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The Effects of Attraction on Investment Decisions

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The attraction effect occurs when an inferior item changes a decision-maker's perception of the relationship between other available alternatives, contrary to the expectations of rational decision-making. This study presents the first evidence that this effect, which has appeared persistently in consumer research, can influence investment decisions. The study also finds two distinct patterns of reaction to the inferior item as a sign of "cluster attraction"—a way of spreading investment risk. Evidence of attraction means that the values of important facets of corporate reporting may not be stable across an investor's decisions, but may depend on the items presently available for investment. Results of an experiment conducted with approximately 100 graduate students with investing experience or interest show that the investor's perceived values of reported financial or non-financial performance, quality of earnings, and information source reliability are subject to trade-offs and can be altered by the composition of the decision set, rather than by any intrinsic change in the investment candidate itself. The discussion highlights the implications of these findings for an understanding of how investors regard the qualities of financial reporting.

An individual deciding between two companies as possible investments would be expected to make trade-offs between the firms' attributes. For example, perhaps one is more aggressive in its accounting but promises higher earnings, while the other has a reputation for consistent, conservative reporting, but expects lower earnings.

If a third company now comes to the investor's attention, we would expect his overall allocation to change. But we would not expect the third company to influence his perceptions of the first two *in relation to each other,* especially not if it is clearly inferior to one of the first two on attributes that matter to this investor.

However, consumer research has shown that the trade-offs we make in our decisions are not always stable. In other words, a decision-maker can evaluate the same characteristics differently from one grouping (Company A versus Company B) to another (Company A versus Company B, after knowing about Company C). Furthermore, if the introduction of a third item establishes new relationships among the investment candidates, assessing those relationships may lead to unexpected outcomes, including investment in a clearly inferior alternative.

This situation is an illustration of the attraction effect, one of a family of influences on context-dependent decision-making (Huber, Payne, and Puto [1982]; Huber and Puto [1983]; Simonson [1989]; Simonson and Tversky [1992]; Tyszka [1983]). The attraction effect, which we discuss in more detail later, occurs when an alternative that is similar to but dominated by one of the elements of a decision set increases the likelihood that a decision-maker will favor the dominating alternative over another member of the set. That is, the relationships established by the third firm change the way an individual looks at the first two firms compared solely to each other, even though nothing about the two firms has changed. This outcome is contrary to what we expect from rational decision-making.

Its practical implications make it important to examine whether attraction is present in an investing context, since investors frequently face situations that parallel the introduction of a third firm to an initial two-firm decision set. For example, an investor can review a subset of her portfolio upon hearing of a new investment opportunity. Even unavailable items can prompt this review, such as an initial offering before the first day of public sale. Furthermore, the attraction effect suggests that an investment candidate may be able to influence an investor's perceptions by emphasizing both the dimensions on which it would like to be compared and the other candidates that it would like to be compared to.

Even absent this strategic intent on the part of the firm, individuals may unknowingly influence their own perceptions of an investment candidate merely by how they choose the items they want to compare. As a result, firms may appear to become better investments simply because of another company that the investor

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happens to think of. Initial investments may seem to improve or worsen simply because a new item coming to the investor's attention changes the values he uses when making comparisons—even if the new item is clearly inferior to the initial investment.

If attraction influences investor views of company attributes, it is also likely to affect perceptions of financial reporting, since this reporting plays a significant role in informing investors about a firm. Attraction works on the decision-maker's trade-offs. Discussions about the importance of financial reporting, however, have tended to treat its facets as isolated topics. For example, lately regulators and practitioners have expanded their concerns from the details of financial reporting to how firms use the latitude permitted by financial accounting rules to portray their overall operations—the question of quality of earnings (AICPA [2000]; Levitt [1998]; Pownall and Schipper [1999]).

At the same time, the financial reporting community has realized the part played by non-financial information in investor decisions (AICPA Special Committee on Financial Reporting [1994]), which has opened up the broad area of performance measurement practices. Finally, with both financial and non-financial information more widely available, source reliability has risen in importance, prompting CPAs to offer assurance services on non-financial as well as financial information.

The evidence of attraction in other areas of decision-making, however, alerts us to the need to examine the trade-offs that investors make between these facets of reporting. Prior consumer research has shown that attraction changes decision-maker values for quality and functionality (see Heath and Chatterjee [1995] for a summary of the literature). If, in the investing context, attraction works on attributes such as quality of earnings and performance, investors would implicitly trade a degree of quality of earnings for an improvement in reported performance, based solely on which candidates they happen to be examining. A similar revaluation of the reliability of a source in comparison to reported performance would also occur. In other words, not only would facets of reporting influence decisions (as expected), but the decision-making process would also change the perceived value of those facets during the course of the decision.

Therefore, we examine more closely the possibility that investment decisions are influenced by the composition of the investor's decision set, when the dimensions of comparison include reporting-related areas such as quality of earnings, source reliability, and financial or non-financial summary measures. This research contributes to the relatively new area of behavioral financial reporting studies (Hodder, Koonce, and McAnally [2001]).

The experiment we report here provides the first evidence of attraction effects on investor allocation. This study also expands prior research into context-dependent decision-making by introducing the notion of "cluster attraction," a revaluing of the elements in the decision set in response to the desire to spread risk. The following section describes these effects in more detail, leading to the hypotheses tested. Subsequent sections describe the experimental method, present the results, and provide a discussion and interpretation of the findings.

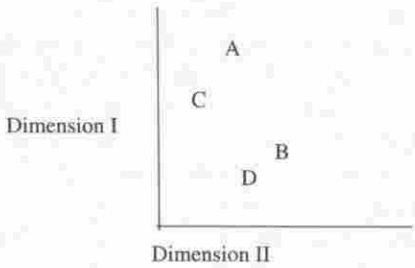
Attraction and Cluster Attraction

Attraction

We adapt an example from Simonson and Tversky [1992] to illustrate the attraction effect. In Figure 1, let Dimension I be a computer's processing speed and Dimension II be the inverse of cost (so less expensive items are "better"). Note that we focus on how the decision-maker views the relationship between A and B. Given a choice between an expensive but fast computer (A), and an inexpensive but slow computer (B), the presence of a very expensive computer (C) that is *slower* than the expensive machine should not determine what proportion of people choose the fast computer over the inexpensive one (A versus B).

