direction (Within groups: up vs. down) model. The only main effect observed was that of Direction, which held for the commentator-focused rating $F(1,104) = 63.79$, $p < .001$, $\eta_p^2 = .380$, the audience-focused rating $F(1,104) = 181.63$, $p < .05$, $\eta_p^2 = .636$ and the self-focused rating $F(1,104) = 45.76$, $p < .001$, $\eta_p^2 = .306$. This pattern indicating that ratings were generally higher after updays than downdays suggests that participants generally expected continuance rather than correction.

The influence of agent metaphors

The first hypothesis, that agent metaphors would give rise to increased continuance expectancies, was tested by the Commentary Content × Direction interaction. That is, agentic descriptions of uptrends were expected to produce an upward bias and agentic descriptions of downtrends were expected to produce a downward bias. This was significant for the commentator-focused rating $F(1,104) = 16.06$, $p < .001$, $\eta_p^2 = .134$, the audience-focused rating $F(1,104) = 4.89$, $p < .05$, $\eta_p^2 = .045$, and the self-focused rating $F(1,104) = 4.66$, $p < .05$, $\eta_p^2 = .043$. Given the larger effect size for the commentator-focused rating, one might wonder whether it mediated the effect on the self-focused rating. We followed the Judd, Kenny, and McClelland (2001) for testing mediation in designs with within-groups variables, which involves regression analysis on the difference scores that collapse the within-groups variable of Direction. Following the standard three steps (Baron & Kenny, 1986), we regressed our proposed mediator (commentator-focused score) and dependent variable (self-focused score) on the independent variables. 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 the independent variables 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 the putative mediator (i.e., the commentator-focused score) remained significant ($B = .613$, $p < .001$). A Sobel test confirmed that the effect of metaphor type on participants' self-focused expectancy score was significantly reduced when their commentator-focused expectancy score was entered into the model ($z = -4.18$, $p < .001$). This suggests that metaphoric content strongly influenced participants' perception of the commentator's views and this ultimately influenced their own expectancies about the market.

The moderating effect of format

The second hypothesis that the influence of agent metaphors would be diminished when price trend information was presented numerically rather than graphically was tested by the Commentary Content × Direction × Format interaction. The interaction effects were directionally present for all three ratings albeit not always reliably: for the commentator-focused rating $F(1,104) = 3.56$, $p < .07$, $\eta_p^2 = .033$, for the audience-focused rating $F(1,104) = 4.89$, $p < .05$, $\eta_p^2 = .045$, and for the self-focused rating $F(1,104) = 1.93$, $p > .10$. To illustrate the interaction pattern, Fig. 2 shows difference scores (collapsing across Direction to measure overall continuance bias) as a function of Commentary Content and Format. Planned contrasts on the difference scores consistently reveal that they are increased by agentic metaphors in the *graph* condition (commentator-focused rating $t(1) = 4.57$, $p < .01$; audience-focused rating $t(1) = 3.43$, $p < .01$; and self-focused ratings $t(1) = 2.75$,
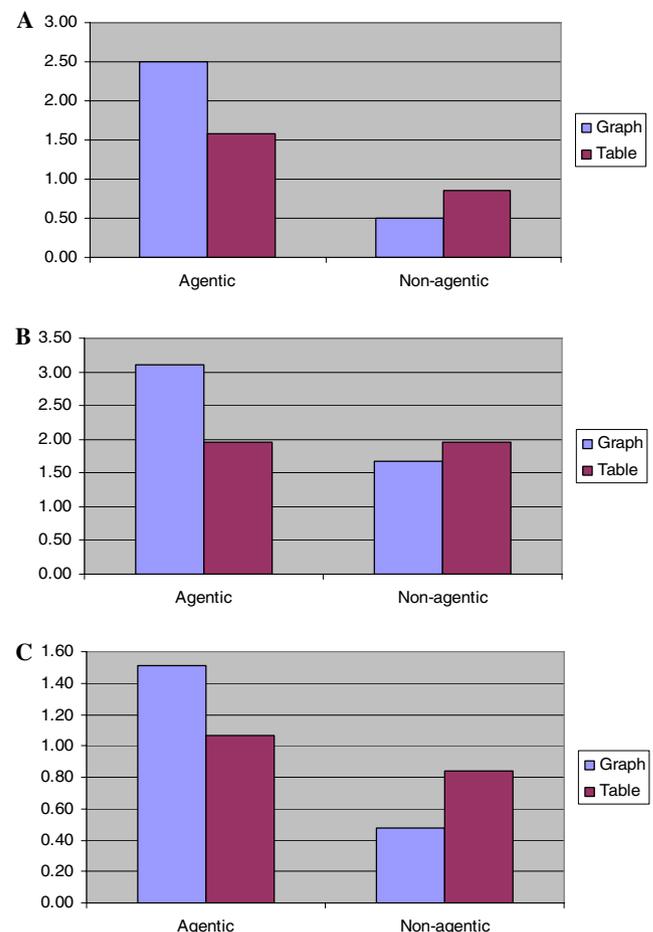

