

Reference Price Research: Review and Propositions

A substantial body of research evidence has now accumulated in the reference price literature. One stream of research has identified the antecedents of reference price and has assessed their effects through experimentation. Others have calibrated a variety of reference price models on panel data and reported the effects on brand choice and other purchase decisions. In this article, the authors review the published literature on reference price in both the behavioral and modeling streams. They offer an integrative framework to review prior research on (1) the formation of reference price, (2) retrieval and use of reference price, and (3) influences of reference price on various purchase decisions and evaluations. In doing so, the authors examine the influences of consumers' prior purchase history and contextual moderators, such as specific purchase occasions, promotional environment of the store, and product category characteristics. They summarize the key findings, identify the unresolved issues, and offer an agenda for further research, which includes a set of testable propositions. They also identify the methodological challenges that face reference price research. In the concluding section, the authors discuss the managerial implications of reference price research.

Reference prices are standards against which the purchase price of a product is judged (Monroe 1973). Numerous articles on the topic of reference price have been published in marketing journals and presented at marketing conferences. These articles provide insights into such issues as the conceptualization of reference price, how it can be measured or modeled, and its effects on consumer purchase behavior. The effects of reference price on consumer choice have been accepted as an empirical generalization in marketing (Kalyanaram and Winer 1995), and the idea of reference point has been extended to other stimuli such as price promotions (Lattin and Bucklin 1989) and product quality (Hardie, Johnson, and Fader 1993). A few researchers have also incorporated reference price into economic theory and have developed models of consumer choice (e.g., Putler 1992). Others have considered reference price effects in modeling competitive behavior of firms and have developed managerial guidelines for retailers and manufacturers (Greenleaf 1995; Kopalle, Rao, and Assunção 1996).

Despite the wealth of available findings and the acknowledged theoretical and managerial importance of the reference price concept, there is no cohesive framework that has systematically examined its antecedents, the mechanisms by which it is formed, and its use by consumers. Winer (1988) provides a survey of the theoretical founda-

tions and modeling of the reference price concept, Briesch and colleagues (1997) present an empirical comparison of different reference price models, and Kalyanaram and Winer (1995) draw empirical generalizations, but these reviews focus primarily on modeling-based investigations that use panel data for frequently purchased packaged goods (FPPG). Thus, there has not been a comprehensive assessment of what is known about reference price and what remains unresolved.

The goal of this article is to present an integrative review of published articles on reference price and related topics. In our attempt to synthesize the empirical evidence, we identify two fairly independent streams of research. The first stream takes a behavioral perspective and uses experimental approaches to assess the effects of external stimuli on consumers' internal reference price (IRP), price judgments, and other evaluations (e.g., Alba et al. 1999; Urbany, Bearden, and Weilbaker 1988). The second stream of research models alternative reference price formulations and tests their effects from the statistical fit of models calibrated on consumer panel data. (e.g., Briesch et al. 1997; Winer 1986).

We offer a framework that synthesizes the findings from both behavioral and modeling-based research streams, and we assess our current understanding of (1) the formation of reference price, (2) the retrieval of IRP from memory and the relative use of memory versus information available externally (hereafter, external reference price [ERP]), and (3) the effects of reference price on purchase decisions and evaluations. For each of the three areas of reference price research, we first review available prior research and present the findings as summaries. We then identify "research gaps" and provide directions for further research, which include a set of propositions. Next, we highlight the methodological challenge that arises from the confounding effects of consumer heterogeneity when reference price effects are estimated. We conclude with a brief review of

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the different domains of reference price construct and a discussion of the managerial implications.

A Conceptual Framework

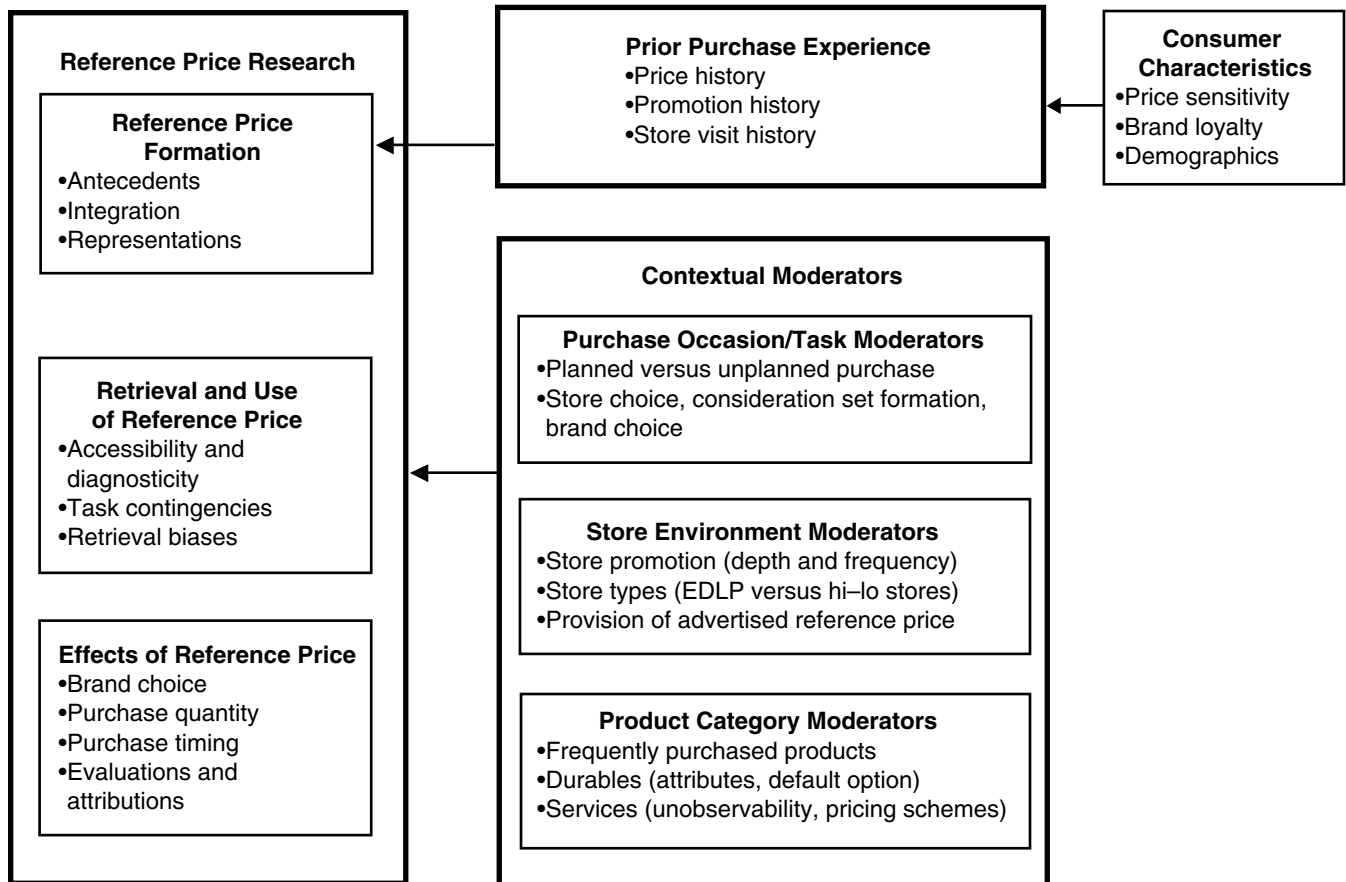
Reference price has multiple conceptualizations. A common conceptualization views reference price as a predictive price expectation that is shaped by consumers' prior experience and current purchase environment (Briesch et al. 1997; Kalyanaram and Winer 1995). The theoretical rationale for this conceptualization comes from adaptation-level theory (Helson 1964), which holds that people judge a stimulus relative to the level to which they have become adapted. Thus, in a pricing context, the expectation-based reference price is the adaptation level against which other price stimuli are judged (Monroe 1973). Other conceptualizations of reference price include normative and aspirational standards (Klein and Oglethorpe 1987). A normative reference price is one that is deemed "fair" or "just" for the seller to charge (Bolton and Lemon 1999; Bolton, Warlop, and Alba 2003; Campbell 1999), and an aspiration-based reference price is based on what others in a social group pay for the same or similar product (Mezias, Chen, and Murphy 2002). Although we offer a brief review of the latter two conceptualizations in the concluding section of this article, our main focus is on the expectation-based reference price (for a

comprehensive account of the fair price conceptualization, see Xia, Monroe, and Cox 2004).

Figure 1 serves as a framework for organizing the presentation of this review. At the core of the framework (see the left box in Figure 1), we include three main areas of reference price research. The first area of research examines the formation of reference price. The relevant areas of research interest here are identification of the inputs to IRP, integration and assimilation of the information, and the different representations of IRP in memory. The second area of research focuses on the retrieval and use of IRP. The key research issues here are the moderating effects of the accessibility of price information in memory (i.e., IRP) versus those available externally (ERP), retrieval of IRP under different task contingencies, and the biases that may occur during consumers' retrieval process. The third aspect of reference price research focuses on the effects of using reference price on a variety of buying decisions (e.g., brand choice, purchase quantity) and on making other evaluations and attributions.