In rational decision-making terms, the concept of regularity holds that the likelihood of choosing one alternative over another cannot be increased by adding a third item to the decision set (Huber, Payne, and Puto [1982]). But adding an asymmetrically dominated alternative (C)—that is, a candidate that is clearly inferior to one but not both of the original alternatives—has been shown to increase the proportion of decision-makers who choose the asymmetrically dominating alternative (A) over the other contender (B). One can say the presence of C attracts attention to A, hence the "attraction ef-

FIGURE 1
Attraction and Cluster Attraction



Note: Attraction occurs when the addition of C to {A B} increases the likelihood that the decision-maker will favor A over B in the pairwise comparison between A and B. Cluster attraction is expected to take place when the addition of C to {A B} causes the individual to reduce his investment in B when considering all three candidates (A, B, C) as possible investments. Adding D to {A B} should increase investment in B when A and B are compared on their own. Adding D should also lead to a decline in A's share in the {A B D} set.

fect." A is considered the *target,* B is the *competitor,* and C is the *decoy.* (In Figure 1, B becomes the target if the decoy D is placed so that B dominates it but A does not.)

Researchers have suggested two mechanisms to explain this phenomenon: a "value-added" or "direct dominance" approach, and a notion of "value shift" (Wedell [1991]; Wedell and Pettibone [1996]). The value-added view holds that the relationship of the decoy to the target changes the decision-maker's view of the target by causing her to notice that the target dominates the decoy. This leads to a preference for the dominating element, perhaps because the decision is easier to explain or defend (Simonson [1989]).

Tversky and Simonson's context-dependent advantage model [1993] uses a similar idea to include attraction effects. In their model, each candidate's standing leads the decision-maker to notice relative advantages and disadvantages. Weighing provides a result in favor of easily justified decisions.

In value shift, the participant alters his perceived value of the element along each of the given trade-off dimensions. Wedell [1991] cites range-frequency theory (Parducci [1965, 1974]) to explain how this can occur. According to range-frequency theory, as the range between two elements is expanded from an initial set of endpoints, differences along that range assume less importance to the decision-maker. In Figure 1, Dimension II becomes less important when C is added to A and B. Conversely, as more elements are introduced between two initially established endpoints (as the frequency of elements increases along the dimension), differences along the dimension assume more importance. In Figure 1, Dimension I increases in importance when C joins A and B.

More recently, Roe, Busemeyer, and Townsend [2001] proposed a theoretical framework and cognitive model to account for attraction. Their framework, called multialternative decision field theory, holds that the weight, or valence, of an alternative in the view of the decision-maker changes over the course of the decision. This valence is composed of the decision-maker's personal evaluation of the alternative on each of the attribute dimensions, the attention the decision-maker devotes to the alternative, and the comparison process itself.

In addition to being affected by the valence, the decision-maker's view of an alternative is influenced by his preference, expressed as an integration of valences during the decision-making process, and taking into account initial preference for a given alternative. Finally, Roe, Busemeyer, and Townsend [2001] allowed for feedback effects that reflect how closely alternatives in a given decision set are related to each other. The authors discuss the correspondence between these feedback effects and lateral inhibition in a connectionist model of decision-making.

To see how investment decisions can be subject to attraction, consider the following example in conjunction with Figure 1. Let Dimension I be earnings estimate and Dimension II quality of earnings. The target (A) represents a company with a high earnings estimate but a low quality of earnings (relative to other firms in its industry). The competitor (B) presents a low earnings estimate, but a high quality of earnings. The decoy (C) is the lowest of the set {A B C} on quality of earnings, but better than B and worse than A on earnings estimate. Attraction suggests that A will draw more investment relative to B after the investor learns of C. That is, the introduction of C will draw investment away from the candidate with the higher quality of earnings (B) in favor of the candidate with the higher earnings estimate (A). Note that this occurs even though C is the lowest of the three candidates on quality of earnings.

Researchers have framed their models and explanations of attraction primarily for choice decisions, which is most appropriate for the consumer context in which attraction was first noticed. But the effect has also been seen in allocation decisions (see Mishra, Umesh, and Stem [1993]; Sen [1998]; and Sivakumar and Cherian [1995]). Since investing is typically an allocation decision, our experiment focuses on allocations. Hypothesis 1 formally states the expectation for finding the attraction effect in an investing context. (Note that this and the following hypothesis appear in their alternate form.)

> Hypothesis 1 (standard attraction): *The introduction of an asymmetrically dominated decoy to a decision set will increase investment allocations in favor of the target relative to the competitor when the target and the competitor are compared.*

Cluster Attraction

Investment allocations permit a closer look at other important relationships among the candidates, which can shed some light on the sequence of decisions an individual may go through. After all, the introduction of the decoy not only establishes a new relationship involving the target, but it should also change the relationship of the competitor to the other members of the decision set. In particular, the relationship of the competitor to the new target-decoy cluster should be accounted for.

Here, a simple heuristic such as "majority rule" may motivate the decision-maker. That is, the investor can note that both the target and the decoy are better than the competitor on one dimension. (In Figure 1, A and C are better on Dimension I than B is.) The decision-maker may be attracted to them *both,* particularly if they are beyond some threshold value on the dimension along which they are the two best candidates. This is consistent with Roe, Busemeyer, and Townsend's [2001] view that attention and the comparison process influence outcomes. In this instance, however, the val-

ues or valences of both the target and the decoy—not just the target alone—change. Note that the investor may then be motivated to allocate shares to a clearly inferior alternative (C), contrary to intuition and rational decision-making principles.