Fig. 2. The interactive effect of commentary content (agentic vs. non-agentic) and price information format (graph vs. table) in Study 1. (A) Commentator-focused expectancy rating. (B) Audience-focused expectancy rating. (C) Self-focused expectancy rating.

$p < .01$), but not the *table* condition (commentator-focused rating $t(1) = 1.39$, ns; audience-focused rating $t(1) = 0.00$, ns; and self-focused ratings $t(1) = .50$, ns).

Discussion

Study 1 results support our proposal that commentators' metaphorical descriptions influence the investor audience's metaphorical encodings and ensuing judgments. Consistent with the H1, participants exposed to agent-metaphors responded with increased expectancies that today's price trend would continue tomorrow. Moreover, the influence was moderated by the format in which the price trend was presented to participants. Consistent with H2, there was greater influence in the graph condition, where price trends were presented as spatial trajectories, than in the table condition, where price trends were presented in abstract numbers. The interaction effect is important because it cannot be explained by alternative accounts of the influence of commentary content. For instance, if a participant's response reflected a rational signal-reading process, then it would be present regardless of the format condition.

Given the Study 1 findings that commentators' metaphorical descriptions have consequences for their audience's investment judgments, 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 antecedent conditions that evoke agent and object metaphors. We left the laboratory to study how real market trends affect real market commentators. Transcripts of an influential end-of-day television program were read 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 sampled a historical period (January–June 2000) in which indices were volatile but not consistently ascending or descending. Hence, there were many updays, many downdays, and many sideways days.

We analyzed whether the rates of agent and object metaphors depend on features of the daily price trend, specifically its direction and steadiness. Our hypotheses, to review, were that price gain (vs. loss) would be associated with more agent (and less object) metaphors (H3), and that this relationship would be stronger when the directional trend resulted from a steady as opposed to an unsteady trajectory (H4). The steadiness of a trend is a gestalt variable that doesn't correspond precisely to any financial metric; however, one partial measure

of steadiness is the price range within the day. To illustrate, when the daily range exceeds the overall rise or gain, this indicates unsteadiness in addition to the overall directional trend.

Method

Procedures

Transcripts of the *CNBC* television program *Business Center* were collected for January through June, 2000. This show aired on weeknights after the close of the primary US markets (5 p.m., EST) and provided a review of the day's market activity.[5] All sentences or clauses having the Dow, Nasdaq, or S&P index as their subject were extracted for coding, resulting in a list of 1454 descriptions (roughly four mentions per index per day).

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

To compute the criterion 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 the daily description constituted by agent- and object-metaphors, respectively, were computed by dividing these counts by the total count of descriptions for each index.

The predictor 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.

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

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[5] 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 describe the day's market activity, making frequent reference to individual stocks as well as the major market indices.