Consistent with adaptation-level theory, the framework also proposes that consumers' prior purchase experiences, the current purchase context, and individual characteristics of consumers influence certain aspects of reference price formation, retrieval, and effects either directly or indirectly.

FIGURE 1
A Conceptual Framework for the Review of Reference Price Research



Prior experiences during which consumers are exposed to price and promotional information create a price memory, the retrieval of which has subsequent effects. However, several contextual factors may moderate this influence. In our framework, we consider three contextual moderators: (1) the purchase occasion or task, (2) the store environment, and (3) the type of product being purchased.¹ The purchase occasion and task moderators differentiate one purchase occasion from another (e.g., planned versus opportunistic purchase) and one purchase task from another (e.g., brand choice versus store choice task). The store environment moderators include retail pricing and promotional strategies, which are implemented by altering the depth and frequency of promotions through everyday low price (EDLP) or hi-lo pricing; such promotions are often accompanied by the retailer's explicit provision of the advertised reference price at the point of purchase. The inclusion of product category moderators expands the scope of reference price research beyond FPPG to include durable products and services as well.

Finally, the framework considers the possibility that prior experience can vary across consumers as a result of individual differences in price sensitivity, brand loyalty, demographics, and so forth. These differences influence consumers' purchase history and incidence. Accounting for individual differences in assessing the reference price effects presents methodological challenges in reference price research. We consider each of these issues in greater depth in the following sections.

Reference Price Formation

We divide this section into three parts. First, we identify the information that consumers acquire over time and contextually, which serves as input to the formation of IRP. Second, we review the processes that consumers may use to integrate memory-based and contextual information. Third, we consider alternative mental representations of reference price. We offer a summary at the end of the section.

Antecedents to Reference Price

Prior purchase experience. Because panel data provide extensive information on consumers' prior purchases, modeling-based reference price research has used consumer purchase history as the main determinant of IRP for FPPG (for a summary of previously used IRP models, see Briesch et al. 1997). The following is a commonly used IRP model for brand i and consumer H on purchase occasion t :

$$(1) \quad \text{IRP}_{iHt} = \alpha \times \text{Price}_{iH(t-1)} + (1 - \alpha) \times \text{IRP}_{iH(t-1)} \\ + \beta_{\text{Prom}} \text{Prom}_{iH(t-1)}.$$

This model of IRP is entirely memory based and is influenced by prior prices and promotions. The first two terms capture the effect of prior prices on IRP and have

¹The three moderators and the components in each cover the main areas of prior and potential research on reference price. However, note that the list of moderators is by no means exhaustive.

been shown to be the strongest predictors of price expectation. Parameter α , $0 \leq \alpha \leq 1$, signifies the recency effect of prior exposures to price on IRP. Studies have found that this parameter ranges from approximately .60 to .85 in different product categories, which indicates that prices encountered beyond two to three prior purchase occasions have negligible direct influences on IRP (for the results of a field study, see Dickson and Sawyer 1990). In addition to prior prices, consumers use previously encountered promotions to create a promotion expectation for a brand (Lattin and Bucklin 1989) that reflects their interest in obtaining transaction utility (Thaler 1985). Because the promotion expectation indicates the extent to which a consumer has been conditioned to promotions, it is usually operationalized as the proportion of times he or she purchased (or observed) a brand on promotion in the past. The greater the deal expectation, the lower is the IRP for the brand (Kalwani et al. 1990).

Summary 1: The following factors involving a consumer's prior purchase experiences have been shown to influence IRP:

- The strongest determinant of a consumer's IRP is the prior prices he or she observes.
- Prices encountered on recent occasions have a greater effect on IRP than distant ones.
- The greater the share of prior promotional purchases, the lower is the consumer's IRP.

Purchase context moderators. Although the reference price model presented in Equation 1 has been used frequently, it does not allow for differences in purchase contexts. Thaler (1985) demonstrates that reference points for an identical product differ simply because of differences in purchase contexts. One such purchase context is the type of shopping trip consumers make for FPPG (e.g., planned versus unplanned trip, regular versus fill-in trips). Bucklin and Lattin (1991) show that consumer processing of in-store promotional activities varies depending on whether a shopping trip is planned or opportunistic. Kahn and Schmittlein (1989, 1992) find that out-of-store promotions have a stronger effect on brand purchase decisions during a regular shopping trip (i.e., larger basket size), whereas in-store promotions have a stronger effect when the trips are fill-in (i.e., smaller basket size). Bell and Lattin (1998) demonstrate that large-basket shoppers are less price elastic in their individual category purchase incidence decisions but are more price elastic in their store choice decisions.

Although the preceding research was not conducted in the context of reference prices, it suggests that the shopping occasions should moderate the influence of prior price and promotional history on IRP.² Further research might investigate whether the salience of prior prices in the formation of IRP varies by shopping trip types. Prices encountered during prior planned and regular shopping trips may be more salient (than those encountered during opportunistic and

²We review the research on planned/regular versus opportunistic/fill-in to illustrate the potential effect of purchase context moderators. There can be a variety of other purchase context moderators (e.g., purchase for gift giving, purchases made during a vacation).

fill-in trips) for the IRP used for subsequent planned and regular shopping trips. Likewise, the effect of prior promotional purchases on the formation of IRP may also vary by shopping trip type. Out-of-store promotions may be more salient in the formation of IRP when a shopping trip is planned and the basket size is large than when the trip is opportunistic and the basket size is smaller. In-store promotions may be salient for both opportunistic and planned purchases.

Store environment moderators. A brand's IRP may vary by store because of the level of service provided, assortment offered, or store types (e.g., factory outlet, specialty store, mass merchandiser) (Berkowitz and Walton 1980; Biswas and Blair 1991). For example, the same price of a bottle of wine could be judged more favorably if it is sold in a specialty wine store than if it is sold in a discount wine store. Likewise, consumers may be more (less) price sensitive and thus have lower (higher) IRP when buying products from online retailers that provide comparative price (quality) information aimed at lowering search costs (Lynch and Arieli 2000). In addition, the promotional strategies that stores use may influence consumers' IRP. Stores implement these strategies by altering the frequency and depth of promotion by their adoption of either an EDLP or a hi-lo pricing policy (see Neslin 2002).

Frequent deals and deep price cuts have been shown to lower consumers' IRP (Alba et al. 1999; Kalwani and Yim 1992). Kalwani and Yim (1992) report that the price consumers expected to pay for an item was significantly lower after they observed either more frequent or deeper promotions for the item on previous purchase occasions. However, there are several factors that have been shown to bias consumers' perception of deal frequencies. Consumers tend to distort perceptions of deal frequency when they are random; in addition, their perceptions of deal frequency of a certain brand are affected by the dealing pattern of a rival brand (Krishna 1991). Krishna, Currim, and Shoemaker (1991) find that consumers tend to overestimate the deal frequency of infrequently promoted brands and underestimate the deal frequency of brands that are promoted more heavily. Distortions are also found to occur for depth of promotions based on how the promotion is framed. DelVecchio, Krishnan, and Smith (2003) find that promotions framed as a percentage off (versus cents off) influence consumers' price expectations more when the depth of promotion is high for low-priced products and when the depth is low for high-priced products. The effect of depth is found to decrease beyond a high level of discount (Gupta and Cooper 1992).

Summary 2: The negative effect of deal frequency on consumers' IRP is moderated by (a) the dealing pattern (i.e., regular versus random) of the purchased brands, (b) the dealing pattern of competing brands, and (c) the framing of the deal (percentage off versus cents off). In addition, the marginal (negative) effect of deal frequency and depth on IRP decreases as the frequency and depth of promotions increases.

The effects of depth and frequency of promotions found in prior research have not been adequately integrated into the research on the formation of IRP at an EDLP versus a

hi-lo store (cf. Kopalle, Rao, and Assunção 1996). Because all brands in an EDLP store are, in effect, being promoted as brands "always" on sale, this promotional strategy can be considered one of moderate discount depth but infinite frequency. Because promotion frequency has been shown to have a stronger influence than promotion depth on price perceptions (Alba et al. 1999), IRPs for brands sold in an EDLP store are likely to be lower than those of brands sold in a hi-lo store, *ceteris paribus* (Alba et al. 1994; Shankar and Bolton 2004). However, hi-lo stores can influence IRPs for selected brands within these stores by deep and simple dichotomous discounts—that is, one regular (high) and one sale (low) price (Alba et al. 1999).

Another potential area for research is to investigate the effects of "rollback" prices on IRP. In advertising rollback prices, EDLP stores (e.g., Wal-Mart) often convey the message that additional cost savings they are able to obtain from suppliers are being passed on to customers. This explanation of additional price cuts within an EDLP store is presumably to minimize the negative effects of promotions on IRP. However, frequent use of rollback prices in predictable categories is likely to be noticed by consumers and incorporated into their price expectations, much like promotions in a hi-lo store.

Product category moderators. The variables included in Equation 1 are not appropriate for durables and services. Winer (1985) proposes a model for durable products in which IRP is a function of (1) price trend, (2) current and anticipated economic conditions (e.g., inflation), (3) predictive signals of future prices, and (4) household demographics. Focusing on the personal computer category, Bridges, Yim, and Briesch (1995) find that consumers' price expectations are also influenced by the relative level of technology used (e.g., processor speed) by a specific model in the same product category.

