MANOJ THOMAS and GEETA MENON*

When do internal reference prices differ from articulated price expectations? The authors propose that the internal reference price depends not only on the magnitude of the expected price but also on the confidence associated with this expectation. Four experiments delineate the effects of price expectation and confidence on the internal reference price. In Experiments 1 and 2, the authors manipulate repetition and examine the effects of repetition-induced confidence on price judgments. In Experiments 3 and 4, they manipulate confidence directly to investigate its effects on judgments. The results from all four experiments suggest that consumers with less confidence have higher internal reference prices than more confident consumers, even when they do not differ in their articulated price expectations. The authors discuss the implications of these results for pricing theory.

When Internal Reference Prices and Price Expectations Diverge: The Role of Confidence

A fundamental assumption in most models of price cognition is that consumers evaluate a price by comparing it with a memory-based analog standard, often referred to as the "internal reference price" (Adaval and Monroe 2002; Monroe 2003; Winer 1988). Although a large body of empirical evidence supports the concept of the internal reference price, the psychological mechanisms that underlie this comparison process remain unclear (Kalyanaram and Winer 1995). In this article, we examine the effects of repetition on the price comparison process to understand the underlying psychological mechanisms that are in play.

Our interest in the effects of repetition on the price comparison process was kindled by an intriguing conundrum reported in the pricing literature. Repetition affects consumers' judgments of offer prices, but it has little or no effect on their articulated price standards. Econometric studies suggest that frequent buyers are more sensitive than infrequent buyers to price increases (e.g., Breisch et al. 1997; Rajendran and Tellis 1994), implying that frequent and infrequent buyers may be using different comparison standards for evaluating offer prices. However, several price knowledge surveys have reported that a frequent buyer's estimates of regular prices or fair prices are no different from those of an infrequent buyer (Dickson and Sawyer 1990; Gabor 1988; Urbany and Dickson 1991). These findings lead to the following question: If repeated price evaluations have no effect on the magnitude of the articulated price expectation, why do they affect price magnitude judgments?

In this article, we posit that the internal reference price used in price magnitude judgments may be distinct from the articulated price expectation. The literature refers to the internal reference price as the price point on the subjective judgment scale above which all prices are typically judged as high and below which they are judged as low (Winer 1988). The articulated price expectation is the price magnitude that consumers articulate as the regular price or the fair price for the product. Although both constructs are based on consumers' prior experiences, we argue that the internal reference price is more malleable than the articulated price expectation. Consider two consumers: a frequent buyer, Anna, who purchased a product three times during different store visits at $3.50, and an infrequent buyer, Leo, who purchased the product just once at $3.50. Both Anna and Leo

*Manoj Thomas is Assistant Professor of Marketing, S.C. Johnson Graduate School of Management, Cornell University (e-mail: mkt27@cornell.edu). Geeta Menon is Professor of Marketing and Harold MacDowell Faculty Fellow, Leonard N. Stern School of Business, New York University (e-mail: gmenon@stern.nyu.edu). This article is based on part of the dissertation of the first author under the supervision of the second. The authors thank members of the dissertation committee, Vicki Morwitz (cochair), Amitav Chakravarti, Tom Meyvis, Yaacov Trope, and Russ Winer, for their insightful comments on prior versions of this article. They also gratefully acknowledge the helpful comments from the two anonymous *JMR* reviewers. Gita Johar served as guest editor for this article.

To read and contribute to reader and author dialogue on JMR*, visit http://www.marketingpower.com/jmrblog.*

ISSN: 0022-2437 (print), 1547-7193 (electronic)

would expect the future price of that product to be $3.50. Although both consumers have the same price expectation, Anna somehow feels much more confident than Leo when evaluating an offer price. The issue under investigation in this article is whether this feeling of confidence can independently affect the internal reference price used for judging offer prices. We suggest that repetition-induced confidence can affect the internal reference price used in magnitude judgments even when it has no effect on the articulated price expectation.

In the following sections, we first discuss the literature pertaining to how consumers make price comparisons with the goal of evaluating prices, and then we present four experiments designed to study the effects of repetition on the price comparison process. In Experiments 1 and 2, we examine the effects of repetition-induced confidence, and in Experiments 3 and 4, we manipulate confidence directly to confirm the construct validity of our results. We conclude with a discussion of the theoretical implications of our findings.

THE PRICE COMPARISON PROCESS

Internal Reference Price Versus Articulated Price Expectation

The idea of internal reference price in the marketing literature has been inspired by Rosch's (1975) theorization on cognitive reference points and Helson's (1964) adaptation-level theory. Conceptually, the internal reference price refers to a point on the internal judgment scale that is used as the standard to judge offer prices (Winer 1988). Therefore, by definition, all offer prices above this reference point are perceived as high, and all offer prices below this standard are perceived as low. However, in practice, several different operationalizations have been used to study internal reference prices (see Winer 1988): consumers' self-reports of fair price (e.g., Lichtenstein and Bearden 1989; Thaler 1985), estimates of normal prices charged by the retailer (e.g., Jacobson and Obermiller 1990; Kalwani and Yim 1992; Urbany and Dickson 1991), and recalled magnitude of prior prices (e.g., Dickson and Sawyer 1990; Gabor 1988). Econometricians have operationalized internal reference price as a weighted average of prior prices (e.g., Breisch et al. 1997; Rajendran and Tellis 1994). However, as Kalyanaram and Winer (1995) point out, it is not clear whether these self-reported and econometric measures precisely capture the internal reference price that consumers actually use to judge offer prices.