Of course, both the target and the decoy are also worse on one dimension than the competitor is. But both the direct dominance and the value shift approaches suggest that favorable attention should be drawn to the target. By extension, this implies that shares should migrate to the target-decoy cluster, since the decision-maker is attracted to the cluster rather than to the target alone. We regard this new phenomenon as "cluster attraction."[1]

If the share allocated to the target together with the decoy is larger than the share initially allocated to the target (before the decoy appeared), then the increase will cause an equal decrease in the competitor's share, as stated in Hypothesis 2.

> Hypothesis 2 (cluster attraction): *The addition of an asymmetrically dominated decoy to a decision set will decrease the investment share of the competitor in the three-element set.*

Finally, note that this cluster attraction is not self-evident. Rationally speaking, an investor could ignore the decoy for investment purposes. On the other hand, the individual could simply allocate part of the target's initial share to the decoy, effectively spreading risk between two candidates that are similar on both attribute dimensions. (In Figure 1, C would draw shares only from A, not from B.) Cluster attraction and standard attraction are separate effects hypothesized to occur in separate relationships. The distinguishing feature is whether the decoy is considered available for investment (cluster attraction), or whether the investor must decide between only the target and the competitor (standard attraction).

Method

Design

A single experiment delivered via the Internet tested both hypotheses. The introduction asked the participants to imagine that they had just inherited $10,000 from a relative on the condition that they invest the money immediately in a firm or firms doing business in high-tech. The money had to be invested for one full year and could not be touched in the meantime.

This setting was chosen to provide the sense of a meaningful sum of money being invested in a risky, well-publicized industry segment, with little chance of immediate subsequent intervention. Earlier work on attraction has generally focused on static decisions, where all alternatives are present to the individual throughout the decision-making (Sivakumar and Cherian [1995] and Stewart [1989] are exceptions). However, many important decisions, including investments, are often sequential: New alternatives become available, causing a reexamination of existing allocations. Accordingly, participants went through a three-step exercise.

- In the first step, participants read about two investment candidates. They then decided how to allocate 100 percentage points of their investment between the two candidates (the "initial pairwise comparison").
- In the second step, participants reviewed a set of three candidates, two of which were identical to the members of the initial set (but which now had different names). The third candidate was the decoy. Participants allocated 100 points among the three (the "three-element comparison").
- Finally, participants were asked to make 100-point allocations for each of the three pairwise combinations of the three candidates (the "subsequent pairwise comparisons").

The tests for Hypothesis 1 looked at how responses concerning the initial pair of candidates changed between step 1 and step 3. The tests for Hypothesis 2 examined changes between step 1 and step 2.

This three-step process took place three times per participant, each time using a different set of traits (trade-offs) to describe the investment candidates. Thus there were three steps to each part, and three parts to the experiment. In addition, there was an introduction to the experiment as a whole, background information preceding each part, and intervening tasks between the initial pairwise comparison and the three-element comparison in each part.

Each part featured a trade-off between two dimensions of information. The three parts, defined by these trade-offs, appeared in the same order throughout: quality of earnings versus earnings estimate, source reliability versus earnings estimate, and source reliability versus performance measure. The dimensions were operationalized as follows.

Quality of earnings. The background material described quality of earnings as a function of a firm's financial reporting choices in revenue recognition, frequency of changes in estimate, and level of detail in disclosure. The material defined each term and told participants that variation in financial reporting choices was legal and prevalent. Participants then saw a display showing a range of reporting possibilities and how these would be ranked for quality of earnings (see Appendix A). This display was reproduced each time a

candidate's quality of earnings was mentioned, with the candidate's position clearly marked.

Earnings estimate. The background material provided information on earnings estimates. For consistent interpretation across participants, earnings estimates were described as changes in a firm's earnings per share from year to year. Earnings per share for all candidates was shown to have increased over the prior year, and each firm's earnings estimate was compared to the industry average, thus producing points above or below that average. Candidates' positions were clearly marked on a scale from *4 points below* to *4 points above,* with one-point gradations, and including zero (which was also noted as *average*).

Source reliability. The background material to parts 2 and 3 introduced readers to the idea that information on a firm can come from different sources. The reading defined terms that may have been unfamiliar to some participants. The nine-item lists shown in Table 1 appeared separately at the beginning of parts 2 and 3. In each case, the materials asked participants to select the four most trustworthy sources, and then to rank them in order of reliability. They were then asked to rank the four *least* trustworthy sources from the five they had not chosen. This procedure guaranteed a full ranking of the sources tailored to the individual respondent, to be used in the subsequent decisions.

Performance measure. The background material to the third part described performance measures as a type of information that could supplement standard financial data for investors. The material also mentioned that performance measures are not subject to financial accounting and reporting rules, and that the measures and how they are used vary by firm.

Each participant was asked to choose one of the following categories to obtain performance information from an investment candidate: customer satisfaction, intellectual property (knowledge) management, or product quality. Brief descriptions of each were included. Using the participant's choice, the computer program generated two factors that the investment candidate reportedly measured. Factors were selected based on discussions in the literature about current performance measures (Edvinsson and Malone [1997]; Hoffecker and Goldenberg [1994]; Provost and Leddick [1993]). Details appear in Table 2.

Participants saw that the investment candidates reported improvements ranging from 7% to 15% over the prior year in the chosen area. As with earnings estimates, all firms showed increases to minimize the confounding that might have occurred between candidates reporting improvements and those reporting declines.

Table 1. *Available Sources of Firm Information*

Earnings Estimate and Source Reliability	Performance Measure and Source Reliability
Comments on Internet chat rooms	Comments on Internet chat rooms
CEO comments during a conference call	CEO comments during a conference call
Press release reported in *The Wall Street Journal*	Press release reported in *The Wall Street Journal*
Internet web site	Internet web site
Individual analyst forecast	Individual analyst forecast
Consensus forecast of analysts	CPA report (assurance report)
Discussion with friend working in the industry but not at the investment candidate	Business reporter column in a local newspaper
Investment advisor unsolicited newsletter	Industry trade association newsletter
	Study conducted by a recognized polling organization and paid for by the industry trade association
Participant's own financial analysis	

Note: Participants were asked to rank the reliability of different sources of information, shown above in abbreviated form. Respondents ranked sources in separate activities for parts 2 (using the left-hand column) and 3 (using the right-hand column) of the experiment.