Because durables have longer interpurchase time than FPPG, the attribute configuration, technology used, and price of a durable may change significantly. The information acquired during prior purchase occasions is therefore less salient in the formation of a reference price for a durable product than it is for an FPPG. Thus, current prices of competitive products and economic and technological trends are likely to be better predictors of IRP for durable products. Moreover, compared with FPPG, the variations in attributes and features across choice alternatives are typically more discernible for durables. Thus, IRPs of durable products may be a hedonic function of the features and attributes they contain.

Summary 3: IRPs for durable products are influenced by such aggregate factors as anticipated economic conditions (e.g., inflation) and household demographics. In addition, in the formation of IRPs for durable products, competitive prices and differences in attribute configurations and features across alternatives are more salient than historical prices; historical prices of durable products are used only to discern a price trend, if it exists. Finally, consumers' price expectations are influenced by the technology used in a specific brand compared with other brands in the same durable product category.

In addition to the relative level of technology of a brand (or model), IRP for high-technology durables should also be influenced by consumers' estimates of cost of key inputs (e.g., Intel versus AMD microprocessor) and other externalities such as expected installed base and availability of complementary products. In addition, in many durable products, consumers use the price of a "default option" provided by the seller (e.g., Dell Web site) as an initial reference point. Further research is necessary to understand the influences of the default provider's characteristics and the attribute configurations of the default option.

There is limited research on the formation of reference prices for services. Services range from those that are purchased at regular intervals (e.g., oil change, hair cut, car wash) to those that are infrequently purchased and sometimes have long temporal separation between their purchase and consumption (e.g., cruise) (Shugan and Xie 2000). Because the former class of services is conceptually similar to FPPG, the usual factors, such as prior and competitive prices and promotions, and store characteristics (e.g., dealership versus an independent repair shop) should be significant predictors of IRP. For the latter type of services, extrinsic signals (e.g., reputation of the service provider, word of mouth, endorsements) (Bolton and Lemon 1999) and tangible signals (e.g., time spent on performing a service, cruise itinerary, refund policies) are likely to influence consumers' expectations about service quality and, therefore, price expectations.

There is another class of services in which consumers make a long-term commitment to buy the service from a service provider, but the consumer's usage rate may vary (e.g., cable television, telephone calling plans, health club memberships). To investigate how consumers evaluate continuously provided services, Bolton and Lemon (1999) propose that consumers use a priori norms (i.e., reference points) of expected payments, performance, and usage rates. Consumers maintain mental accounts of whether the actual outcomes exceed (or fall below) the norms, which results in the assessment of fairness or "payment equity." The assessment of gains and losses in payment equity influences customer satisfaction and service usage rates aimed at reestablishing payment parity.

Because consumers have been shown to use reference points to evaluate a service, a relevant area for further research is to explore how IRP is formed for continuously provided services. One of the determinants of IRP is the type of pricing scheme that the service provider offers and what consumers adopt.³ When consumers adopt a usage-independent fixed fee or access charge (e.g., Internet service), the prices that competing providers charge may serve as a basis for comparison. Consumers may also convert the fixed (e.g., monthly) fee into a dollar per unit of expected consumption (e.g., dollar per minute) and use it as an IRP to monitor their usage pattern (Bolton and Lemon 1999). For a purely usage-based pricing scheme (e.g., calling card, metered parking), IRP is likely a weighted average of prior

³For expositional ease, we assume that pricing scheme is exogenous. When a firm offers multiple pricing schemes, the scheme that consumers adopt likely depends on their expected use of the service (see, e.g., Danaher 2002).

usage-based payments; recent payments tend to receive greater weights (e.g., first two terms in Equation 1).

When consumers adopt a two-part pricing scheme for a service (e.g., mobile communication), a question that arises is whether they retain two separate IRPs, one for the fixed part and another for the variable component, or integrate the two components into a single IRP. Factors that may influence the formation of either a single IRP or multiple IRPs include (1) the relative magnitude of the fixed and the variable part of the price, (2) the consumer's need for controlling spending for the expense category (e.g., monthly cellular phone bills), and (3) the extent to which consumers link the amount spent with actual usage. When the variable part of the price is small compared with the fixed component and when the need to control the budget is high, consumers may retain an integrated IRP for the service category. However, when consumers' propensity to link price with usage is strong, consumers may retain separate IRPs for the fixed and variable components. On the basis of our preceding discussion, we offer the following proposition:

P₁: For continuously provided services, IRP depends on the pricing scheme adopted.

- (a) For a fixed-fee option, IRP is a function of competitors' prices for similar services; in addition, consumers retain IRP as a dollar per unit of expected usage for monitoring actual usage.
- (b) For a strictly variable pricing, IRP is a recency-weighted average of amount spent in the past.
- (c) For a two-part pricing scheme, consumers retain either dual IRPs or a single IRP, depending on the relative magnitude of each part, budget importance, and perceived price-usage equity.

Integration of Antecedents

In the preceding sections, we identified several antecedents of reference price. We now review the literature that has investigated the mechanisms by which consumers integrate the input information to form and/or update a reference point.

Theoretical perspectives. Researchers have adopted one of two theoretical perspectives to study how consumers construct and update IRP. One perspective uses theories from social psychology (e.g., Parducci 1965; Sherif and Hovland 1964), and the other relies more on economic theories on the formation of price expectations (e.g., Muth 1961; Nerlove 1958). The psychological perspective uses assimilation-contrast theory (Sherif and Hovland 1964) to investigate how consumers integrate external information into their IRP (e.g., Lichtenstein and Bearden 1989). The theory suggests that for a given quality level, a consumer has a distribution of prices that are considered acceptable. The new price information is assimilated only if the observed price is judged as belonging to that distribution; the distribution of IRP is then updated in a manner akin to Bayesian updating. Several researchers have attempted to investigate the assimilation process empirically as a function of the distributional properties of price. Kalyanaram and Little (1994) find that in the unsweetened drinks category, consumers assimilate a price if it falls within approximately .75 times the price variability of the product.

Kalwani and Yim (1992) find that consumers assimilate prices that are within $\pm 4\%$ of the regular price of the brand. Han, Gupta, and Lehmann (2001) propose that the thresholds for assimilating prices are “fuzzy” or probabilistic.

The assimilation–contrast theory was later augmented by range theory (Volkman 1951) and range-frequency theory (Parducci 1965) that make predictions about the effects of the properties of the acceptable price range (e.g., end points and distributions) on price judgments. Recent marketing applications of these theories have shown that the assimilation (i.e., judgment) of a purchase price depends on the end points of the price distribution (Janiszewski and Lichtenstein 1999) and on the frequency distribution of prices (Niedrich, Sharma, and Wedell 2001).

Economists’ views of integration of previously acquired price information in forming price expectations are based on economic interactions between the buyer and the seller. For example, the “rational expectation” model (Muth 1961) suggests that consumers form expectations using the same decision rules that firms use. Therefore, the current price (set by firms) is an unbiased predictor of the price consumers expect to pay. Although several researchers in marketing have used this model to estimate reference price equations for FPPG, the empirical support of the rational expectation model is somewhat mixed (see Briesch et al. 1997; Jacobson and Obermiller 1990; Kalwani et al. 1990; Winer 1985, 1986).

The “adaptive expectation” model (Nerlove 1958) introduces a mechanism by which consumers can adjust their prior expectations on the basis of the discrepancy between the observed and the expected prices. A consumer’s expected price at time t can be expressed as follows:

$$(2) \quad IRP_t = IRP_{(t-1)} + \beta_{AE} [P_{(t-1)} - IRP_{(t-1)}].$$

Note the similarity between the adaptive expectation model and a model derived from assimilation–contrast theory. For a given difference between an observed price and IRP, the parameter β_{AE} can be viewed as an assimilation parameter. If the parameter is close to zero, consumers are unaffected by the difference between IRP and P , and a contrast is deemed to have occurred. Conversely, a high value of β_{AE} indicates that the observed price is assimilated. Note that by rearranging terms in Equation 3, we obtain the following:

$$(3) \quad IRP_t = \beta_{AE} \times P_{(t-1)} + (1 - \beta_{AE})IRP_{(t-1)}.$$

Therefore, consumers’ reference price is a weighted average of the last period’s reference price and observed price. This form of updating has been used extensively in both modeling-based and behavioral research on reference price.

Summary 4: Research on how previously encountered prices are integrated to form a reference price has produced the following results:

- Assimilation contrast theory and the adaptive expectation model seem to depict the process of integration of prior prices and contextual information accurately.
- Consumers update their reference prices (a) by weighting their existing reference price and the observed prices and (b) by factoring in a price trend observed from prior prices.