Psychologists who study stimulus discrimination processes have been interested in the distinction between the internal reference point used for judgments and the articulated comparison standard. People's ability to discriminate between stimuli has been conventionally investigated through experiments in which participants are asked to compare a stimulus of variable magnitude with a specified standard and to indicate whether the stimulus is higher or lower than the standard. The findings from these studies suggest that the internal reference point is an implicit construct that is influenced not only by the values of the articulated standard but also by factors such as confidence, fatigue, habituation, attitudes, and motivations (Helson 1964; Sherif and Hovland 1961; Woodworth and Schlosberg 1954). It is widely accepted that the internal reference point used in comparative judgments is seldom identical to the articulated standard (Woodworth and Schlosberg 1954).[1] For example, Festinger (1943) finds that participants' internal reference points shifted even when the comparison standard was explicitly shown on the screen at the time of judgment. He asked participants to compare pairs of vertical lines, presented simultaneously in a tachistoscope and to say "longer" or "shorter" in response to whether the line on the right appeared longer or shorter than the one on the left. He observed that the internal reference point shifted upward when participants were instructed to guard against making "longer" responses incorrectly. Conversely, when participants were told to be careful not to make "shorter" responses incorrectly, the internal reference point was displaced in the opposite direction. These findings suggest that the internal reference point used in judgments is more malleable than the articulated comparison standard.

The Effects of Repetition

Because prior research has shown that repetition increases consumers' confidence in price knowledge, we are interested in the effects of repetition on the price comparison process. The literature documents that frequent buyers are more confident than infrequent buyers about their estimates of regular prices (Urbany and Dickson 1991), and they take less time than infrequent buyers to evaluate price (Dickson and Sawyer 1990). The proposition that repetition leads to greater confidence has also found empirical support in the psychology literature (Dewhurst and Anderson 1999; Koriat 1993; Zaragoza and Mitchell 1996; also see Menon and Raghubir 2003). Because the internal reference price is a malleable construct that is sensitive to phenomenological experiences, these findings suggest that consumers' internal reference prices will be affected by this repetition-induced confidence. The notion that confidence affects price expectations is not new. It has been shown that less confident consumers articulate higher price expectations (Mazumdar and Jun 1993; Urbany and Dickson 1991). However, prior research has not examined the possibility that confidence can have a direct effect on internal reference price even when it does not change the articulated price expectation. We test this dissociation between the articulated price expectation and the internal reference price. More specifically, we hypothesize that repetition-induced confidence can affect the internal reference price that consumers use for price judgments, even when it has no effect on their articulated price expectations. We began our investigation with an experiment that examines the effect of repeated price evaluations on price judgments and the articulated price expectations.

EXPERIMENT 1

To test the effects of repetition on price judgments, we manipulated two factors in a mixed-factorial design. Repeti-

[1]Woodworth and Schlosberg (1954, p. 198) conclude, "Strangely enough, PSE is rarely identical with St. If it lies above St, there is what is called a positive constant error; if below, a negative constant error." Here, *PSE* refers to the point of subjective equality, and *St* refers to the stimulus used as the comparison standard. The point of subjective equality is conceptually analogous to the internal reference point.

tion was a between-subjects factor, and the offer price magnitude was a within-subject factor.

Method

Eighty undergraduate students from a large northeastern university participated for partial course credit. They were randomly assigned to one of the two between-subjects conditions (repetition group versus no-repetition group). The experiment was administered on personal computers. We used fictitious brand names of pens as stimuli to eliminate the effect of strong prior price standards for the stimulus.

Participants were asked to complete two temporally separated judgment tasks. The first task was a repetition manipulation task that was designed to manipulate participants' prior experience with the prices; this task varied across the two groups of participants (i.e., the repetition group and the no-repetition group). The second task was a price judgment task; this task examined the effect of the repetition manipulation on judgments of new prices. The price judgment task was the same across both between-subjects conditions, and the main dependent measures were recorded during this task. Participants assigned to the repetition group made several price evaluations before the price judgment task, whereas those in the no-repetition group did not. Because our interest was in delineating the effects of confidence and the articulated price expectation, we designed the experimental procedure to ensure that the repetition and the no-repetition groups did not differ in their price expectations.

Repetition manipulation task. This part of the experiment was called "New Product Study." Participants were told that Columbia, an online pen store, was introducing a new pen. All participants saw a picture of a pen along with a short description. We then manipulated the participants' experience with the prices in the product category. Participants, who were randomly assigned to the repetition group, were told that the store managers were considering seven different pricing options for the new pen and were interested in evaluations of these test prices. The first test price they saw was $3.00 (the price expectation that was being created in the experiment). They indicated their agreement or disagreement with the statement that the pen was a "good value for the money" on an 11-point scale anchored by "disagree" and "agree." On the subsequent screens, they evaluated six more test prices, one at a time, that the store managers were ostensibly considering for the new pen: $3.50, $2.50, $2.75, $3.25, $1.75, and $4.25. Note that these prices are uniformly distributed around the mean level of $3.00. Therefore, we expected these prices to induce a price expectation around $3.00. Participants assigned to the no-repetition group also made similar evaluations. However, instead of evaluating test prices, they evaluated seven potential brand names for a pen. To ensure that they also had a the same price expectation, participants in this group were told that that the pen was priced at $3.00 and that the store managers were considering seven brand name options for the new pen. Thus, all participants saw the same pen and were expected to have the same price expectation of $3.00, but unlike participants in the no-repetition condition, those in the repetition condition made repeated price evaluations before the final price judgment task.