Table 2
Content analysis coding scheme (Study 2)

Category	Description	Example
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 physical forces such as gravity, resistance, or external pressure	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 a volitional action	The NASDAQ index <u>jumped</u> 122 1/3rd points. (February 10, 2000)

Table 3
Correlations of financial measures with rates non-metaphor, object metaphor, and agent metaphor references to market movements (Study 2)

	Count measures			Proportion measures		
	Non-metaphor	Object metaphor	Agent metaphor	Non-metaphor	Object metaphor	Agent metaphor
Overall (n = 348)						
Gain	.03	$-.24^{**}$	$.19^{**}$	.07	$-.33^{**}$	$.27^{**}$
Range	$.18^{**}$	$.33^{**}$	$.32^{**}$	$-.11^{*}$	.07	.05
Nasdaq (n = 121)						
Gain	$-.03$	$-.28^{**}$	$.19^{*}$	.01	$-.30^{**}$	$.31^{**}$
Range	$.20^{*}$	$.24^{**}$	$.18^{*}$	.01	.02	$-.03$
Dow (n = 120)						
Gain	.08	$-.14$	$.27^{**}$	.06	$-.32^{**}$	.24
Range	.03	$.23^{*}$	$.27^{**}$	$-.15$	.12	.05
S&P (n = 107)						
Gain	$.24^{*}$	$-.50^{**}$	$.27^{**}$	$.21^{*}$	$-.51^{**}$	$.34^{**}$
Range	.02	.02	.13	$-.02$	$-.03$	.05

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

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 (non-metaphoric, 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).

To test hypotheses, the proportional metaphor rates were regressed on measures of trend direction (gain), trend unsteadiness (range), and their interaction. Agent-metaphor rate showed a main effect of trend direction $b = .57$, $p < .001$, $\eta_{p}^{2} = .070$; no effect of trend variability $b = .07$, $p < .10$, $\eta_{p}^{2} = .004$; and an effect of their interaction $b = -.32$, $p < .01$, $\eta_{p}^{2} = .022$; $R^2 = .11$, $F(3,344) = 13.59$, $p < .001$. Likewise, object metaphors showed a main effect of trend direction $b = -.88$, $p < .001$, $\eta_{p}^{2} = .164$; no effect of trend variability $b = .08$, $p < .10$, $\eta_{p}^{2} = .007$; and an effect of their interaction $b = .64$, $p < .001$, $\eta_{p}^{2} = .090$; $R^2 = .19$, $F(3,344) = 26.46$, $p < .001$. To illustrate the interaction effects, Fig. 3 plots metaphor rates for two subgroups—updays (days that closed more than 1% up) vs. downdays (days that closed more than 1% down) as a function of unsteadiness (plotted at 1 *SD* below and above the mean). As expected, the effect is an attenuation of the difference between updays vs. downdays at higher levels of trend unsteadiness.

Discussion

Study 2 results showed that rates of agent and object metaphors in market commentary depend on the overall direction of the daily trend (H3). Also, this effect of trend direction was clearer when the trend was steady as opposed to unsteady (H4). Hence the two hypotheses were supported.
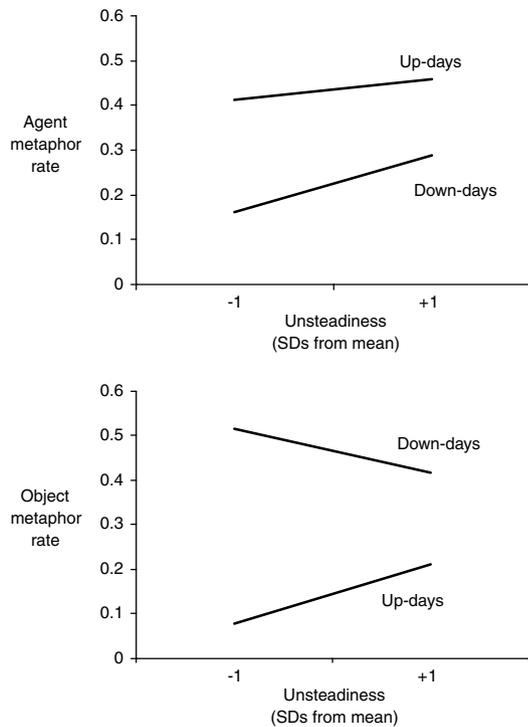
Fig. 3. The interactive effect of trend direction and trend steadiness in Study 2.