Table 2. *Performance Measure Areas and Factors*

Area of Interest	Factors Measured
Customer satisfaction	Number of repeat customers
	Reduction in customer complaints
Intellectual property (knowledge) management	Sales generated by products less than two years old
	Cost per employee of relevant training and education
Product quality	Reduction in warranty claims
	Reduction in the costs of reworking the product during manufacturing

Note: In the third part of the experiment, participants were asked to choose the area for which they would most like to receive performance information. The experimental instrument then generated the same two factors per area for each participant choosing that area. Amounts associated with each factor varied as listed in Appendix B.

Appendix B presents the list of investment candidates used in the experiment. A few simple rules governed the way they were formed:

- In the initial two-element set for each part, one candidate had to be better than the other on one dimension, while the second candidate had to be better than the first on the other dimension. Since neither candidate dominated on both dimensions, this established the need for a trade-off.
- In the initial two-element set, each candidate's "location" on the dimensions had to have at least one "step" between it and the other candidate. For example, if one candidate had an earnings estimate *2 points above the industry average,* the other candidate could not be at that level or at *3 points or 1 point above.*
- No candidate in the two- or three-element sets could be at the top or at the bottom of the dimension ranges. This was meant to minimize the chance of a ceiling or floor effect in the participant's view of the candidates.

The form of the third candidate varied by version, as discussed below.

Versions

Participants saw only one version of the experiment through all three parts. The four versions varied based on the target item. Recall that attraction requires that only one of the initial two elements dominates the decoy. Therefore, the decoy can be introduced so that the target is either better on Dimension I or Dimension II. This provided for two versions of the experiment. A control group was used to determine whether the size of the effect was different from changes caused by the addition of *any* dominated element. This formed the third version, where the added third element was dominated by both the target and the competitor.

Finally, given the role that Roe, Busemeyer, and Townsend [2001] assign to the decision-maker's preferences in their model, a fourth version was designed to explore how initial preferences affect attraction. In this version, the decoy was placed so that the target was the candidate from the initial pairwise comparison that the participant did *not* prefer. This was necessary because it was impossible to control assignment to different versions based on preferences.

Participants

Participants were solicited through print and e-mail ads delivered by faculty and academic administrators in graduate schools of business and public policy. Participants came from six institutions in New England, three in southern states, and one in the Midwest. The ads sought individuals with an undergraduate degree (in any discipline) with an interest in investing, whether the individual had ever invested or not.[2] Participants were informed that the research concerned decision-making in an investing context, that responses would not be tied to individual names, and that the research was not related to any investment advisor or brokerage firm.

Delivery

The instrument was delivered via the Internet, and interested individuals participated by e-mail. They received the instrument's Internet address and a unique identification number that was used to randomly assign them to a version of the experiment. Identification numbers could only be used once, and expired once the participant logged out of the program.

Participants provided their responses by either clicking on a response area (a radio button) or by filling in blanks. Thus, typing in numbers was required to enter allocations in response to questions. Responses were automatically collected in a database. Extensive pilot testing verified the reliability of the functions of the identification number and the response mechanisms, as well as the security of the database.

Participants were offered $10 for completion of the instrument, which they could accept or choose to donate to charity. On average, participants took approximately forty-eight minutes to complete the experiment.

Results

Participants

109 respondents participated in at least one of the three parts of the experiment. Some participants did not complete all parts and some responses were not usable, leading to a varying number of valid responses by part. In total, there were 109 valid responses for the first part (quality of earnings versus earnings estimate), 105 for the second (source reliability versus earnings estimate), and 100 for the third (source reliability versus performance measures). These amounts included twenty-six responses for parts 1 and 2, and twenty-five responses for part 3 from members of the control group. In total, ninety-nine individuals completed all three sections with valid responses.

Of the 105 respondents who provided demographic information, fifty were male. All but three reported having at least a bachelor's degree. (The three without a bachelor's degree had an average of twenty-four years of work experience.) Seventy-seven participants were enrolled in a master's degree program, all but five in a business-related field. Twenty-nine of the seventy-seven were enrolled in a program related to accounting or finance. Thirty-seven reported already holding a

master's degree or higher. Average years of work experience were 7.7 (SD = 8.6). Seventy-nine of the 105 said they had invested in common stocks or mutual funds. Of the twenty-six who said they had not invested, twenty-one said they planned to invest in the future.

Attraction

On average, participants initially allocated 58% (SD = 20.5) to the candidate with higher quality of earnings in part 1, 55% (SD = 19.8) to higher source reliability in part 2, and 61% (SD = 18.3) to better source reliability in part 3. The dependent variable for tests of attraction was the change in allocation from the initial comparison to the comparison solely between the target and the competitor after the decoy was added.

Note that it was necessary to measure just one candidate's allocation, as participants divided 100 points between only two candidates in these steps. For convenience, the "measured candidates" were those with higher quality of earnings in part 1 and higher source reliability in parts 2 and 3. Each variable required minor transformations because of violations of the assumptions of normality, typically due to outlier values that were revalued to measure within three standard deviations of the mean.

Roe, Busemeyer, and Townsend's [2001, p. 380] model of multialternative decision field theory demonstrates that increased feedback effects or lateral inhibition enhance the attraction effect.[3] Indications of these effects can be gathered from how the respondent treats the decoy when it is introduced. One obvious indicator is to observe whether the decoy receives any shares when it is an available investment candidate. Surprisingly, the decoy received shares from the vast majority of respondents in each part (74%, 82%, and 95% by part, respectively).[4] This finding, contrary to rational decision-making, suggests that the presence or absence of investment in the decoy is not a good indicator of feedback effects for this sample.