Price judgment task. After completing the first task, participants read that a competing online retailer, Endeavor, was planning to introduce a similar pen. Furthermore, they were told that the store managers were considering 16 different offer prices for the pen. Their task was to judge whether each price was high or low. We employed the swift binary judgment paradigm used in similar magnitude judgment experiments (e.g., Dehaene, Dupoux, and Mehler 1990; Moyer and Landauer 1967). Participants saw several prices, one at a time on the computer screen, and were instructed as follows: "Now you will see 16 prices that the online store is considering. After seeing each price, you have to click on one of the two buttons that you will see below the price." The order of presentation of these 16 prices was randomized for each participant. Each price remained on the screen until the response was submitted. Participants responded to each price by clicking the mouse on one of the two buttons: "high" or "low." The two buttons on the computer screen were a centimeter apart from each other. To counterbalance the relative positions of the "high" and "low" buttons on the response screen, a randomly selected half of the participants had the "high" button on the right and the "low" button on the left, and the other half had the "high" button on the left and the "low" button on the right. It was emphasized that accuracy and speed were equally important. To facilitate rapid responses, a small clock at the bottom of the screen indicated the number of elapsed seconds. The computer recorded the time the participants took to respond to each price. The 16 different stimuli prices to be evaluated were set at $.25 intervals: $1.00, $1.25, $1.50, $1.75, $2.00, …, $4.25, $4.50, $4.75, and $5.00. Eight of these prices ($1.00–$2.75) were lower than the induced price expectation ($3.00), and the other eight ($3.25–$5.00) were higher than the price expectation. Thus, for each participant, there were 16 binary price magnitude judgment responses and the response time associated with each of these judgments that served as the primary dependent measures. Next, we measured the magnitude of participants' articulated price expectations by asking them to submit an estimate of the fair price for the pen that was shown at the beginning of the task. These articulated price expectations were measured in an open-ended format.

Results

Price expectation. To rule out the possibility that the effects of repetition on price judgments could be due to differences in the articulated price expectations, we ascertained that the postjudgment price expectations did not differ between the repetition group and the no-repetition group. A one-way analysis of variance (ANOVA) confirmed that participants assigned to the repetition and no-repetition conditions did not differ in their articulated price expectations ($M_{repetition}$ = $2.80 versus $M_{no\ repetition}$ = $3.09, $p >$ .22). The median value of price expectations was $3.00 for both groups.

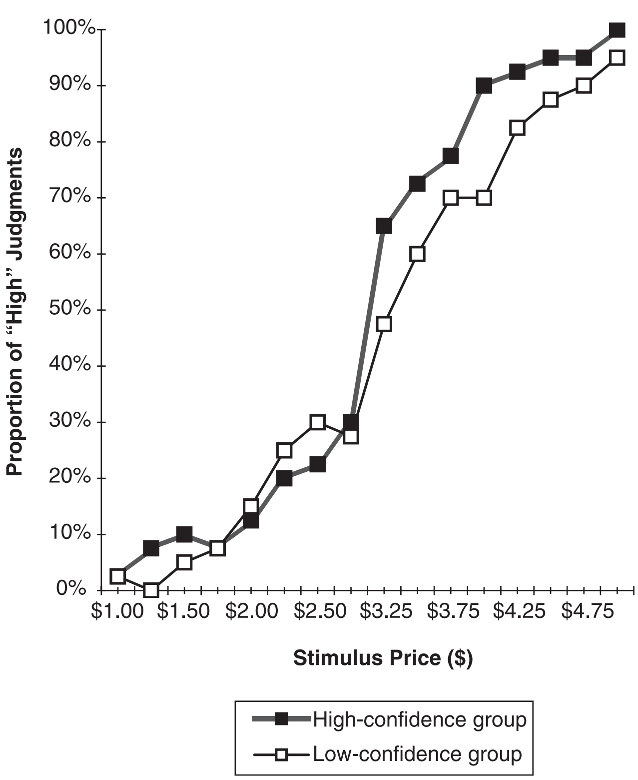
Price judgments. If participants were using their articulated price expectation as the internal reference price for judgments, the repetition manipulation should have no effect on their price judgments. To examine the effect of repetition on judgments of offer prices, we analyzed the binary judgments (1 = high, and –1 = low) using a conditional logit model with offer price magnitude and repetition as the two independent variables. Predictably, the price coefficient was significant and positive ($\beta = 5.94$, $p < .01$), indicating that higher prices were associated with "high" responses rather than "low" responses. The price × repetition interaction term was also significant (β = 2.19, $p < .01$), and the positive interaction coefficient suggests that participants assigned to the repetition condition were more likely than those assigned to the no-repetition condition to judge a price as high.[2] Whereas participants in the repetition condition judged 50% of the offer prices as high, those in the no-repetition condition judged only 44% of the prices as high. Note that the offer prices in this experiment were uniformly distributed around the articulated price expectation; half of the offer prices were higher than the price expectation, and the other half of the offer prices were lower than the price expectation. The finding that the proportion of high judgments in the no-repetition condition was significantly lower than 50% ($p < .01$) indicates that the internal reference price in the no-repetition condition was higher than the articulated price expectation. Further analyses revealed that the repetition manipulation affected judgments only for prices that were higher than the articulated price expectation (see Figure 1). When the prices were higher than the articulated price expectations (i.e., \$3.25–\$5.00), the repetition group judged 85.9% of the prices as high, whereas the no-repetition group judged only 75.3% of the prices as high ($\chi^2(1) = 12.6$, $p < .01$). However, for prices lower than the articulated price expectation (i.e., \$1.00–\$2.75), the repetition and no-repetition groups did not differ in their magnitude judgments; both groups judged 85.9% of the prices as low.