However, alternative explanations for the main effect of direction can be raised. A critic might point out that the period sampled directly followed the greatest bull market in history; commentators conditioned by this recent experience may have had bullish expectations. Assuming that commentators have such time-lagged expectations, agent metaphors may have been produced in response to updays simply because these days corresponded to commentators' expectations, not because of anything inherent about upward trends. In our next study we test this argument by sampling a later historical period when time-lagged expectations would have been less bullish than in the period sampled in Study 2.

Study 3

Study 3 replicated the basic method of Study 2, yet in the aftermath of *bear* rather than *bull* markets. Rates of agent and object metaphors were tallied and regressed on the two general measures of price change—direction and steadiness—to test our hypotheses. 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 such as "climbing," "struggling," "falling" and "bouncing." Also, price trajectories were coded into more specific patterns than updays and downdays based on their qualitative shapes on intraday price charts.

Method

Procedures

As in Study 2, electronic transcripts of *CNBC Business Center* 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 predictor 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 appear in the upper panel of Table 4). Charts without a salient directional change were categorized into four types (shown 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).

The criterion measures of metaphor rate were also coded at a more fine-grained level—subtypes of verbs rather than the general agent vs. object categories. Metaphoric descriptions were tallied 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 histor-

Table 4
Most frequent verb subtypes evoked as a function of coded trajectory patterns (Study 3)

	Visual prototype	1st	2nd	3rd
Price-change patterns (n = 92)				
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%
Non-change patterns (n = 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%

ical 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, $b = .33$, $p < .05$, $\eta_p^2 = .031$; no effect of range, $b = .067$, $p > .10$; and the interaction effect fell short of significance, $b = -.23$, $p > .10$; $R^2 = .035$, $F(2,167) = 2.03$, $p > .10$. For object metaphors, results showed the expected an effect of gain, $b = -.62$, $p < .01$, $\eta_p^2 = .108$; no effect of range, $b = -.04$, $p > .10$; and the expected interaction effect $b = .414$, $p < .01$, $\eta_p^2 = .046$; $R^2 = .126$, $F(3,167) = 8.06$, $p < .01$. In sum, there was strong support for the main effect and 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 epitomize our 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 sideway 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 in terms of commentators' bullish expectations.

Finally, the interaction-effect involving unsteadiness fell short of significance on one of the two metaphor rate measures. The mixed results may reflect the fact that our measure (range) captures only part of the overall gestalt of steadiness. Our final study was a laboratory experiment in which we could manipulate trend steadiness (rather than measuring it) to gain a clearer identification of the effects.

Study 4

Our final study put student participants in the role of stock market commentators. They were shown a series of charts representing daily trajectories of a market index, and they were asked to describe each day's price movements into a microphone, descriptions that were coded for metaphorical content. Later, participants rated the metaphorical content of their descriptions. Within the series of charts, trend direction and steadiness were varied as within-groups manipulations.

A between-groups condition was introduced to test another alternative interpretation of the direction effect. Motivated reasoning research suggests that people tend to apply a given schema to a problem if it supports the conclusions that they want to reach (Kunda, 1990). If commentators generally wish for market uptrends, then they would be motivated to infer trend continuance after updays but not downdays. If so, our effect could reflect that commentators apply action schemas to trends as a function of whether the trends are desirable, and trend direction is not the key factor. To investigate this, we varied the labeling of the charts across condition so that uptrends were clearly desirable for participants in one condition and undesirable for them in the other 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. They were run one at a time. 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. In the uptrend-desirable condition, participants were told they would see charts of the Nasdaq index, an indicator of the local (Silicon Valley) job market. In the uptrend-undesirable 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 recently hindering the region. Participants were asked to paraphrase back the instructions, and they all comprehended the valence of uptrends as opposed to downtrends in the two conditions.