A reasonable alternative is to see whether the decoy draws shares from the target. If it does not, the investor presumably sees the target as clearly dominating the decoy, suggesting high feedback or lateral inhibition. This would lead to an expectation of signs of attraction. If the decoy is seen as being "in competition with" the target for investment shares, lateral inhibition is low and one would expect little or no attraction effect.

Accordingly, responses from the three-element comparison were divided into two groups: those in which the decoy drew shares from the target (Group 1), causing the target's allocation to decline, and those in which it did not (Group 2), meaning the target's allocation did not decline.[5] Lateral inhibition suggests that Group 2 would show attraction, while Group 1 would not. Recall that the measurement of interest does not involve the decoy itself.

The mean differences in allocations appear in Table 3. Since the change in allocation is measured for only one of the initial candidates in each part, the attraction effect says that the change should be positive when that candidate is the target, and negative when the other initial candidate is the target. As Table 3 shows, the change is in the predicted direction in five of the six instances in Group 2, where attraction was expected. None of the instances in Group 1 shows signs of attraction. The five changes in the predicted direction are significantly different from zero at two-tailed p-values ranging from less than 0.001 to 0.08. Note, however, that the size of the change is about the same for the control as it is when the measured candidate is the target. This suggests that attraction may be at work, but in some instances it may be no larger than a change caused by the addition of a candidate dominated by both original elements. We expand on this finding later in the discussion section.

Models used to further analyze standard attraction appear in Table 4. These are regressions of the change in allocation on a constant and three independent variables, preference (one variable), and position (two variables), that is, which candidate was the target. To illustrate, the test conducted on allocation changes in the first part of the experiment (where the candidates varied on quality of earnings and earnings estimate) featured a regression of the change in percentage allocated to the candidate higher on quality of earnings (qechange) on variables representing 1) whether this candidate was initially preferred (qepref), 2) whether the candidate better on quality of earnings was the target (qetarg), or 3) whether the candidate better on earnings estimate was the target (eetarg), and a constant:[6]

$$\text{qechange} = b_0 + b_1 \text{ x qepref} + b_2 \text{ x qetarg} + b_3 \text{ x eetarg} \quad (1)$$

The story told by the observed means is supported by the models in Table 4. All the models, regardless of group, feature jointly significant position variables, but the significance is primarily driven by the second initial candidate being the target. The important difference is that the changes described by the models in Group 2 are in the direction predicted by the attraction effect, as expected, while those described in Group 1 are in the opposite direction.

Changes showing the effect of attraction range from 7 to 16 points. As a percentage of the mean initial allocation, these changes range from 12% to 36%, suggesting a moderate size to the effect. Taken as a whole, the results support Hypothesis 1. Finally, note that preference does not generally appear significant in the changes seen for Group 2, but it does have a role in Group 1's changes. There were no significant interactions between position and preference in these models.

Table 3. *Tests of Attraction: Observed Mean Changes in Allocations When Responses Are Partitioned by Reaction to the Decoy*

Part 1		Part 2		Part 3	
Target is the candidate higher in	***n*** ***M*** ***SD*** **(*p*-value)[a]**	**Target is the candidate higher in**	***n*** ***M*** ***SD*** **(*p*-value)[a]**	**Target is the candidate higher in**	***n*** ***M*** ***SD*** **(*p*-value)[a]**
		Group 1 (decoy drew from target)			
Quality of earnings	20	Source reliability	25	Source reliability	23
	0.2		–5.8		–4.6
	10.32		12.88		11.86
Earnings estimate	25	Earnings estimate	25	Performance measurement	30
	3.0		9.6		9.2
	14.93		15.67		15.49
No target (control)	14	No target (control)	14	No target (control)	12
	–13.6		–7.9		–10.4
	12.92		17.29		15.73
		Group 2 (decoy did not draw from target)			
Quality of earnings	13	Source reliability	7	Source reliability	8
	7.3[b]		–0.7		16.9[b]
	9.27		11.70		19.26
	(0.01)		(0.88)		(0.04)
Earnings estimate	25	Earnings estimate	22	Performance measurement	14
	–11.4[b]		–13.9[b]		–14.3[b]
	12.38		17.99		16.16
	(<0.001)		(0.03)		(0.08)
No target (control)	12	No target (control)	12	No target (control)	13
	10.0		12.5		10.0
	13.65		17.65		10.80

Note: The table shows the mean changes in allocations to the two original investment candidates when compared only to each other, before and after the decoy was introduced. Changes were measured for the candidate higher on quality of earnings in part 1, and higher on source reliability in parts 2 and 3. If attraction is present, this measure should be positive when the target is higher on quality of earnings (source reliability). It should be negative when the target is higher on earnings estimate (performance measurement).

Responses were divided into two groups based on reactions to the decoy. In the first group, the decoy did not draw any investment shares from the target. In the second group, the presence of the decoy caused the respondent to shift some shares from the target to the decoy. Control group responses were partitioned based on whether the decoy drew shares from the measured candidate.

[a]*p*-values are provided only when Hypothesis 1 suggests a non-zero change. Values are based on two-tailed *t*-tests of whether the mean differs from zero.

[b]Change is in the direction predicted by Hypothesis 1. The hypothesis is silent about changes in the control group.

Cluster Attraction

The change in allocation for the test of cluster attraction was calculated as the difference between the allocation to the competitor when the decoy was available for investment (the three-element comparison), and the competitor's share in the initial pairwise comparison. Since the control group did not have a true decoy, those observations were excluded from the tests.

As in the tests of standard attraction, responses were divided into two groups, based on whether the decoy drew shares from the target. The partitioning revealed an interesting pattern, detailed in Table 5. For Group 2, the "high lateral inhibition" group, the competitor's shares fell, as Hypothesis 2 predicted. The decline was approximately 20 points in each part of the experiment. Furthermore, the shares went to the target-decoy cluster and not all to the dominating target. On average, the change was spread roughly evenly between the target and the decoy.