A 2 × 16 mixed-factorial ANOVA on response latency, with repetition (the repetition group versus the no-repetition group) as the between-subjects factor and offer price level (16 levels) as the within-subject factor, revealed a main effect of repetition ($F(1, 78) = 4.9$, $p < .05$). Participants assigned to the repetition group took less time ($M_{repetition}$ = 1095 milliseconds) to judge the offer prices than those assigned to the no-repetition group ($M_{no\ repetition}$ = 1253 milliseconds). To ensure that this difference is not due to the outliers in the distribution, we reanalyzed the response latency data after trimming the values beyond the 99th and 1st percentiles. In this trimmed data set, the mean response time in the no-repetition condition was 102 milliseconds more than that in the repetition condition ($p < .05$).

[2]To control for the individual differences in articulated price expectations, we computed the difference between the offer price and the articulated price expectation for each participant. The results remained unchanged when we used this relative price level as the independent variable instead of absolute prices. The main effect of relative price level (β = 5.91, $p < .01$) and the interaction between repetition and the relative price level (β = 2.21, $p < .01$) were significant.

Figure 1

EXPERIMENT 1: THE EFFECT OF REPETITION-INDUCED CONFIDENCE ON PRICE MAGNITUDE JUDGMENTS



Notes: The articulated price expectation was around \$3.00 and did not vary across the two groups of participants.

Discussion

The findings of Experiment 1 support the hypothesis that repetition can influence price judgments even when the articulated price expectation remains unchanged. For participants assigned to the repetition condition, the internal reference price used to judge offer prices was the same as the articulated price standard. However, for participants assigned to the no-repetition condition, the internal reference price was higher than the articulated standard. The finding that participants in the no-repetition condition took more time for their judgments suggests that these participants were less certain about their price knowledge, and this phenomenological experience of uncertainty could have shifted their internal judgment standard upward. This is consistent with the notion that the internal reference point used in a stimulus discrimination task depends not only on the value of the articulated standard but also on the phenomenological experience during the task.

EXPERIMENT 2

We conducted Experiment 2 to address some of the limitations of the previous experiment. In the previous experiment, we recorded the articulated price expectations after the price judgment task. Therefore, the extent to which the judgment task itself influenced price expectations may be questioned. To preclude the possibility that the participants differed in the prejudgment price expectations, Experiment 2 measures the price expectations immediately after the repetition manipulation. Furthermore, we directly measured their confidence in price knowledge immediately after the repetition manipulation task. Because the act of measuring confidence could affect the nature of the judgment process in a discrimination task (Baranski and Petrusic 1998; Petrusic and Baranski 2003), we tested the effects of the repetition manipulations on price judgments in a posttest on a separate group of participants.

Prejudgment Measures

Forty-eight participants, separate from those who participated in the previous experiment, were randomly assigned to either the repetition condition or the no-repetition condition as in Experiment 1. The repetition manipulation procedure was similar to that used in Experiment 1, with one minor change. In the interest of generalizability, we changed the induced price expectation from $3.00 to $5.00. All the other aspects of the procedure remained unchanged.

Immediately after the repetition manipulation, participants submitted their estimate of their perceived fair price and the upper and the lower price thresholds for the product in an open-ended response format. We measured the upper and lower thresholds of participants' price expectations following the standard protocol used in pricing literature (Gabor 1988; Janiszewski and Lichtenstein 1999). We elicited the upper threshold with the question, "If you were to buy the pen from Endeavor, what is the highest price that you would be willing to pay?" We also measured the effect of repetition on participants' confidence in their price expectations. We asked participants to report how confident they were that their fair price estimate was neither too high nor too low on an 11-point scale anchored by "not confident" and "quite confident."

Results

Even when we measured the price expectations immediately after the repetition manipulation, one-way ANOVAs revealed that participants assigned to the repetition and no-repetition conditions did not differ in their fair price expectation ($M_{repetition}$ = \$4.57 versus $M_{no\ repetition}$ = \$4.87, F < 1), the upper threshold ($M_{repetition}$ = \$5.55 versus $M_{no\ repetition}$ = \$6.09, F < 1), and the lower threshold ($M_{repetition}$ = \$2.55 versus $M_{no\ repetition}$ = \$2.80, F < 1). Furthermore, participants reported greater confidence in their articulated price expectation in the repetition condition ($M_{repetition}$ = 7.77) than in the no-repetition condition ($M_{no\ repetition}$ = 6.23), and this effect reached marginal significance ($F(1, 47) = 3.7$, $p = .06$). Participants in the repeated-evaluation condition were also faster in submitting their fair-price expectation ($M_{repetition}$ = 7.7 seconds versus $M_{no\ repetition}$ = 10.2 seconds; $F(1, 47) = 3.9$, $p < .05$).

Price Judgments

Prior research on the effects of confidence in stimulus discrimination tasks suggests that measuring confidence can alter the task itself (Baranski and Petrusic 1998; Petrusic and Baranski 2003). Building on this insight, we recruited a separate group of participants for testing the effects of the repetition manipulation on price judgments. The procedure for repetition manipulation was identical to that in the preceding study. The procedure for the price judgment task was similar to that in Experiment 1, with the exception that in this experiment, the offer prices were distributed around $5.00. These prices were set at $.50 intervals: $1.00, $1.50, $2.00, $2.50, …, $7.50, $8.00, $8.50, and $9.00. As in Experiment 1, eight of these prices ($1.00–$4.50) were lower than the induced price expectation of $5.00, and the other eight ($5.50–$9.00) were higher.