Store environment moderators. In addition to integrating previously encountered information (e.g., prices) temporally, consumers contemporaneously integrate contextual information available in the store environment to form IRP. One stream of research involving the contextual influences on IRP has been in the area of retailer-provided advertised reference point (ARP). In many product categories, retailers explicitly provide ARP at the point of purchase to encourage either competitive comparisons (e.g., “compare at”) or temporal comparisons (“was–now”) of the actual purchase price (Biswas and Blair 1991; Lichtenstein and Bearden 1989; Mayhew and Winer 1992). Researchers theorize that ARP is first assimilated into consumers’ IRP, which in turn influences purchase behavior or evaluations (e.g., Lichtenstein and Bearden 1989; Urbany, Bearden, and Weilbaker 1988). The assimilation process is captured in Equation 4:

$$(4) \quad IPR_t = \omega \times ARP_t + (1 - \omega) \times IRP_{t-1}.$$

The assumption is that a consumer enters a purchase environment with a prior IRP and adjusts it on the basis of the retailer’s ARP. The weight ω , $0 \leq \omega \leq 1$, signifies the extent to which the seller-provided ARP has an effect on consumers’ IRP. The ability of ARP to influence IRP is found to be affected by the plausibility of the ARP (Urbany, Bearden, and Weilbaker 1988), the difference between the ARP and the actual selling price (Kopalle and Lindsey-Mullikin 2003), and the semantic cues (e.g., was–now versus compare at) that retailers use to frame the sale (Lichtenstein, Burton, and Karson 1991). The literature on ARP is vast and has been reviewed and meta-analyzed in recent articles (see, e.g., Grewal, Monroe, and Krishnan 1998).

Bearden, Carlson, and Hardesty (2003) examine the effects of multiple ARPs for automobiles (e.g., dealer invoice price and manufacturer suggested retail price) on the judgment of an offer’s fairness; they find that invoice price is more likely to be assimilated than manufacturer suggested retail price. In an Internet auction context, the provision of a reserve price, compared with a minimum bid, has been shown to raise the average bid. When both reserve and minimum bid are provided, the reserve is found to have a greater effect on the final bid (Kamins, Dreze, and Folkes 2004).

In addition to ARP, the retail environment provides a variety of other external price stimuli (i.e., ERPs), which consumers integrate when forming a reference point. Rajendran and Tellis (1994) explicitly model a context-based reference price and, on the basis of model fit, conclude that consumers use the lowest price in the category as an ERP. Mayhew and Winer (1992) suggest that the retailer-provided “regular” price of a brand serves as its ERP. Hardie, Johnson, and Fader (1993) propose that the current price of the brand chosen on the previous purchase occasion is a relevant ERP.

Because a purchase environment typically provides a large amount of information, consumers must be selective in their choice of which pieces of externally available information they attend to and assimilate in their IRP. An important determinant of selectivity is the size of a consumer’s consideration set. Because consumers are expected to pay greater attention to the prices of brands they purchase more

frequently, Mazumdar and Papatla (1995, 2000) propose a model in which current prices are weighted by the respective shares of purchases devoted to a brand. Deal-sensitive consumers may also be selective by integrating prices of only those brands that are on sale (i.e., featured or displayed) during a purchase occasion (Bolton 1989). Recent studies have also shown that when a purchase environment does not contain diagnostic price information, consumers unknowingly integrate “incidental” price information (e.g., prices of completely unrelated products) (Nunes and Boatwright 2004).

Summary 5: The findings on the integration of information at the store environment are summarized as follows:

- Retailer-provided ARP that exceeds the selling price raises the consumer’s IRP, even when the ARP is deemed to be exaggerated. The effect of ARP on IRP is nonlinear; it has an inverted-U shape. A moderately discrepant ARP has a stronger impact on IRP than either very similar or very dissimilar (i.e., implausibly high) ARP.
- The use of semantics aimed at competitive comparison (i.e., compare at) is more effective in raising IRP than is the use of temporal comparisons (i.e., was–now). Cues that are distinctive in relation to the competition and have low consistency have stronger effects on IRP.
- In an automobile purchase context, the seller’s invoice cost information is more readily integrated into an IRP than is a manufacturer’s list price. In an Internet auction context, reserve prices are more readily integrated into an IRP than is a minimum bid.
- When faced with a large amount of externally available information, consumers are selective in deciding which pieces of contextually provided information are salient. Customers who are loyal to a few brands integrate prices of only the favorite brands, whereas switchers tend to integrate prices of promoted brands. In addition, lacking diagnostic information in the purchase environment, consumers unwittingly integrate readily available incidental and irrelevant price information.

Product category moderators. Other than the investigations of the assimilation of ARP, which sellers of durable products often provide, there is practically no research on how different pieces of information for durable products are integrated. We suggested previously that attribute differences are a significant predictor of IRP for durables. An important research question is how consumers integrate the attribute information in constructing an IRP as they sequentially evaluate attributes of different models of a durable product. For example, consumers who are interested in buying a personal computer may begin with a default option and then adjust their IRPs upward or downward as they consider either adding or subtracting attributes. Park, Jun, and MacInnis (2000) consider two default alternatives: a loaded model from which consumers subtract and a base model to which consumers add. They find that a loaded-model default yields higher prices paid and more optional attributes included as a result of insufficient adjustment

from the initial anchor. This finding can be extended in the context of reference price.

For services, a fertile area for further research is to investigate how the fixed and variable parts of a two-part service price are integrated (see P_1). Literature on partitioned pricing (e.g., Morwitz, Greenleaf, and Johnson 1998) suggests that consumers can use as an anchor either the fixed or the variable component and then insufficiently adjust for the other component of the price. Which of the two components of price serves as an initial anchor may depend on their relative magnitudes. In addition, when the fixed part serves as an anchor, the degree of adjustment of the variable part may depend on how frequently consumers pay the variable part and the magnitude of the variable portion when they do. The frequency effect may also be stronger than the magnitude effect because frequent payment of a moderate variable fee (in addition to the fixed fee) is more likely assimilated into IRP than rare occurrences of large magnitude.

- P_2 : (a) IRP for a durable product depends on the default option that serves as an initial anchor from which consumers insufficiently adjust their IRPs upward or downward on the basis of addition or deletion of product features, respectively. (b) In integrating the fixed and the variable part of two-part prices of services, consumers use either the fixed or the variable part as an anchor depending on their relative magnitude and then insufficiently adjust upward to account for the other part. Frequent payment of a moderate variable fee is more likely assimilated into IRP than are rare occurrences of large magnitude.

Mental Representations of Reference Price

Researchers typically assume that a reference price is stored in memory in a numeric form and at the brand or item level (e.g., a 64-ounce liquid Tide normally sells for approximately \$5). We now consider other forms and levels of IRP and discuss when these alternative representations may occur.

Numeric versus nonnumeric forms of IRP. Price standards may not always be stored in shoppers’ minds as “precise quantitative prices” (Dickson and Sawyer 1990, p. 51). Price information is also encoded in memory as price ranks (e.g., Tide is usually more expensive than Wisk) or as price beliefs (e.g., Wisk is frequently on sale). Mazumdar and Monroe (1990) show that when people acquire price information incidentally (rather than under directed learning), they are more accurate in recalling price ranks than in estimating numerical prices.

A better understanding of the alternative forms of IRP may require further investigation on at least two fronts. First, research should investigate how prices are encoded at different stages of a purchase process. For example, price encoding during the initial stages of information search may result in prices being encoded at a more sensory level without strong associations with other information. In later stages, consumers may integrate price with nonprice information, which leads to a more evaluative representation of price (e.g., a Kenmore dishwasher is a good value for the money). The second potential area of inquiry is how consumers extract meaning from numeric price information

(e.g., Schindler and Kirby 1997; Thomas and Morwitz 2005) or adaptively convert price evaluations (e.g., prices are “reasonable” in this restaurant) to numeric price estimates.

Levels of IRP. Although IRP is typically modeled at the brand level, reference price may also be represented in memory at more aggregate levels. We present a hierarchy of IRP levels and discuss the contexts in which IRP may be conceptualized at each of these levels. Economists have proposed a two-stage purchase process in which consumers first decide how much to budget for an expenditure category and then decide which item within that category to purchase (e.g., Deaton and Muellbauer 1980). Thus, a consumer may set spending limits that represent how much he or she wants to allocate to different expenditure categories (e.g., weekly grocery shopping, Christmas shopping, eating out). The spending limit or the mental budget may serve as a reference point for monitoring the actual spending (Heath and Soll 1996; Thaler 1980) and may also help time-constrained consumers simplify the task of price comparison.

The reference price may also be encoded at a product category level, and it may be an average of prices of different brands (Monroe 1973) or the price frequently charged in a category (Urbany and Dickson 1991). Consumers may retain a category-specific reference price in product classes with low variability in brand quality and price, because small differences across brands may not justify the cognitive burden of attending to and retaining price information for several brands in memory.

As we noted previously, IRP is typically conceptualized at the brand level. Indeed, a brand-specific model of IRP has been shown to provide the best fit for data in several grocery product categories (Briesch et al. 1997). Unlike a category-level IRP, the brand-specific IRP assumes that each brand has its own reference point. Substantively, this conceptualization of IRP implies that consumers are interested in capitalizing on price and quality or unit price differences across brands. Within the brand- and item-specific IRP, consumers may also retain separate reference points for promotional and regular prices.

P₃: (a) Consumers retain IRP in both numeric and evaluative forms. The form changes from a numeric form to a more evaluative form with repetitive purchase experiences. Consumers use the numeric structure (e.g., spatial location of digits) of price to form price evaluations or to derive numeric price estimates from evaluations. (b) The representations of IRP in memory are ordered at different levels of aggregation (i.e., spending level, product category level, and brand and item level). The level of aggregation in which IRP is represented depends on consumers’ assessments of the cost and benefits of detailed price comparisons at the brand and item level.