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 9:30 a.m. to 4:00 p.m. 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 they interpreted that 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 non-agentic 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 Valence (2: uptrend-desirable, uptrend-undesirable) as a between-participants factor. Overall, the results fit our predictions. There was a main effect of Direction and an interaction effect of Direction × Steadiness. More-

over, no there were no effects of the Valence manipulation.

The coded measures may be seen in Table 5. For agentic description, there was a main effect of Direction, $F(1,57) = 50.07$, $p < .001$, $\eta_p^2 = .468$, reflecting more agentic description of uptrends $M = 2.71$ than downtrends $M = 1.49$. Agentic description also showed an interaction of Direction × Steadiness $F(1,57) = 11.799$, $p < .001$, $\eta_p^2 = .171$, 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, $F(1,57) = 116.05$, $p < .001$, $\eta_p^2 = .671$, and an interaction of Direction × Steadiness, $F(1,57) = 16.74$, $p < .001$, $\eta_p^2 = .227$. The MANOVA means are plotted in Fig. 4. Again we see that uptrends were described more agentically 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 distinct subtypes of agent and object schemas may be evoked by steady and unsteady trajectories.
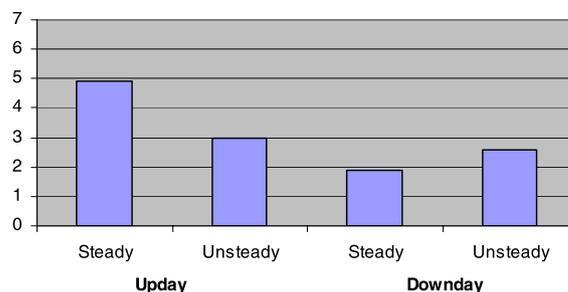

Fig. 4. Self-rated degree of agentic description as a function of trend direction and steadiness in Study 4.

Table 6

Endorsement of verbs as a function of trend steadiness (Study 4)

	Trend steadiness	
	Steady	Unsteady
Uptrend verbs		
Jumped	3.09	3.00
Climbed	3.43	4.29***
Thrusted	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***

Note: *$p < .05$, **$p < .01$, ***$p < .005$.

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 × 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

Table 5

Transcript codings as a function of trend direction, steadiness, and valence condition (Study 4)

Valence condition	Within-groups factors			
	Uptrend		Downtrend	
	Steady	Unsteady	Steady	Unsteady
How agentic was the description?				
Uptrend-desirable ("Nasdaq Index") $N = 39$	2.94	2.71	1.29	1.63
Uptrend-undesirable ("Energy Futures Index) $N = 19$	2.67	2.39	1.28	1.50
How dramatic was the description?				
Uptrend-desirable ("Nasdaq Index") $N = 39$	3.37	3.37	3.54	3.29
Uptrend-undesirable ("Energy Futures Index) $N = 19$	3.22	3.28	3.22	3.78

are evoked by trends that are perceived to be dramatic. An experimental manipulation of the valence of uptrends 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 vs. unsteady trends. Results were consistent with our intuitive predictions about verbs that fit steady vs. 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 these findings are merely suggestive; a systematic analysis of the 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 consequences and preconditions of metaphors in stock commentary. Study 1 found, consistent with H1, that agent-metaphor commentary increased investor expectancies of trend continuance. Further, consistent with H2, the influence was stronger when price information was presented in graph rather than table format. Although alternative accounts may be posited for the main effect of commentary content, only the metaphorical encoding account can explain why the influence is stronger in the graph than table condition.

The preconditions we investigated were features of intraday price trajectories. Consistent with H3, 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).

Finally there was mixed evidence for H4, that the effect of direction would be attenuated when the trend is unsteady as opposed to steady. Unsteady trajectories include minor movements opposite to the overall direction and hence send a mixed signal about animacy. 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).