Analyses of binary magnitude judgments and response latency corroborated the findings from Experiment 1. A conditional logit model revealed that the main effect of price level ($\beta = 2.10$, $p < .01$) was moderated by repetition ($\beta = .57$, $p < .01$). Whereas participants in the repetition condition judged 45% of the offer prices as high, those in the no-repetition condition judged only 39% of the prices as high. These results imply that the internal reference price in the no-repetition condition was higher than that in the repetition condition. The proportion of high judgments in the no-repetition condition was significantly lower than 50% ($p < .01$), suggesting that uncertain consumers' internal reference prices are higher than their articulated price expectations. As in Experiment 1, participants assigned to the repetition group took less time ($M_{repetition}$ = 1123 milliseconds) to judge the offer prices than those assigned to the no-repetition group ($M_{no\ repetition}$ = 1383 milliseconds; $F(1, 38) = 4.2$, $p < .05$).

Discussion

The results from Experiment 2 rule out the possibility that participants differed in their prejudgment price expectations. Thus, these results offer additional support for the proposition that repetition affects price judgments, even when the articulated price expectations remain unchanged. Furthermore, the results of this experiment partially support our theorization that effects of repetition on price judgments are due to changes in the confidence associated with price knowledge. Not only were participants in the repetition condition more confident, but they also took less time to report their price expectation.

EXPERIMENT 3

If, as we suggest, the results of Experiments 1 and 2 are indeed due to changes in confidence, a direct manipulation of confidence should yield similar results. Specifically, participants who have less confidence in their price knowledge should judge price increases less unfavorably. To make conclusive inferences about the role of confidence, in Experiment 3, instead of manipulating repetition, we directly manipulated participants' confidence in their price expectations.

In addition, it could be argued that though our repetition manipulation in the previous experiments emulates how confidence develops in the actual purchase situation, it is confounded with the perceived distribution of prices. That is, before judging the offer prices, participants assigned to the repetition condition in the previous experiments saw a series of prices around the induced price expectation, whereas those in the no-repetition condition were deprived of this information. Could it be that participants in the repetition condition were aware of the distribution of prices and therefore were able to discriminate on both sides of their price expectation? To address these issues, instead of inducing a price expectation in the laboratory, we asked the participants to submit their spontaneous price expectation at the beginning of the experiment. The offer prices used in the subsequent judgment task were uniformly distributed around the articulated price expectation each participant submitted.

Method

Sixty-one students from a large northeastern university (separate from those who participated in previous experiments) participated for partial course credit; they were randomly assigned to either the control condition or the low-confidence condition. The experiment, titled "Stapler Study," was conducted on personal computers. Participants were told that they would complete two tasks: (1) guess the price of a stapler and (2) evaluate several prices that the retailer was considering for that product.

Stimulus and procedure. Participants saw the picture of a stapler on the computer screen and read the following question: "What do you think would be the price of this stapler at an office supplies store?" In an open-ended format, they were instructed to enter their price estimate in dollars in the text box provided below the picture. This response served as a measure of each participant's articulated price expectation for the product. Participants assigned to the control condition proceeded to the price evaluation task, whereas those assigned to the low-confidence condition were presented with the confidence manipulation information. Participants in the low-confidence condition were instructed to wait for 30 seconds while the computer compared their price estimate with the actual market price, after which time they were informed, "Sorry, your guess is incorrect. The actual price is quite different from the price that you guessed."

All participants then responded to a series of filler questions about brand name evaluations, which took approximately five minutes. These brand evaluation questions were inserted to separate the binary magnitude judgment task from the price expectation question. On the following screen, all participants read the instructions for the price evaluation task. Then, they saw 12 prices, one price at a time, on the computer screen and judged whether the shown price was high or low. The computer generated these 12 prices for each participant on the basis of their price expectation submitted on the previous screen. Six of the prices were 10%, 20%, 30%, 40%, 50%, and 60% lower than the articulated price expectation, and the other six were 10%, 20%, 30%, 40%, 50%, and 60% higher. Thus, although each participant saw a unique set of 12 prices, the relative level of these prices in relation to their price expectation was the same across all the participants. These prices were presented in a completely random order determined by the computer. Participants responded to each price by clicking on one of the two buttons: "high" or "low." This binary judgment (–1 = low, and 1 = high) was the main dependent variable.

To monitor changes in their articulated price expectation, participants made a second estimate of the price in response to the question, "In your opinion, what would be a fair price for this stapler?" As in Experiment 2, they also submitted estimates of the maximum and the minimum price expectations.

Results

Price expectation. One-way ANOVAs revealed that neither the preevaluation measure of price expectation ($M_{control}$ = \$7.92 versus $M_{low\ confidence}$ = \$7.67, $F < 1$) nor the postevaluation measure of price expectation ($M_{control}$ = \$7.60 versus $M_{low\ confidence}$ = \$6.81, $F < 1$) differed across the two conditions. Similarly, the postevaluation estimates of the maximum price ($M_{control}$ = \$9.23 versus $M_{low\ confidence}$ = \$8.77, $F < 1$) and estimates of the minimum price ($M_{control}$ = \$4.25 versus $M_{low\ confidence}$ = \$3.87, $F < 1$) were the same across the two groups.

Price judgments. We analyzed the binary judgments using a conditional logit model with offer price magnitude and confidence as the two independent variables. The main effect of offer price magnitude ($\beta = 11.58$, $p < .01$) was moderated by the confidence manipulation ($\beta = 3.40$, $p < .01$). Whereas participants in the control condition judged 49% of the offer prices as high, those in the low-confidence condition judged only 44% of the prices as high. The proportion of high judgments in the low-confidence condition was significantly lower than 50% ($p < .05$), suggesting that when participants were less confident of their price knowledge, the internal reference price used for judgments shifted upward.