Section summary. A summary of what is known about the formation of reference price and what remains unresolved appears in Table 1. Additional research is necessary on how purchase occasions may moderate the IRP formation, how reference prices for services are formed, and how retail pricing strategies may shape consumers’ reference prices. Prior research has focused on the integration of information acquired over time and on integration of ARP

and other contextual information. More work is necessary to understand whether consumers retain reference points at more aggregate (e.g., spending, category) levels and whether reference price could be represented in memory in nonnumeric forms as well.

Retrieval and Use of IRP

We begin this section with a review of existing research on the moderating role of accessibility of IRP in memory in consumers’ relative use of IRP versus ERP. We then identify the research gaps, examine how different purchase tasks may influence the IRP retrieval process, and consider the biases in consumers’ price retrieval process.

Accessibility and Diagnosticity Moderators

The extent to which consumers use an IRP to make a purchase decision depends on the accessibility of price in memory (e.g., Biehal and Chakravarti 1983) and the perceived appropriateness of the remembered price versus the information available externally when making a price judgment (Feldman and Lynch 1988). To investigate the extent to which consumers use memory versus external information, researchers have used a hybrid (of IRP and ERP) model of reference price and have identified factors that determine the differential weights that consumers assign to memory versus external information. Supporting the accessibility–diagnosticity principle, consumers who devote their purchase share to only a few brands are found to use IRP (or temporal) more than ERP (or contextual) reference price (Mazumdar and Papatla 2000; Rajendran and Tellis 1994). Driven by their idiosyncratic preference for certain brands, these consumers do not consider contextual prices of other brands salient for price judgment, and therefore they tend to use their favorite brands’ prior prices as reference points. Moreover, being focused on only a few brands, these consumers can more readily remember prior prices of their favorite brands than consumers who tend to switch across a large number of different brands.

Mazumdar and Papatla (2000) also find that consumers who primarily buy during promotions tend to make greater use of external information. In addition, categories that are characterized by higher absolute price levels, shorter inter-purchase time, and more stable prices (i.e., less frequent promotions) are associated with greater use of memory than external information, and vice versa. Kumar, Karande, and Reinartz (1998) show that the relative use of IRP and ERP is also moderated by a household’s inventory position.

Summary 6: Research on the differential use of memory for prior prices versus externally available information has produced the following findings:

- Consumers use both memory and external information, but they assign weights to each that depend on consumer and product characteristics.
- The weight placed on memory (relative to external information) is related (a) negatively to the size of the consumer’s consideration set, (b) negatively to the frequency of purchases during promotions such as features and displays, (c) positively to the price level of the product cate-

TABLE 1
Formation of Reference Price: Summaries of Prior Research Findings and Further Research Opportunities

Research Areas	Extent of Research	Prior Findings and Further Research
Antecedents		
Purchase History	Extensive	Effects of prior prices, promotions, and recency of purchase are well established (Summary 1).
Contextual Moderators		
•Purchase occasion	Low	Further research: moderating effects of different shopping occasions (e.g., planned versus unplanned) on the roles of prior prices and promotions on IRP.
•Store environment	Moderate	Effects of depth, frequency, and framing of promotions on IRP have been demonstrated (Summary 2). Further research: effects of store pricing policy (hi-lo versus EDLP) on IRP.
•Product category	Durables: moderate	Effects of economic conditions, technology, and attribute configuration have been demonstrated (Summary 3). Further research: effects of input costs, externalities, and default options on IRP.
	Services: low	Further research: effects of pricing schemes (e.g., fixed, variable, two-part pricing) on IRP (P_1).
Integration		
Purchase History	Extensive	Temporal integration is captured well by the adaptive expectation model and assimilation–contrast theory (Summary 4).
Contextual Moderators		
•Store environment	Extensive	Effects of ARP on IRP, the weighting of contextual information, and the influence of irrelevant information are well established (Summary 5).
•Product category	Durables: low	Further research: investigating the anchoring effects of a default option and sequential addition/deletion of attributes on IRP for durables (P_{2a}).
	Services: low	Further research: investigating the integration of two-part prices of services (P_{2b}).
Representations	Low	Further research: identifying alternative forms (e.g., numeric versus nonnumeric) and levels (budget, category, brand/item) of IRP (P_3).

gory, (d) negatively to the increase of interpurchase time of the category, and (e) negatively to the frequency of promotions in the category.

Because prior research has focused on the retrieval and use of price in the context of brand choice, there is no known research on how IRP is retrieved in other types of purchase tasks. In addition, research on less effortful price retrieval and the factors that bias the retrieval process is somewhat sparse.

Purchase Task Moderator

Although the retrieval and use of IRP is relevant in many purchase contexts, we consider only two purchase tasks here: store selection decision and consideration set formation.⁴ The former task is performed outside of the store, and the latter may take place either in the store or out of the store.

Store choice decision. Deciding which store to visit depends on factors such as store location, assortment and quality of products, overall price level of the store, and

⁴These tasks are not independent. Items in the consideration set may influence the store choice decision, and vice versa. A brand choice task can be considered a special case of consideration set formation performed at the point of purchase. Other tasks for which price retrieval is necessary include purchase timing decisions.

prices of specific brands. As we noted previously, consumers retrieve store-specific reference prices to decide which store to visit. Because the retrieval of store prices depends on consumers' prior experience with the store, consumers are prone to draw a sample of prices of product categories (or brands) from memory that they are more familiar with and place greater weights on these prices in judging the overall store price levels. Moreover, the availability hypothesis (Tversky and Kahneman 1973) suggests that estimates of the probability that certain products will be on promotion depend on how easily the consumer can remember a previously encountered promotional episode. Thus, promotional frequencies may be over- or underestimated on the basis of what a consumer readily remembers about a prior purchase experience. When consumers make store choices (or switching) based on externally available price and promotional information (e.g., feature advertisements), they may evaluate the attractiveness of the sale price by comparing it with prices previously paid in the store or prices charged by competing stores. In either case, retrieval of prior and competitive prices is subject to the same set of previously discussed biases.

Consideration set formation. The decision to include certain items in the consideration set is influenced in large part by consumers' idiosyncratic preferences for specific brands and their prices. When the consumer forms a consid-

eration set before actually visiting the store, the decision to include or not to include a brand in the set is mostly memory based. If the consumer forms the consideration set at the store, the decision to include a brand involves a mixed task in which recalled prices serve as reference points to judge the observed price of the same and other brands. A research question that requires investigation is how consideration set size or the frequency of promotions of the brands within the set affects retrieval. When the consideration set size is small (e.g., due to strong brand loyalties), the consumer can recall the encoded prices more easily than when the set size is large. This is also the case when the brands in the consideration set are infrequently promoted and their prices are relatively stable over time (Mazumdar and Papatla 2000; Rajendran and Tellis 1994).

P₄: (a) In making a store choice decision, consumers retrieve store-specific reference prices as a basis for price comparison. However, the retrieval of store-specific reference prices may be biased as a result of erroneous sampling caused by relative familiarity with prices of different product categories and retail promotional strategies. (b) In consideration set formation, retrieval accuracy is moderated by the consideration set size and the frequency of promotions of the brands in the set.

Heuristics and Biases in Price Retrieval

Retrieval heuristics. In recent years, researchers have proposed retrieval processes that rely on simplifying heuristics (e.g., Schwarz and Vaughn 2000). Monroe and Lee (1999) argue that in many low-involvement purchases, price memory is implicit in that it serves as an input to performing a task successfully without the consumer being aware of the input information. Menon and Raghurir (2003) demonstrate that consumers use “ease of retrieval” as a heuristic to judge the appropriateness of the retrieved information, and the heuristic use occurs outside of awareness. Mere accessibility serves as an input to judgment even when the source of the information is discounted. Thus, factors that increase the ease of retrieval of previously encoded price information (e.g., small consideration set, dichotomous promoted/regular prices) will increase the likelihood of consumers using prior prices as IRP. In addition, as Menon and Raghurir (2003) note, if distant information is unexpectedly remembered, consumers may use the remembered information to make judgments.

Biases in price retrieval. We previously discussed how consumer perceptions of promotions may be distorted and how retrieval of store prices may be biased as a result of consumers’ prior experiences and store promotions. We now identify a few additional factors that may introduce biases in the retrieval of price. One such factor is the way the price is structured (e.g., product price, cost of delivery). Morwitz, Greenleaf, and Johnson (1998) argue that when the total price of a product is partitioned, consumers tend to allocate greater attention and processing resources to the product price, making it more memorable than the delivery cost component, thus resulting in retrieval biases. Specifically, this study shows that consumers tend to underestimate (i.e., recall a lower) total price more when the price is parti-

tioned than when prices are aggregated. This finding can be extended to two-part prices of services and product bundles that are composed of a core component and add-ons (Janiszewski and Cunha 2004).

Retrieval biases may also occur because of spatial locations of digits in price. Recent research has shown that consumers convert the digits of price into an analog magnitude scale, and the spatial locations of the digits in price determine the extent to which the digits are attended to and processed and, therefore, recollected and used in price judgments (Dehaene 1997; Thomas and Morwitz 2005). The retrieval of previously encoded prices may also be influenced by interference caused by multiple tasks. For example, a vacationer evaluating the online price of an airline ticket may be distracted by an advertisement that depicts a low-price offer for a hotel in the destination city. An important research question is how consumers handle dual (retrieval) tasks and whether certain characteristics of the interfering tasks actually help retrieval.