Overall, the current studies found strong evidence for the main effect hypotheses (H1 and H3). The evidence for the interaction effect hypotheses (H2 and H4) was less consistent across measures, and so further research

is necessary to explore these effects. To better understand the issue of boundary conditions on metaphoric encoding (H2), future studies could compare the conventional chart and tabular formats to other formats for presenting price trend information, such as horizontal bar graphs. Metaphorical encoding should be facilitated only by graph formats that represent price movements as paths through a Euclidean space in which higher points correspond to higher prices.

Similarly, to explore the interactive effect of trend unsteadiness (H4), future experiments could examine different components of unsteadiness to determine whether one of them is most crucial in moderating the effect of direction. We have defined unsteadiness as a gestalt property–the degree to which there are salient reversals from the primary direction of a trend. It may be that unsteadiness could be defined more objectively in terms of a combination of underlying features, such as the number and magnitude of directional reversals. Future research focusing on these subfeatures may enable a more precise understanding of the interaction effect. In sum, trend steadiness should be regarded as a provisional construct that may be refined or replaced in subsequent research.

Implications for the metaphor literature

The current findings contribute evidence for the ubiquity of metaphor in cognition and communication (Lakoff, 1993). The prevalence of metaphor in our studies is all the more striking considering that it is seen in communication about the stock market. Compared to domains like love in which metaphoric processing has been previously studied (Gibbs, 1992), the stock market is one where communicators strive for practical precision rather than inspiring poetry. It also striking that the same types of metaphors are used by professional commentators (Studies 2 and 3) as well as novices (Studies 4).

Yet more important than documenting the prevalence of agent and object metaphors, the current studies demonstrate that these kinds of metaphors are evoked systematically by specific types of price trends. As predicted from the premise that trajectory-triggered schemas are involved, agent metaphors are evoked more by uptrends, and object metaphors by downtrends. Our studies rule out a number of alternative interpretations of the agent-uptrend link, such as that uptrends are more expected, more desired, or more dramatic in the eyes of commentators. The interaction of direction and steadiness, reflecting that the impact of vertical direction is stronger for steady as opposed to unsteady trends, provides further support for our interpretation. Not only is this the first evidence about the eliciting conditions for stock market metaphors, it is the first evidence (to our knowledge) about stimulus conditions for meta-

phors in any domain. Past metaphor research has been rooted in linguistics, and so the issue of metaphor evocation has remained relatively unexplored.

Our findings concerning preconditions support the "embodied cognition" view that metaphoric processing involves cannibalizing innate perceptually rooted schemas for conceptual tasks (Barsalou, 1999). Dennett (1995) argues this is a critical aspect of human cognition; only through "recycling" perceptual schemas that we overcome the "representational bottlenecks" that otherwise would limit our ability to model new domains. More specifically, cognitive theorists in several disciplines (Boyer, 2001; Wegner, 2002) have argued that people's tendency toward anthropomorphic thinking about complex systems–such as the weather, the supernatural, and computers—reflects our application of the same schemas we use to interpret personal actions. Yet there has been little direct evidence. The current results concerning trajectory features provide more direct evidence that perceptually rooted schemas underlie anthropomorphic metaphors.

This view does not assume that commentators consciously decide to cannibalize their action schemas primarily for market uptrends and their object schemas primarily for downtrends. Rather two kinds of schemas are simply triggered by different stimulus features and commentators apply whatever schemas have been triggered. An interesting issue, however, is the extent to which the pattern is reinforced by the structure of the English language itself or, at least, of contemporary American habits of speech. There may simply be more agentic phrases for uptrends than downtrends in use. If so, then the agentic-uptrend correlation would be exhibited by commentators who just sample expressions at random from the language or its stock of common expressions. To investigate the extent to which the asymmetry in commentators' metaphors for uptrends vs. downtrends depends on trajectory perception or on linguistic sampling, future research could introduce manipulations of price information format (like that used in Study 1) to the experimental paradigm used in Study 4.