For Group 1, the low lateral inhibition group, it appears that essentially all the decoy's shares came from the target. Once again, the amount of the shift was approximately 20 points in each part of the experiment. The results provide reasonable support for Hypothesis 2, while emphasizing the importance of different investor perceptions of the decoy.

Discussion

The findings support the notion that introducing alternatives changes the way an investor revisits a decision, even if the new alternatives are clearly inferior to one of the original items being reviewed. This echoes the results of consumer research into how context affects decision-making, and suggests that when making comparisons, investors are susceptible to the same

Table 4. *Tests of Attraction: Regression Models for Groups Partitioned by Response to the Decoy*

Group 1 (decoy drew from target)

Part 1: $F(3, 55) = 6.81$, $p < 0.001$, $n = 59$, $R^2 = 0.27$, $MSE = 161.3$

	Intercept	qepref	qetarg	eetarg
Coefficient estimate	–7.0	–7.6	12.6**	14.6**
(standard error)	(4.63)	(3.68)	(4.46)	(4.34)
p-value	0.133	0.043	0.006	0.001

Part 2: $F(3, 60) = 7.67$, $p < 0.001$, $n = 64$, $R^2 = 0.28$, $MSE = 213.2$

	Intercept	srpref	srtarg	eetarg
Coefficient estimate	–2.8	–7.9	1.1***	17.7***
(standard error)	(4.61)	(3.79)	(4.91)	(4.89)
p-value	0.545	0.042	0.825	0.001

Part 3: $F(3, 61) = 9.84$, $p < 0.001$, $n = 65$, $R^2 = 0.33$, $MSE = 187.7$

	Intercept	srpref	srtarg	pmtarg
Coefficient estimate	–2.7	–10.3	5.7***	19.8***
(standard error)	(4.95)	(3.95)	(4.89)	(4.69)
p-value	0.591	0.011	0.245	<0.001

Group 2 (decoy did not draw from target)

Part 1: $F(3, 46) = 12.16$, $p < 0.001$, $n = 50$, $R^2 = 0.44$, $MSE = 144.0$

	Intercept	qepref	qetarg	eetarg
Coefficient estimate	11.6	–4.7	–2.1***	–18.6***
(standard error)	(3.74)	(4.30)	(4.82)	(4.90)
p-value	0.003	0.277	0.667	<0.001

Part 2: $F(3, 37) = 9.12$, $p < 0.001$, $n = 41$, $R^2 = 0.43$, $MSE = 196.0$

	Intercept	srpref	srtarg	eetarg
Coefficient estimate	17.5	–14.9	–9.7*	–18.5*
(standard error)	(5.05)	(6.07)	(7.76)	(6.59)
p-value	0.001	0.019	0.220	0.008

Part 3: $F(3, 31) = 10.54$, $p < 0.001$, $n = 35$, $R^2 = 0.51$, $MSE = 219.0$

	Intercept	srpref	srtarg	pmtarg
Coefficient estimate	15.0	–10.9	5.9**	–18.4**
(standard error)	(5.10)	(6.55)	(6.67)	(6.70)
p-value	0.006	0.106	0.381	0.010

Note: Models based on the observed allocation changes follow the form:

$$\text{change} = b_0 + b_1 \times \text{preference} + b_2 \times \text{position1} + b_3 \times \text{position2},$$

where the change is measured as the difference in allocation to the candidate higher in quality of earnings (in part 1), or source reliability (in parts 2 and 3). The preference variable—qepref, srpref—equals 1 when the candidate higher in quality of earnings (source reliability) is preferred, and 0 when the candidate higher in earnings estimate (performance measure) is preferred. The position variables—qetarg, eetarg, srtarg, pmtarg—equal 1 when the candidate higher in quality of earnings (earnings estimate, source reliability, performance measure) is the target, and 0 when the candidate is the competitor. The control group was coded "0" for each of the two position variables. (No interaction between preference and position proved statistically significant, hence interactions are omitted.) Responses were divided into two groups based on whether the decoy drew any investment shares from the target. Control group responses were partitioned based on whether the decoy drew shares from the measured candidate.

*Position variables are jointly significant at $p < 0.05$.

**Position variables are jointly significant at $p < 0.01$.

***Position variables are jointly significant at $p < 0.001$.

kinds of behavioral processes seen in buyers of computers, cameras, and insurance. Perhaps this should not be a surprise if we consider the investor as a consumer of information about a firm.

It is useful to review the apparent sequence of the investor's decisions. How the investor views the decoy upon its introduction influences whether shares migrate from the target to the decoy or from the competitor to both the target and the decoy (see Figure 2). It also affects the investor's reexamination of his original allocation between the target and the competitor. If the investor believes the decoy is worth any of the target's shares, the target either does not change or becomes slightly less attractive when compared solely to the competitor. If the decoy does not diminish the target's allocation, however, then the investor believes the target is even more important when compared to the competitor alone.

In either case, the decoy has played a larger role in changing the status of the two original alternatives with respect to each other than we would have expected, given its relatively inferior position. Furthermore, although the two different allocation patterns involving the decoy may be seen as different ways of spreading risk, it is neither necessarily rational nor desirable, as discussed below.