We also analyzed the pattern of "errors" across the two experimental conditions. A judgment can be considered erroneous if a participant categorized a price that is higher than the expectation he or she articulated at the beginning of the task as low or if he or she categorized a price that is lower than the expectation he or she articulated as high. At an aggregate level, 10.1% of the judgments were erroneous. For participants assigned to the low-confidence condition, 18.8% of the judgments were erroneous when the offer prices were above their articulated price expectation, whereas this proportion was only 7.2% for offer prices below their articulated expectation. This finding supports the notion that under conditions of uncertainty, the internal reference price (i.e., the point of subjective equality on the psychological scale used for price judgments) is higher than the articulated expectation. In contrast, for participants in the control condition, the error patterns were symmetric around their articulated price expectation ($M_{below\ expectation}$ = 6.5% versus $M_{above\ expectation}$ = 8.1%).[3]

A 2 × 12 mixed-factorial ANOVA on response latency, with confidence (control group versus low-confidence group) as the between-subjects factor and offer price level (12 levels) as the within-subject factor, revealed a main effect of confidence ($F(1, 59) = 4.3$, $p < .05$). Participants assigned to the low-confidence condition took more time ($M_{low\ confidence}$ = 1649 milliseconds) to evaluate the stimuli than those assigned to the control condition ($M_{control}$ = 1467 milliseconds).

Discussion

The results of Experiment 3 are consistent with the proposition that the internal reference price used by a participant to judge offer prices is distinct from the articulated price expectation. Although the offer prices were uniformly distributed around the price expectations articulated before and after the judgment task, participants in the low-confidence condition responded as if a larger proportion of the offer prices were lower than their reference point. Consequently, these participants were more likely to commit more "errors" in their judgments. Strikingly similar findings about asymmetric errors have been reported by researchers examining the effects of anchorages on judgments. Volkmann (1951) reports an experiment in which participants judged a series of visual inclinations. When a line inclined at 30 degrees was introduced as an explicit comparison standard, participants made more errors for stimuli with inclinations higher than 40 degrees than for stimuli with inclinations in the 5–40-degree range. Reese and colleagues (1953; see also Sherif and Hovland 1961) report similar

[3]The overall pattern of error distribution was similar even when the postevaluation price expectation was considered the judgment standard. In the low-confidence condition, most errors occurred when the offer prices were higher than the articulated expectation ($M_{above\ expectation}$ = 24% versus $M_{below\ expectation}$ = 2%). The errors in the control condition were more symmetric ($M_{above\ expectation}$ = 10% versus $M_{below\ expectation}$ = 6%).

results from an experiment in which the task was to estimate the number of dots in the pattern. The stimuli comprised several randomly arranged dot patterns with dots ranging from 1 to 210. When a comparison standard stimulus with 49 dots was introduced, as in the previous experiment, the proportion of errors in the segment above the comparison standard was higher than the proportion in the lower segment. Together, these studies suggest that when judging the relative magnitude of a series of stimuli, the internal analog standard used by people is often slightly higher than the articulated standard.

More pertinent to this research is the finding that the discrepancy between the internal reference point and the articulated standard depends on the degree of uncertainty associated with the standard. The greater the uncertainty, the larger is the shift in the internal reference point. Notably, this shift in the internal reference point did not manifest in the articulated standards reported after the judgment task. This suggests that though both the articulated standard and the internal reference points are based on prior information stored in memory, the former is more stable and less susceptible to phenomenological experiences of uncertainty and confidence. This notion is consistent with Helson's (1964) conceptualization that the adaptation level is a region rather than a point on an internal continuum and that it changes from moment to moment.

EXPERIMENT 4

Until now, we have examined the effects of repetition and confidence manipulation on binary judgments only. However, consumers may not only judge whether a price is higher or lower than their reference point but also judge how much higher or lower the new price is in relation to the reference point. In Experiment 4, we investigate the effects of confidence on continuous price evaluations by measuring participants' perceptions of price attractiveness on a continuous scale.

Method

In design and procedure, this experiment was similar to Experiment 3. Sixty-three students from a large northeastern university participated for partial course credit; they were randomly assigned to either the low-confidence condition or the control condition. None of these students participated in the previous experiments. However, the offer prices and measures employed in this experiment were different from those in Experiment 3. First, instead of high–low binary judgments, the responses to these prices were collected on a ten-point scale. For each stimulus price, participants indicated their disagreement or agreement with the statement, "$XX is an attractive price for this stapler." A high score on this scale indicates that the participant perceived the price as attractive. Second, instead of 12 offer prices, participants evaluated only 6 prices. Again, the computer generated these 6 prices for each participant on the basis of their articulated price expectation submitted at the beginning of the experiment. Of the prices, 3 were 10%, 20%, and 30% lower than the articulated price expectation, and the other 3 were 10%, 20%, and 30% higher.

Results and Discussion

One-way ANOVAs confirmed that the articulated price expectations did not vary across the control and the low-confidence conditions. The preevaluation price expectation ($M_{control}$ = \$7.37 versus $M_{low\ confidence}$ = \$6.95, $F < 1$) and the postevaluation price expectation did not differ across the two conditions ($M_{control}$ = \$6.46 versus $M_{low\ confidence}$ = \$6.29, $F < 1$). Similarly, the postevaluation estimates of maximum price ($M_{control}$ = \$7.97 versus $M_{low\ confidence}$ = \$8.20, $F < 1$) and estimates of minimum price ($M_{control}$ = \$3.99 versus $M_{low\ confidence}$ = \$3.51, $F < 1$) were the same across the two groups.