A related question is whether metaphors produced merely by parroting common expressions are "dead" metaphors. Commentators may get so accustomed to hearing of "100-point leaps" that they form a concept for market leaps that is detached from their original concept for leaps and their broader schema for agentic action. In such cases, it may be that commentators are not mentally encoding the event metaphorically, just talking in terms that originated in other domains. This could be tested by examining whether such expressions prime action schemas for financial commentators. Yet even whether there is not metaphoric encoding underlying commentators' metaphorical words, these words may still strongly affect their audience. As Sartre said, "Words are loaded pistols." Speakers may offer them merely as stylistic ornaments, but their audiences can still get hurt. Particularly when experienced commentators speak to naïve investors, the speaker's dead metaphors may be metaphors the audience lives by, or invests by.

Implications for investor judgment and decision making

The current research also contributes to the literature examining the content of stock market commentary and its influence on investor judgment. Andreassen (1987) found that pairing price change with explanatory references to news about business conditions leads investors to expect continuance. DiFonzo and Bordia (1997, 2002) found the same 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 plausibly causal business conditions. Just describing price changes agentically (without explaining them) leads investors to biased judgments about tomorrow's trends.

A question for future research on judgment is whether this bias would occur as much among experts as among novices? Expert investors, who hold more elaborated rules for making market judgments based on quantitative indicators, may have an easier time suppressing their action schemas when exposed to agentic metaphors. That is, experts may be better at "inhibition of the literal" (Galinsky & Glucksberg, 2000). So the biases ensuing from media metaphors may chiefly afflict "Main Street" rather Wall Street investors. Yet some recent findings reveal that even expert investors think of market sectors in terms of anthropomorphic imagery. MacGregor, Slovic, Dreman, and Berry (2000) found that measures of investors' anthropomorphic imagery concerning market sectors predicted their willingness to invest even after measures of their quantitative assumptions about financial issues were taken into account. Hence the question of whether experts are susceptible warrants empirical exploration.

The current findings are relevant to the debate in behavioral economics over whether markets under-react or over-react to recent price directions. Analyses of some markets show an over-reaction bias, consistent with investors over-predicting continuance from the past trend (Offerman & Sonnemans, 2004). Yet there is also, in other cases, evidence for under-reaction (Forbes, 1996). The current research suggests that one source of over-reaction is interpretation in terms of agentic schemas. To the extent that different causal schemas are prevalent or highly accessible in different financial communities, this may help to explain differences in reaction to price trends.

A related question is how precisely investors' judgments about future trends determine their buy and sell decisions. Though obviously uptrend expectations gen-

erally lead to buying and downtrend expectations to selling, other factors also come into play. For instance, the "disposition effect" refers to a reluctance to sell "losing" stocks but not "winning" stocks, independent of expected future trends. Weber and Camerer (1998) found that that this comes from investors using their purchase price as a reference point, then gambling on losses while avoiding risk on gains. Hence, the relationship between uptrend expectancies and buy decisions may be weaker when purchase prices are salient.

A broader issue is how the increased pervasiveness of media commentary has affected stock markets. Our results suggest that, overall, media commentary influences investors to take uptrends as meaningful signals of tomorrow's direction whereas to take downtrends as nondiagnostic. That is, updays are more likely to be described agentically, and agentic descriptions then foster expectancies of continuance. Schiller (2000) notes that the late 1990s stock market rise came as media commentary (through channels such as CNBC) became more pervasive than ever before. Increased media commentary, then, may be one of the many forces that contributed to this record overvaluation.

Issues for future research

More types of metaphors

Though the distinction between agent and object metaphors has been a good first cut, there are other distinctions worth investigating—subtypes within these two basic categories and other categories outside of them.

Subtypes of agent and object metaphors may be psychologically important in that they reflect subtypes of action and object schemas (Wellman, 1990). The current findings offer a few hints that different subtypes of agency metaphors are evoked by different types of upward trajectories—primarily sideways as opposed to substantially upward trends (Study 3) and unsteady as opposed to steady uptrends (Study 4). Future research should push beyond the upward-agentic hypothesis to identify the eliciting conditions for specific metaphor subtypes.