Biases may also occur when consumers use readily available nonprice information to infer IRP because prices are not accessible in memory. Prices can be inferred from product quality levels (Bettman, John, and Scott 1985) or distinctive product features (e.g., class, make, or trim level of an automobile) (Murray and Brown 2001). However, literature on intuitive covariation assessment in social psychology has shown that people often detect illusory relationships because of deeply entrenched beliefs, which results in biased inferences (Crocker 1981). Thus:

P₅: (a) In low-involvement purchase tasks, price memory (i.e., IRP) is implicit and is retrieved outside of awareness by invoking heuristics such as ease of retrieval. (b) Retrieval and use of IRP is biased because of partitioning of price (i.e., consumer’s cost), spatial positions of the digits in price, and task interferences. (c) Consumers may infer IRPs of a brand based on available nonprice information. However, the inference may be biased as a result of consumers’ prior beliefs about the relationship between price and these nonprice attributes.

Section summary. Research on the accessibility–diagnosticity moderators of the relative use of IRP and ERP is fairly extensive (Summary 6). However, more research on how IRP is retrieved from memory under different task contingencies is necessary. We consider store choice and consideration set formation and relate these tasks to certain types of price encoding that are activated in memory (P₄). We also identify several variables that may influence and bias the retrieval process (P₅).

Effects of Reference Price

Research using panel data has focused mainly on reference price effects on consumer brand choice decisions and, to a lesser extent, on purchase quantity and purchase-timing decisions. The behavioral stream has studied the effects of reference price on constructs such as perceived value of the offer, intentions to search for lower prices, and purchase intention (for a review, see Grewal, Monroe, and Krishnan 1998).

Consumer Brand Choice Decision

Increased availability of individual-level panel data spurred a flurry of research activity on reference price effects on consumer brand choice decisions. A summary of this research stream appears in Table 2. Because reference price is unobserved, its effect is typically inferred by comparing the fit of a brand choice model that contains no reference price with that of a model that incorporates a reference price term. The utility specification of the baseline model (Equation 5 in Table 2) contains the usual price and promotional variables, consumer preference, and brand loyalty (Guadagni and Little 1983).

Symmetric “sticker shock” effect. Winer (1986) was the first to propose a “sticker shock” model of reference price, which includes an additional term that captures the difference between the brand’s reference price and its purchase price (Equation 6 in Table 2). The assumption is that a positive difference between the reference price and the purchase price increases the utility of the item, and a negative difference lowers it. However, responsiveness to a positive difference is assumed to be the same as that to an equal negative difference.

As we show in Table 2, several researchers have used this particular specification and found that the model outperforms the baseline model, thus making the sticker shock effect of reference price empirically generalizable (Kalyanaram and Winer 1995). However, Lattin and Bucklin (1989) find that the inclusion of a similar reference effect of promotion (i.e., actual versus expected promotion) makes the symmetric reference price effect not significant. Bell and Lattin (2000) find that after they account for heterogeneity in price sensitivities, the sticker shock effect is somewhat reduced, but it remains significant. Chang, Sirdarth, and Weinberg (1999) find that the sticker shock effect in brand choice disappears when the heterogeneity of consumers’ purchase timings is taken into account.

Asymmetric reference price effect. According to prospect theory (Kahneman and Tversky 1979; Thaler 1985), when an observed price is higher (lower) than the reference price, consumers encode it as a loss (gain). Loss aversion dictates that consumers are more sensitive to losses than to gains. The asymmetric utility function appears in Equation 7 in Table 2. This table shows that the evidence of loss aversion is mixed. When consumers are segmented on the basis of their brand preferences (or loyalties) or their price sensitivities, either the loss aversion effect is reduced or it disappears (Bell and Lattin 2000; Krishnamurthi, Mazumdar, and Raj 1992; Mazumdar and Papatla 1995).

Purchase Quantity Decisions

Krishnamurthi, Mazumdar, and Raj (1992) empirically investigate the reference price effects on purchase quantity decisions in frequently purchased product categories. The study finds a significant effect of reference price, but the effect is mediated by consumer brand loyalty and household inventory levels. When household inventory reaches a stock-out level, brand-loyal consumers are found to be more sensitive to perceived gains than to losses when shopping for their favorite brands. However, brand-loyal consumers

are more sensitive to losses when the purchase quantity decision is made before the stock-out. No such difference is found for the switcher segments.

Purchase-Timing Decisions

Bell and Bucklin (1999) consider how reference price affects purchase timing. Using Loewenstein’s (1988) framework of intertemporal choice, Bell and Bucklin posit that at every purchase occasion, consumers compare the relative attractiveness of buying into a category with the prospect of postponing the purchase. Thus, expected category attractiveness acts as the benchmark and is assumed to be a function of individual background factors (e.g., inventory) and marketing-mix variables (e.g., promotions). The study finds that during a given shopping visit, the purchase postponement that results from a perceived loss (i.e., negative difference between actual category value and the reference category value) significantly exceeds the purchase acceleration that takes place when a gain is perceived.

Summary 7: (a) The symmetric sticker shock effect of reference price on brand choice is empirically generalizable. However, the evidence for loss aversion is mixed. (b) The effect of reference price on purchase quantity is mediated by household inventory position and brand loyalty. (c) Reference price has a significant effect on consumers’ purchase-timing decisions, in which they evaluate the “attractiveness” for buying into a category now or later.

Although there is considerable research demonstrating reference price effect on brand choice decisions, little is known about how reference price affects store choice decisions and consideration set formation. The relevant questions here are, What are the likely decision sequences? Are the antecedents that are identified in brand choice models still relevant here? If not, what additional factors might be relevant? and How might these factors interact with reference price? Further research should also investigate (1) the role of reference prices in services and durable goods purchase decisions and (2) the effects of reference price in other evaluations and attributions.

Service and Durable Purchases

Research on the reference price effects on purchase quantity can be extended to include service quantity (i.e., usage) decisions as well. Prior research has found that the actual usage depends on consumers’ price expectations and satisfaction with the overall payment equity (Bolton and Lemon 1999). Further research might also investigate the reference price effects on service quantity decisions under different pricing policies that are postulated to shape consumers’ price expectations (P_1). The methodological challenge here is that reference price formation may not be exogenous to usage expectation and prior usage level.

Purchase timing is a critical decision for most durable product purchases. A fertile area for further research is to investigate reference price effects on durable goods purchase timing. In the past, researchers have used a conditional hazard function approach to investigate timing of frequently purchased products (Jain and Vilcassim 1991).

TABLE 2
Modeling-Based Research on the Effects of Reference Price on Brand Choice

Models	Utility Specifications	Sample Studies	Effects Studied	Product Categories	Special Features	Results
Baseline	(5) $U_{iHt} = \beta_{0,i} + \beta_p \times Price_{iHt} + \beta_{Prom} \times Prom_{iHt} + \beta_{Loy} \times Loyalty_{iHt} + \epsilon_{iHt}$	Guadagni and Little (1983)	No reference price effect			
Symmetric sticker shock model	(6) $U_{iHt} = \beta_{0,i} + \beta_p \times Price_{iHt} + \beta_{Prom} \times Prom_{iHt} + \beta_{Loy} \times Loyalty_{iHt} + \beta_{ref}(RP_{iHt} - Price_{iHt}) + \epsilon_{iHt}$	Winer (1986) Lattin and Bucklin (1989)	Sticker shock Sticker shock and reference promotions	Coffee (three brands) Ground coffee (ten stockkeeping units)	Multiple price expectation models. Includes promotion expectation term.	Significant sticker shock effect for two brands. Reference price is not significant in the presence of promotion effect.
		Mayhew and Winer (1992)	Sticker shock	Yogurt	Multiple reference price (IRP and ERP).	Both IRP and ERP effects are significant.
		Rajendran and Tellis (1994)	Sticker shock	Salted and unsalted saltine crackers	Multiple reference prices.	Significant sticker shock effects when ERP is included.
		Krishnamurthi, Mazumdar, and Raj (1992)	Sticker shock	Ground coffee and an undisclosed category	Consumers segmented on the basis of brand loyalty; brand-specific effects.	Significant sticker shock effect for both loyals and switchers.
		Chang, Siddarth, and Weinberg (1999)	Sticker shock	Yogurt, ketchup	Purchase-timing heterogeneity accounted for.	Sticker shock effect is not significant.
		Bell and Lattin (2000)	Sticker shock	Orange juice, bacon, butter, margarine, crackers, sugar, paper towel, ice cream, detergent, hot dogs, tissue, soft drinks	Price-sensitivity heterogeneity accounted for.	Sticker shock effect is significant in 10 of 12 categories.
Asymmetric reference price model	(7) $U_{iHt} = \beta_{0,i} + \beta_p \times Price_{iHt} + \beta_{Prom} \times Prom_{iHt} + \beta_{Loy} \times Loyalty_{iHt} + L_i \beta_L (Price_{iHt} - RP_{iHt}) + G_i \beta_G (RP_{iHt} - Price_{iHt}) + \epsilon_{iHt}$	Kalwani et al. (1990) Krishnamurthi, Mazumdar, and Raj (1992)	Loss aversion Loss aversion	Ground coffee Ground coffee and another undisclosed category	Reference price is separately modeled. Consumers segmented on the basis of brand loyalty; brand-specific effects.	Loss aversion is supported. Loss aversion is supported for one of six brands.

where
 $L_i = 1$ if $Price_{iHt} > RP_{iHt}$;
 0 otherwise;
 $G_i = 1$ if $Price_{iHt} < RP_{iHt}$;
 0 otherwise.