We submitted the price attractiveness measure to a 2 (confidence: control versus low confidence) × 6 (offer price levels: –30%, –20%, –10%, +10%, +20%, and +30%) mixed-factorial ANOVA; confidence was the between-subjects factor, and offer price level was the within-subject factor. The significant main effect of the offer price level ($F(5, 305) = 143.1$, $p < .01$) was qualified by a price × confidence interaction ($F(5, 305) = 2.7$, $p < .05$). A series of planned contrasts confirmed that the participants who were uncertain about the accuracy of their articulated price expectations were less inclined to evaluate price increases unfavorably. The confidence manipulation had no effect when the new prices were 30% lower ($M_{control} = 8.25$ versus $M_{low\ confidence} = 8.21$, $F < 1$), 20% lower ($M_{control} = 7.87$ versus $M_{low\ confidence} = 7.56$, $F < 1$), and 10% lower ($M_{control} = 7.09$ versus $M_{low\ confidence} = 7.15$, $F < 1$) than their articulated price expectation. However, the confidence manipulation affected judgments when the offer price was 30% higher ($M_{control} = 2.38$ versus $M_{low\ confidence} = 3.34$; $F(1, 305) = 6.7$, $p < .01$), 20% higher ($M_{control} = 3.32$ versus $M_{low\ confidence} = 4.50$; $F(1, 305) = 10.2$, $p < .01$), and 10% higher ($M_{control} = 4.67$ versus $M_{low\ confidence} = 5.37$; $F(1, 305) = 3.6$, $p = .06$) than the articulated price expectation. Thus, manipulating confidence not only affects binary judgments of magnitude but also influences subjective perceptions of the attractiveness of offer prices. Furthermore, these findings confirm that uncertainty about price knowledge shifts the internal reference point upward.

GENERAL DISCUSSION

The notion that experience leads to the internalization of a judgment scale has received empirical support in the context of several psychophysical stimuli, such as pitch, weight, and inclination. Sherif and Hovland (1961, p. 68) conceptualize that after people repeatedly encounter a range of stimuli, "standards that were originally external become internalized." Several studies have reported evidence for the existence for an internal reference point on the psychological scale used for price judgments. Researchers have tried to measure this internal reference price by asking consumers to articulate the price that would be deemed fair (e.g., Lichtenstein and Bearden 1989; Thaler 1985) or the normal prices charged by the retailer (e.g., Jacobson and Obermiller 1990; Kalwani and Yim 1992; Urbany and Dickson 1991). Others have suggested that the recalled magnitude of the previous observed prices might serve as the internal reference (e.g., Dickson and Sawyer 1990; Gabor 1988). Do these articulated price expectations accurately represent the point of subjective equality on the internal judgment scale? In this article, we suggest that the internal reference price used in price judgments is much more malleable than these articulated expectations. The results from four experimental studies suggest that consumers with less confidence have higher internal reference prices than more confident consumers, even when they do not differ in their articulated prices expectations. Thus, our research adds to the growing body of literature (e.g., Adaval and Monroe 2002; Monroe and Lee 1999; Thomas and Morwitz 2005; see also Fitzsimons et al. 2002) that suggests that the processes underlying price judgments are not always accessible to introspection.

The proposition that phenomenological experiences and price expectations can independently influence the internal reference price brings up several issues that merit attention in further research. From both a substantive and a theoretic viewpoint, it is worth exploring whether feelings of happiness, sadness, or anxiety could also affect the internal reference price that consumers use for judging offer prices. Research on changes in adaptation level (Helson 1964) suggests that even ambient factors, such as room temperature and color, could affect the internal reference that people use to judge offer prices. Our findings suggest that the effects of such phenomenological experiences are more likely to manifest on judgments than on articulated price expectations. Another issue that merits investigation is the size of such effects. In our experiments, though confidence manipulations had a reliable and robust effect on price judgments, the effect size was small. Any pricing policy recommendations from this research must wait until the impact of this effect on purchase incidence and brand choice is assessed. Finally, the finding that uncertain consumers consistently shift their internal standards upward and not downward is intriguing. Although psychologists have reported similar shifts in the point of subjective equality in stimulus discrimination tasks (e.g., Volkmann 1951; Woodworth and Schlosberg 1954), what drives the direction of this shift is unclear. A plausible account suggests that this phenomenon is caused by an implicit associative relationship between the phenomenological experience of uncertainty and the magnitude representations on the internal analog scale. Because of the logarithmic nature of the internal analog scale, representations on the higher end of the analog scale might be associated with greater uncertainty than those on the lower end of this scale. Further investigation of the psychological factors that affect the internal representations of the reference price might augment knowledge of the mechanisms in stimulus discrimination processes.

REFERENCES

Adaval, Rashmi and Kent B. Monroe (2002), "Automatic Construction and Use of Contextual Information for Product and Price Evaluations," *Journal of Consumer Research*, 28 (March), 572–87.

Baranski, Joseph V. and William M. Petrusic (1998), "Probing the Locus of Confidence Judgments: Experiments on the Time to Determine Confidence," *Journal of Experimental Psychology: Human Perception and Performance*, 24 (June), 929–45.

Breisch, Richard, Lakshman Krishnamurthy, Tridib Mazumdar, and S.P. Raj (1997), "A Comparative Analysis of Alternative Reference Price Models," *Journal of Consumer Research*, 24 (September), 202–214.