Subtypes may also vary in their implications about trend continuance. Agency metaphors, in general, carry an expectation of continuance because they imply an enduring goal ("The Nasdaq fought its way upwards"). Yet some subtypes may imply instead a satiated goal ("The Nasdaq finally reached its 3000 target"). Schema for goal-completing actions (Schank & Abelson, 1977) would not imply behavioral continuance to the same extent.

Likewise, there may be subtypes of object metaphors with distinctive implications about continuance. Though object schemas have weaker implications about future trends than do action schemas, some conceptions of object motion involve the assumption of impetus, that an object is propelled by an internal force that dissipates over time (Kozhevnikov & Hegarty, 2001; McCloskey & Kohl, 1983). Object metaphors involving impetus ("The Dow rolled downhill gaining a head of speed") may convey expectations of continuance at least in the short term. This object metaphor subtype may be most relevant in mid-day market commentary that focuses on hour-by-hour trends, rather than in the end-of-day commentary that we have studied. For instance, if a morning downturn were described with an impetus metaphor investors might take away the expectation that further declines are likely in the afternoon.

Other categories, aside from the agent and object metaphors, may be particularly important in descriptions of longer-term trends. Though news reporters tend to focus on short-term trends, policymakers and analysts often describe month-to-month and year-to-year trends. Their metaphors may also affect investors' judgments. For example, the bubble metaphor, beloved of Alan Greenspan, may imply that excess valuation in a market is corrected all at once, when the bubble pops. The bubble metaphor may mislead investors that it is safe to re-enter a market after a dramatic correction, when in fact another downturn may follow in a second wave.

Two other types of metaphors bear mention. Price trends are often compared to rollercoasters, seesaws, and other mechanical devices. Machines move in more complex ways than simple inanimate objects (in that they deviate from Newton's laws of motion), yet in ways that are more constrained and predictable than those of animate creatures. Hence they may be evoked by unsteady but regular trajectories. And they may imply that the past regularity portends future regularity. Another set of common metaphors depicts market trends as antagonistic conflicts, a contest of bears vs. bulls or clash of armies making retreats and attacks. Again, regardless of how little commentators intend to imply by these metaphors, investors may nonetheless take them as hints about future trends.

Metaphors and investment lore

If agent and object metaphors are ubiquitous tools for making sense of market trends, then we should expect to find them within traditions of investing advice. A couple of examples suggest that this is the case. Consider the warning that a small uptrend after a long downtrend is a "dead cat bounce." This expression references object causality in explicit contrast to animate action. The expression plays off of the audience's schemas to drive home the point that trend continuance should not be expected (i.e. even a dead cat bounces a little bit when dropped from a great height, so don't expect the uptrend to continue).

More broadly, the evocative role of trajectories may be related to the success of the "chartist" school of investment advice. Often called "technical analysis," this

approach of studying price charts has a perennial popular appeal despite the dearth of economic evidence for its validity. Chartists look for features (e.g. "a candlestick pattern") that purportedly portend future price trends (see Smith, 1999). The intuitive plausibility of this approach may owe something to the fact that trajectories evoke rich interpretive schemas.

As a final example, let us consider the quite different approach of contrarian value investing. This was explained to the everyman in Graham's (1959) classic *The Intelligent Investor*. Graham recognized that intuitive anthropomorphic conceptions of price trends make it hard for investors to be contrarians (because this requires selling after an uptrend and buying after a downtrend). Yet shrewdly, instead of forbidding the reader from thinking of the market as like a person, Graham encouraged the reader to think of the market as a special kind of person, a manic-depressive! Graham suggested that the reader think in terms of a salesman named Mr. Market, whose behavior is erratic, changing from one day to the next based on his psychological condition:

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.

With this specialized agent metaphor, Graham helps the reader understand that short-term price swings are largely random and that knowing what the company is really worth allows them to buy at the right time. Research on improving reasoning has found that people often do better when they can think in terms of their intuitive causal schemas rather than in terms of abstract statistical concepts (Morris & Nisbett, 1993). Graham takes this approach by enabling readers to understand market volatility in terms of agency metaphors.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.obhdp.2006.03.001.

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