TABLE 2
Continued

Models	Utility Specifications	Sample Studies	Effects Studied	Product Categories	Special Features	Results
		Hardie, Johnson, and Fader (1993)	Loss aversion in price and quality	Refrigerated orange juice	Reference price is a current price of a previously chosen brand.	Loss aversion for both price and quality is supported. However, quality loss is greater than price loss.
		Kalyanaram and Little (1994)	Latitude of price acceptance, loss aversion	Sweetened and unsweetened drinks	Zone of indifference around the reference price.	Latitude is supported; loss aversion is supported.
		Mazumdar and Papatia (1995)	Loyalty-based segmentation of IRP and ERP use	Margarine, liquid detergent	Estimate brand loyalty threshold to assign to IRP or ERP segment.	Brand loyalty influences IRP or ERP use. Loss aversion is not supported in either segment.
		Briesch et al. (1997)	Identify the best-fitting reference price model	Peanut butter, liquid detergent, tissue, coffee	Heterogeneity accounted for.	Brand-specific IRP provides the best fit for the data. Loss aversion is not supported in the any of the four categories.
		Mazumdar and Papatia (2000)	IRP- and ERP-based segmentation	Liquid detergent, ketchup, tissue, yogurt	Use of mixture model to segment consumers.	Consumers are found to be segmented on the basis of IRP and ERP use. Loss aversion is present in only one segment in each category.
		Bell and Lattin (2000)	Loss aversion	See previous Bell and Lattin (2000) entry	Preference and price sensitivity accounted for.	No evidence of loss aversion.
		Erdem, Mayhew, and Sun (2001)	Consumer heterogeneity in gain and loss responsiveness	Ketchup, peanut butter, tuna	Considers cross-category correlations and accounts for consumer heterogeneity.	Loss sensitivity is heterogeneous; reference price effects are correlated with other sensitivities.

Research could use similar methodologies in which the reference price term and other variables of interest are included as covariates.

Evaluations and Attributions

Brand extensions and brand equity. Aside from the effects on purchase decisions, reference price may also influence evaluations of brand extensions. Jun, MacInnis, and Park (2003) demonstrate that consumers' price expectations of a brand extension are affected by the price of the parent brand, and the effect is moderated by the parent brand's relative price in the parent category and the dispersion in prices in the extension category. The parent brand's prices may also evoke quality associations and influence expectation of quality of the brand extension. Reference price may also moderate the effects of frequent promotions on the long-term negative impact on brand equity (Jedidi, Mela, and Gupta 1999).

Attributions. Nonpurchase influences of reference price include consumers' attributions of fairness of the price that a seller charges and imputation of the seller's motives behind raising or lowering prices. Urbany, Madden, and Dickson (1989) find that consumers appear more ready to accept price increases when sellers provide explicit cost justifications. Campbell (1999) demonstrates that people are more likely to judge the increased price as unfair when they infer that the seller is attempting to earn greater-than-normal profits. However, the seller's reputation moderates this effect. Consumers accord the benefit of the doubt to more reputable sellers. Xia, Monroe, and Cox (2004) propose that perceived unfairness of a price results in lower value perception and evokes negative emotions, which may result in behavioral responses such as withdrawing from a purchase, spreading negative word of mouth, and even engaging in legal actions. This stream of literature can be extended to further study whether reference prices influence other inferences, including consumers' perceptions of sellers' deceptive practices.

Section summary. The research on reference price effect on consumer brand choice decisions is extensive. There is also evidence of effects on purchase quantity and category purchase. The purchase quantity effects should be extended to service usage, and purchase-timing effects need to be tested in the context of durable purchases. The role of reference price on other purchase decisions, such as store choice and consideration set formation, should also be examined. In addition, research is needed to understand how reference prices may influence evaluations of brand extensions and brand equity.

Methodological Challenges

Because IRP is a latent construct, its inferred existence and effects are inevitably open to questions about the appropriateness of methodologies used to model the construct and measure these effects. One such question is directed at the stream of research that uses panel data to infer reference price effects, and it is related to the role of customers' (cross-sectional) heterogeneity confounding the reference price effects. There are also questions about the effects of

reference price overlapping with the effects of other price-related constructs.

Confounding Effects of Customer Heterogeneity

When assessing reference price effects, researchers model reference price using temporal data (e.g., prior prices paid, promotions, stores visited), which differ across consumers because of differences in price sensitivities, brand preferences, loyalties, and purchase timing. The reference price effects are estimated by pooling cross-sectional purchase history data for all households. This approach introduces potential confounding effects that arise from customers' heterogeneity in their price sensitivities (Bell and Lattin 2000) and, thus, in their purchase timings (Chang, Siddarth, and Weinberg 1999).

Heterogeneity and loss aversion. Bell and Lattin (2000) contend that price sensitive (insensitive) consumers have lower (higher) reference points because, on average, they pay a lower (higher) price. Therefore, these consumers experience more losses (gains) in their purchase histories. Thus, the inferred loss aversion in the results may simply be due to the cross-sectional heterogeneity in price sensitivities rather than to the same consumer exhibiting a greater sensitivity to losses than to gains. In addressing the heterogeneity issue, Bell and Lattin (2000) consider both common (occasion-specific) and brand-specific reference price formulations (note that the latter permits each brand to have its own reference price and therefore is less correlated with price sensitivity) and use a mixture model (Kamakura and Russell 1989) to account for heterogeneity in not only price sensitivity but also preference. They find that ignoring heterogeneity in price sensitivities significantly overstates the loss aversion parameter, but it remains significant in the refrigerated orange juice category. The study includes additional product categories, and in all 11 categories, the loss aversion parameters in multisegment models are smaller than those in single-segment models (i.e., no heterogeneity) and are significant in only 6 of the 11 categories. Other studies that have accounted for heterogeneity also find that the loss aversion phenomenon is attenuated, and in some cases, the gain parameters are greater than the absolute values of loss parameters (e.g., Krishnamurthi, Mazumdar, and Raj 1992; Mazumdar and Papatla 2000).

Heterogeneity and symmetric sticker shock effect. The sticker shock model assumes that the responsiveness to gains is the same as the responsiveness to losses. Bell and Lattin (2000) report significant sticker shock effect in 10 of 12 categories after accounting for consumer heterogeneity in price responsiveness. Briesch and colleagues (1997) use a latent class mixture model to account for heterogeneity and find that the symmetric reference price model fits better in all four categories. Krishnamurthi, Mazumdar, and Raj (1992) carry out a priori segmentation of consumers into loyals and switchers and allow for each brand to have its own price and sticker shock parameters. This study shows that for all six brands in two product categories, the symmetric reference price model performs significantly better than the model that does not include a sticker shock term.

Chang, Siddarth, and Weinberg (1999) consider purchase-timing heterogeneity in which price sensitive con-

sumers time their purchases to capitalize on lower prices and, thus, have a lower reference price than consumers who do not. Using simulated data, the authors find that when purchase timing and price responsiveness heterogeneities are not accounted for, there is a significant upward bias in the reference price estimate. Although the existence of purchase-timing heterogeneity is found to be sufficient for the bias to occur, the price responsiveness heterogeneity alone is not sufficient (i.e., the range of price sensitivities must be beyond what is observed in prior research) for the bias to be significant.

Note that reference price effects may manifest in brand choice (e.g., switching) and in purchase timing (e.g., purchase postponement or acceleration). Studies that use choice data account for heterogeneity in price sensitivities and brand preference, conditional on the models being estimated only on choice data (Bell and Lattin 2000; Briesch et al. 1997). As we noted previously, these studies find that the loss aversion effect of reference price is significantly attenuated, but the symmetric reference price effect remains significant. Bell and Bucklin (1999) focus exclusively on purchase timing and find a significant reference price effect in consumers' decision to buy now or later. Thus, if purchase timing is explicitly included in the model and if consumers exhibit a propensity to delay a purchase to avoid a loss and to accelerate a purchase to capitalize on a gain, the reference price effect in brand choice should be reduced or even disappear (e.g., Chang, Siddarth, and Weinberg 1999).

Summary 8: The confounding roles of consumer heterogeneity in the estimation of loss aversion and sticker shock effects are as follows:

- The loss aversion effect in brand choice models is significantly attenuated (and may even disappear) when consumer price response heterogeneity is considered.
- Accounting for heterogeneity in consumer price sensitivities reduces the sticker shock effect in brand choice models, but the effect remains significant.
- When reference price effect is present in purchase timing, ignoring purchase-timing heterogeneity overstates the reference price effects (both loss aversion and sticker shock) in brand choice.