Table 5. *Tests of Cluster Attraction: Changes in Allocations in the Presence of the Decoy*

	n	Decoy's Share	Change in Competitor	Change in Target
Part 1				
Decoy did not draw from target	38	9.9 (11.00)	–19.1 (14.37)***	9.2 (12.11)***
Decoy drew from target	45	21.9 (14.57)	–3.1 (19.00)[a]	–18.8 (14.36)***
Overall average	83	16.4 (14.36)	–10.4 (18.74)***	–6.0 (19.35)**
Part 2				
Decoy did not draw from target	29	11.6 (9.75)	–22.1 (15.24)***	10.5 (13.57)***
Decoy drew from target	50	22.0 (15.55)	–3.5 (16.38)[a]	–18.6 (13.52)***
Overall average	79	18.2 (14.55)	–10.3 (18.27)***	–7.9 (19.49)***
Part 3				
Decoy did not draw from target	22	16.2 (13.12)	–24.6 (14.47)***	8.4 (11.16)**
Decoy drew from target	53	23.6 (11.90)	–4.0 (17.33)[a]	–19.6 (12.78)***
Overall average	75	21.4 (12.64)	–10.0 (18.95)***	–11.4 (17.72)***

Note: Hypothesis 2 predicts the change in allocation to the competitor will be negative. This table shows the number of respondents, the mean allocation to the decoy, the mean changes in allocations to the competitor and the target, and (in parentheses) the related standard deviations resulting from the tests of cluster attraction. The changes to the competitor and the target are measured as the difference in percentage points between the allocation to these items in their initial pairwise appearance and in the presence of the decoy. The control groups are omitted from these tests because they did not feature a true target or competitor. Changes may not sum to the decoy's share because of rounding.

[a]Different from zero at $p > 0.05$ (two-tailed).

**Different from zero at $p < 0.01$ (two-tailed).

***Different from zero at $p < 0.001$ (two-tailed).

Limitations

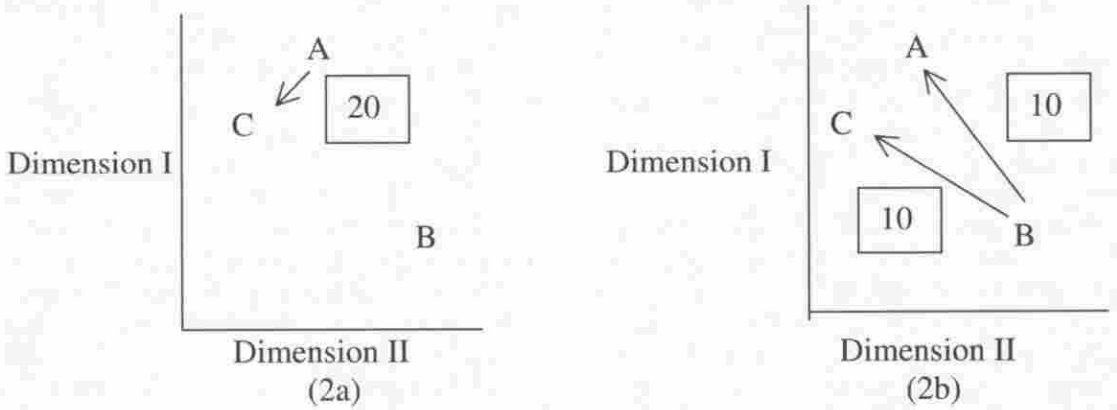
As with any experimental study, this research simplified the complexities of investing. Only two attribute dimensions appeared in each part of the experiment, although there are obviously numerous attributes to choose from when comparing firms. In addition, firm attributes were chosen and defined for the participant. In reality, most attributes are subject to wide interpretation, as different investors examine different components of an attribute. The individual candidate standing on each attribute was clearly defined and marked also, in order to reduce uncertainty, while in reality few firm qualities are clearly and unambiguously reported.

At the same time, however, this study shows it is feasible for attraction to affect investments when commonly used facets of financial reporting are under consideration. Both theoretical and practical implications follow from this.

Implications

Theoretically, the results mirror research findings related to the "construction of preference" (Slovic [1995]), and illustrate some of the complexity underlying decision-making. For example, the results provide some support for the role of lateral inhibition in multialternative decision field theory (Roe, Busemeyer,

FIGURE 2
Shifts of Investment in the Presence of the Decoy



Note: Tests of cluster attraction reveal two patterns of allocation changes in the presence of the decoy, as shown in Figures 2a and 2b. In Figure 2a, the decoy attracts essentially all its shares from the target. Figure 2b occurs when the competitor loses approximately equal shares to both the target and the decoy. The figures show the approximate size of the shifts in percentage points.

and Townsend [2001]). But in practice, how much would investors benefit from having explicit models for their analyses, and how could such models allow for individual differences?[7] As seen here, the results provide some support for the role of lateral inhibition in multialternative decision field theory (Roe, Busemeyer, and Townsend [2001]).

Viewing decisions in a sequence also pinpoints areas where present models of context-dependent effects can be refined. The idea that both standard attraction and cluster attraction can be found in the same situation underscores the importance of better understanding the decision-maker's comparison process. Cluster attraction provides evidence that the global context (the view that considers all available alternatives) comes into play at some point in decision-making. At the same time, standard attraction points to the importance of the local context (here, target versus decoy) in raising awareness of local value differences or perceptions of dominance.

Roe, Busemeyer, and Townsend's [2001] role for the comparison process in context-dependent decision-making suggests that both global and local comparisons may enter into decision-making. While research into context-dependent effects has long been sensitive to this interplay (Ariely and Wallsten [1995], Simonson and Tversky [1992]), current models of attraction say little about when each is invoked, or about what causes the shift.

Practically speaking, participants generally favored the candidate with better quality of reporting. 68% of all participants preferred the candidate higher on quality of earnings to the one higher on earnings estimate. Similarly, 63% preferred the candidate higher on source reliability to the candidate higher on earnings estimate, and 72% preferred it over the alternative higher on performance measure. But the forms of attraction caused investment to migrate to the alternatives that reported better performance, even in the face of the poorer reporting. In fact, the amount of attraction for the candidates better on quality of reporting was about equal to the change caused by the addition of a completely dominated third item. In other words, attraction may be particularly strong for candidates where reported performance is stronger than reporting quality.

The tests of cluster attraction reveal a somewhat surprising "intermediate stage" of this behavior. The two allocation patterns shown in Figure 2 suggest that investors are generally willing to spread the risk of their investment to all available candidates. Viewed strictly in terms of rational decision-making, however, the decoy is not a rational investment in either case, since the target always dominates it.