Dehaene, Stanislas, Emmanual Dupoux, and Jacques Mehler (1990), "Is Numerical Comparison Digital? Analog and Symbolic Effects in Two-Digit Number Comparison," *Journal of Experimental Psychology: Human Perception and Performance*, 16 (August), 626–41.

Dewhurst, Stephen A. and Stephen J. Anderson (1999), "Effects of Exact and Category Repetition in True and False Recognition Memory," *Memory and Cognition*, 24 (July), 665–73.

Dickson, Peter R. and Alan G. Sawyer (1990), "The Price Knowledge and Search of Supermarket Shoppers," *Journal of Marketing*, 54 (July), 42–53.

Festinger, Leon (1943), "Studies in Decision: II. An Empirical Test of a Quantitative Theory of Decision," *Journal of Experimental Psychology*, 32 (5), 411–23.

Fitzsimons, Gavan J., J. Wesley Hutchinson, Patti Williams, Joseph W. Alba, Tanya L. Chartrand, Joel Huber, Frank R. Kardes, Geeta Menon, Priya Raghubir, J. Edward Russo, Baba Shiv, and Nader T. Tavassoli (2002), "Non-Conscious Influences on Consumer Choice," *Marketing Letters*, 13 (August), 267–77.

Gabor, Andre (1988), *Pricing: Concepts and Methods of Effective Marketing*, 2d ed. Aldershot, UK: Gower.

Helson, Harry (1964), *Adaptation Level Theory*. New York: Harper & Row.

Jacobson, Robert and Carl Obermiller (1990), "The Formation of Expected Future Price: A Reference Price for Forward-Looking Consumers," *Journal of Consumer Research*, 16 (March), 420–32.

Janiszewski, Chris and Donald R. Lichtenstein (1999), "A Range Theory Account of Price Perception," *Journal of Consumer Research*, 25 (March), 353–68.

Kalwani, Manohar U. and Chi Kin Yim (1992), "Consumer Price and Promotion Expectations: An Experimental Study," *Journal of Marketing Research*, 29 (February), 90–100.

Kalyanaram, Gurumurthy and Russell S. Winer (1995), "Empirical Generalizations from Reference Price Research," *Marketing Science*, 14 (Summer), G161–69.

Koriat, Asher (1993), "How Do We Know That We Know? The Accessibility Model of the Feeling of Knowing," *Psychological Review*, 100 (October), 609–639.

Lichtenstein, Donald R. and William O. Bearden (1989), "Contextual Influences on Perceptions of Merchant-Supplied Reference Prices," *Journal of Consumer Research*, 16 (June), 55–66.

Mazumdar, Tridib and Sung Youl Jun (1993), "Consumer Evaluations of Multiple Versus Single Price Change," *Journal of Consumer Research*, 20 (December), 441–50.

Menon, Geeta and Priya Raghubir (2003), "Ease of Retrieval as an Automatic Input in Judgments: A Mere-Accessibility Framework?" *Journal of Consumer Research*, 30 (September), 230–43.

Monroe, Kent B. (2003), *Pricing: Making Profitable Decisions*. New York: McGraw-Hill/Irwin.

——— and Angela Y. Lee (1999), "Remembering Versus Knowing: Issues in Buyers' Processing of Price Information," *Journal of the Academy of Marketing Science*, 27 (Spring), 207–225.

Moyer, Robert S. and Thomas K. Landauer (1967), "Time Required for Judgments of Numerical Inequality," *Nature*, 215 (September), 1519–20.

Petrusic, William M. and Joseph V. Baranski (2003), "Judging Confidence Influences Decision Processing in Comparative Judgments," *Psychonomic Bulletin and Review*, 10 (March), 177–83.

Rajendran, K.N. and Gerard J. Tellis (1994), "Contextual and Temporal Components of Reference Price," *Journal of Marketing*, 58 (January), 22–34.

Reese, E.P., T.W. Reese, J. Volkmann, and H.H. Cobbin (1953), "Psycho-Physical Research: Summary Report," Psychophysical Research Unit, Mount Holyoke College.

Rosch, Eleanor (1975), "Cognitive Reference Points," *Cognitive Psychology*, 7 (October), 532–47.

Sherif, Muzafer and Carl I. Hovland (1961), *Social Judgment: Assimilation and Contrast Effects in Communication and Attitude Change*. New Haven, CT: Yale University Press.

Thaler, Richard (1985), “Mental Accounting and Consumer Choice,” *Marketing Science*, 4 (Summer), 199–214.

Thomas, Manoj and Vicki G. Morwitz (2005), “Penny Wise and Pound Foolish: The Left Digit Effect in Price Cognition,” *Journal of Consumer Research*, 32 (June), 54–64.

Urbany, Joel E. and Peter R. Dickson (1991), “Consumer Normal Price Estimation: Market Versus Personal Standards,” *Journal of Consumer Research*, 18 (June), 45–51.

Volkmann, John (1951), “Scales of Judgment and Their Implications for Social Psychology,” in *Social Psychology at the Crossroads*, John H. Rohrer and Muzafer Sherif, eds. New York: Harper, 273–94.

Winer, Russell S. (1988), “Behavioral Perspectives on Pricing: Buyers’ Subjective Perceptions of Price Revisited,” in *Issues in Pricing: Theory and Research*, Timothy Devinney, ed. Lexington, MA: Lexington Books, 35–57.

Woodworth Robert S. and Harold Schlosberg (1954), *Experimental Psychology*. New York: Holt.

Zaragoza, Maria S. and Karen J. Mitchell (1996), “Repeated Exposure to Suggestion and the Creation of False Memories,” *Psychological Science*, 7 (September), 294–300.