Given the confounding effects of consumer heterogeneity found in these studies, two research issues must be resolved. The first issue is whether the effect proposed by prospect theory is indeed present in frequently purchased grocery product categories. Because the attenuating effect of heterogeneity has been demonstrated in many product categories, adding more product categories to verify the existence of the loss aversion phenomenon may not be fruitful. Instead, the answer may lie in the design of controlled experiments similar to that of Kalwani and Yim (1992) that can experimentally induce the reference points, verify their existence through manipulation checks, and assess whether people exhibit loss aversion in their choice decisions.

Second, reference price research that uses panel data requires a comprehensive assessment of the role of heterogeneity in the estimation of not only the loss aversion effect but also the symmetric reference price effect. It is important

to identify the different sources of individual-level heterogeneity, such as price responsiveness, purchase timing, and brand preference. In addition, a comprehensive study should use multiple methods to account for heterogeneity. These methods could range from a priori classification of segments (e.g., loyalists versus switchers) to more rigorous statistical procedures, such as random coefficient models or latent class mixture models. The random coefficient model should permit different assumptions about variables that are susceptible to heterogeneity and their distributional characteristics.

Overlapping Constructs

In addition to cross-sectional heterogeneity confounding the reference price effect, there is also a question of overlap between the reference price construct and other price-related constructs, such as price and promotion sensitivities. Erdem, Mayhew, and Sun (2001) find that the reference price effects for both gains and losses are significantly correlated with consumer sensitivities to price, promotions (i.e., features and displays), and brand loyalty both within and across categories. Although the authors conclude (p. 451) that "reference price sensitivity is distinct from other sensitivities," it would be useful to investigate further the causal links among price and promotional sensitivities, brand loyalties, and reference price effects.

Discussion and Conclusion

We provide an assessment of our current understanding of (1) how reference prices are formed, (2) how reference prices are retrieved and used, and (3) the effects of reference price. We offer summaries of prior findings and an agenda for further research, which includes a set of propositions. We also provide a critical assessment of the role of customer heterogeneity, which has raised questions about the validity of reference price effects found in modeling-based research. In this section, we discuss the alternative domains of the reference price construct and briefly review the normative models that have incorporated reference price into the demand function to draw managerial implications.

Domains of Reference Price Construct

In this review, we conceptualized reference price as price expectation, which is based on consumers' memory or contextual information. However, justifications of the reference price construct are also drawn from other theoretical domains that conceptualize reference points as normative and aspirational. A normative reference price may be the price that consumers consider fair or just (Bolton and Lemon 1999; Campbell 1999; Kahneman, Knetsch, and Thaler 1986). The judgment of fairness is determined not only by prior and competitive prices but also by consumers' assessment of the seller's cost and what is deemed to be a normal profit (Bolton, Warlop, and Alba 2003; Thaler 1985). The dual entitlement principle (Kahneman, Knetsch, and Thaler 1986) suggests that manufacturers are expected to abide by community standards of cost and profit, and consumers "punish" errant sellers that stray from these norms. Xia, Monroe, and Cox (2004) have developed a con-

ceptual framework for the price fairness construct that identifies the key factors influencing consumer price fairness and outcomes of perceived unfairness.

Aspiration-based adaptation levels have been conceptualized in organizational research (Cyert and March 1963). The level at which an organization aspires to perform depends on its prior aspirations, discrepancies between the aspired and actual performance, and how performance compares with that of others in the group (Mezias, Chen, and Murphy 2002). This view is also consistent with the social comparison theory, which postulates that entitlements received by an individual are compared with those received by others in the group (Major and Testa 1989). In a pricing context, aspirational reference price is therefore a function of not only the usual prior and contextual prices but also what others in a social group pay for the same or similar products. If someone pays a low price, the aspiration level of others in the social group is also adjusted downward, and vice versa.

The existence of multiple conceptualizations of reference price raises the question whether there are certain conditions under which one type of reference price is more likely to be evoked than others. We propose that the relative propensity to use one of the three types of reference price (i.e., expectation based, normative, and aspirational) is a function of (1) temporal stability or predictability of prices, (2) level of competition within a category, (3) price transparency, and (4) the extent to which a consumer is locked in to the consumption category. An expectation-based reference price is likely to be used in product categories that are characterized by a high level of competition (i.e., many alternatives), relatively stable prices over time, and transparent pricing. However, a fair or just price benchmark is likely to be evoked when a category is monopolistic or contains few competitors, when prices charged by competing firms lack transparency, and when consumers are locked in to the category because of either the essential nature of the product (e.g., medicine, gasoline) or long-term contracts. Finally, when firms use discriminatory pricing that lacks transparency (e.g., airline pricing, negotiated pricing), which causes significant variation in prices paid across consumers, aspirational benchmarks are likely to be evoked. All three conceptualizations of reference price may come into play in any given decision, though the specific factors or contexts we previously noted are likely to determine which reference price concept becomes more dominant.

Managerial Implications of Reference Price

A limitation of our framework is that it is not suitable to assess the profit-maximizing implications at the firm level explicitly. Therefore, it is useful to review selected studies that have developed analytical models to assess the profit implications for firms when reference price is included in the consumer demand function. Greenleaf (1995) shows that reference price effects can increase profits on promotions, and he demonstrates how a retailer can develop an optimal strategy for repeated promotions over time that maximizes profits from such effects. The study shows that in the presence of reference price effects, the optimal strat-

egy of a monopolist is to institute a cyclical (high–low) pricing policy. Kopalle, Rao, and Assunção (1996) generalize this result to an oligopoly while considering customer heterogeneity in both reference price formation and differential weighting of gains and losses. They show that when heterogeneity has been accounted for, cyclical pricing policies are optimal. However, if the market consists only of loss-averse buyers, the optimal strategy is a constant price.

These findings suggest that reference price should be an important component of managerial decisions about pricing and promotional strategies. There is a growing interest in assessing the impacts of price promotions on category demand (Nijs et al. 2001), the long-term profitability of firms, and brand equity (Dekimpe and Hanssens 1995; Jedidi, Mela, and Gupta 1999). This stream of research can be augmented by incorporating reference price effects in the assessment of the impacts of promotions on long-term category expansion (or contraction) and profitability and the usual short-term effects.

In addition to the normative prescriptions, this review presents summaries and propositions that may offer useful managerial insights into the roles of reference price in consumer purchase decisions in different product categories. For example, this review proposes that attribute configurations of the default option influence the formation of IRP. In many online (e.g., computer) and in-store (e.g., automobile) purchases, firms can present a default option to create an initial anchor and control the sequence of subsequent additions or deletions of attributes. Likewise, firms can invoke consumer interest in a product bundle by framing a low price for the core component (e.g., central processing unit) that serves as an initial anchor for evaluating bundles.

For services, we propose that the pricing scheme (i.e., fixed, variable, or two-part) should significantly influence consumers' IRP, which in turn might influence consumers' usage of the service. A high fixed fee may encourage consumers to increase usage of a service so that it justifies the fee, whereas a variable fee may discourage heavy usage of the service. Firms (e.g., electronic retailers) may capitalize on the increased usage by advertising and cross-selling products to generate additional revenue. Conversely, firms (e.g., utilities) that want to discourage usage may inform users when their usage has exceeded their norms. Some of these propositions may also be useful in the development of normative models for services, in which IRP is a function of different pricing schemes and is included in the demand function. Profitability of a pricing scheme can be assessed under different cost structures and capacity constraints.

With respect to pricing and promotional strategies, many sellers routinely provide ARP to influence consumers' reference points. In addition, as we note in the review, a retailer can frame a selling price relative to the cost either by directly providing the cost information (e.g., invoice price) or by influencing consumers' perceptions of the retailer's cost (e.g., rollback prices). Our review also offers managerial guidance on how EDLP and hi–lo stores may compete. An EDLP strategy creates a favorable store-level reference point. Nevertheless, a hi–lo store can achieve a competitive advantage if it selects certain product categories in which it regularly offers deep and dichoto-

mous discounts. The goal here is to create a stable and accessible memory for low prices.

The type of reference price a consumer uses and the effect of the reference price have been shown to vary across consumers, creating an opportunity for segmenting and targeting consumers on the basis of reference price. Consumers can initially be divided into a reference price segment and a non-reference price segment and then can be characterized by behavioral (e.g., price and promotion sensitivity, brand loyalty) and sociodemographic factors (Arora, Kopalle, and Kannan 2001; Erdem, Mayhew, and Sun 2001). Reference price consumers can be further segmented into an IRP and an ERP segment (Kumar, Karande, and Reinartz 1998; Mazumdar and Papatla 2000; Moon and Russell 2004). Because different reference price segments use different referents, firms should use appropriate strategies to target each segment. A was-now framing is likely to

be effective for an IRP segment, whereas a compare-at framing is more suited for ERP users who construct reference points at the point of purchase.

Finally, we propose an expanded view of reference price that includes more aggregate levels of conceptualization, such as spending levels and product category-level IRP. If consumers set a spending limit as a reference point for a purchase task (e.g., family vacation), a strategy that asserts that the total spending will be below the limit is likely to be more effective than a strategy that focuses on prices of a specific component of the purchase. In addition, consumers may also retain IRP in nonnumeric forms. An understanding of the different representations of IRP is significant because price communication messages must be consistent with these representations. Simply advertising a low price may not convey the notion that it represents a good value for the money.

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