A more disturbing picture emerges when the trade-off attributes are explicitly considered. A participant who initially preferred higher quality of earnings to higher earnings estimates could be prompted to allocate investment shares away from the best quality-of-earnings candidate toward firms with distinctly lower quality. Even more surprising is that the investor would not simply allocate more to the candidate *best* on earnings estimate. Rather, she tended to allocate away from her original preference and toward each of the two other candidates better on earnings estimate than her initial preference. This happened even though the third candidate was the *worst* on quality of earnings and only second best on earnings estimate.

Other practical lessons can be drawn from this behavior. With a first study such as this, however, they must be taken as suggestive rather than definitive.

The most fundamental practical implication is that investors must pay attention to what they are comparing when making decisions. In part, note that the small set of firms one has under consideration may influence one's views. Putting other firms into the mix may change the outcome. Furthermore, investors would be well advised to review decisions, to see whether shifting focus from one set of firm attributes to another makes a difference.

From the investment candidate's perspective, when talking to the investing public, drawing attention to similar firms by comparison may be a double-edged sword. Even if the candidate is selective in its comparison, the other firm may attract interest, sometimes at the candidate's expense.

Finally, note that respondents viewed the attribute dimensions as viable trade-offs. As seen here, even these trade-offs are not stable. The discussion of cluster attraction illustrates how shifts in trade-offs may be unexpected and even undesirable. Often, arguments for improving any of a firm's reporting attributes are framed as though the attribute will be judged only on its own merits, rather than in combination with others. The results presented here argue for a more sophisticated view of quality of earnings and source reliability, including a sensitivity to how investor use of these concepts may fluctuate. This may assume even greater importance as CPA assurance services expand, or as the quality of financial reporting draws more attention from the press, regulators, and investors.

The results of this research hint at how facets of financial reporting may influence investor behavior, and how the perceived value of those facets can change over the course of a decision. It's not surprising that financial reporting as a kind of signaling activity can affect investors, but the idea that its facets can be subjected to trade-offs is new. To summarize, the results of context-dependent decision-making research imply that the items we choose to compare change our perception of the values we use when making comparisons. In general, behavioral financial reporting research has only begun to investigate these notions.

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Notes

1. Of course, if a sizable number of individuals allocate shares to the decoy, it will no longer fit the dictionary definition of a decoy. However, even in this situation, the third element will be considered as the "decoy" to keep the terminology manageable.
2. Solicitations were also made to members of the researcher's local non-academic community, and did not stipulate any educational background requirement. These participants accounted for approximately 5% of the final valid responses.
3. "Lateral inhibition" refers to a perceptual mechanism that has been adapted to cognitive processing. Briefly, feedback between two items serves to bring one more clearly to the decision-maker's attention, while moving the other into the background.
4. Percentages are based on numbers excluding the control group, which did not have a true decoy. It is even more surprising that only two respondents did not allocate any shares to any decoy in their three parts of the experiment.
5. Responses from the control group were divided on the basis of whether the added third candidate drew shares from the measured candidate.
6. Initially the models also included the two interactions formed by the position and preference variables. Since the interactions were not jointly significant to the models, however, they are omitted here.
7. My thanks to an anonymous reviewer for raising this issue.

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Appendix A. *Quality of Earnings Display*

Quality of Earnings		Description
High	Disclosure	Exceptionally detailed; includes required and recommended information; uses disaggregated data whenever possible
	Revenue recognition policy	Conservative
	Frequency of changes in estimate	Low
Company A	Disclosure	Above average detail; includes required and recommended information; uses disaggregated data whenever possible
	Revenue recognition policy	Conservative
	Frequency of changes in estimate	Low
	Disclosure	Average detail; includes required information only; uses mostly disaggregated data, but some aggregated
	Revenue recognition policy	Moderately conservative
	Frequency of changes in estimate	Low
	Disclosure	Average detail; includes required information only; uses disaggregated and aggregated data about evenly
	Revenue recognition policy	Moderate
	Frequency of changes in estimate	Moderate
	Disclosure	Average detail; includes required information only; uses mostly aggregated data, but some disaggregated
	Revenue recognition policy	Moderately aggressive
	Frequency of changes in estimate	Moderate
	Disclosure	Below average detail; includes required information only; uses only aggregated data
	Revenue recognition policy	Aggressive
	Frequency of changes in estimate	Moderate
Low	Disclosure	Exceptionally sparse on details; includes required information only; uses only aggregated data
	Revenue recognition policy	Aggressive
	Frequency of changes in estimate	High

Note: The display depicts how participants saw the description and placement of an investment candidate's (Company A) quality of earnings. The background discussion defined the various components.

Appendix B. *Investment Candidate Manipulations*

Candidate	Estimated Earnings Increase	Quality of Earnings (Lower Numbers Show Higher Quality)	Source Reliability (Lower Numbers Show Higher Reliability)	Non-Financial Performance
A	1% below avg.	2 out of 7	2 out of 9	10% increase
B	2% above avg.	5 out of 7	6 out of 9	15% increase
C (decoy)	3% below avg.	3 out of 7	4 out of 9	7% increase
D (decoy)	Average	6 out of 7	8 out of 9	12% increase
Control Group "Decoy"	3% below avg.	6 out of 7	8 out of 9	7% increase

Note: The different versions of the experiment used separate sets of candidates: {A B C}, {A B D}, or {A B "decoy"}. Candidates bore different names at each appearance. The control group's "decoy" was designed to be dominated by both the target and the competitor. Estimated earnings were presented as numbers and as marks on a scale, where "average" was the industry average. All estimates represented increases over the prior year's earnings per share. A firm's ranking for quality of earnings was presented on the display shown in Appendix A. Participants determined their own rankings for source reliability, but did not see the actual numerical rank during the investment decision part of the experiment. Non-financial performance was a quantitative measure of performance on two common metrics for the participant's choice of performance area. The measure was presented numerically, as shown.