Antecedents to consumer reference price orientation: an exploratory investigation

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Abstract
Purpose – This research paper aims to examine the relationships among the factors associated with changing shopping environment, consumer knowledge and reference price.
Design/methodology/ approach – A self administered online survey was used to collect data (final sample size was 265). After checking for non-response bias, data was factor analyzed and checked for reliability and validity. Hypotheses were tested using structural Equation Modeling procedure.
Findings – Product search opportunity is associated with product and price knowledge. Price volatility is negatively associated with internal reference price. Further, consumers' price comparison propensity and price knowledge positively influence external reference price. Finally, price volatility has a significant negative influence on consumer knowledge and IRP orientation.
Research limitations/implications – The sampling frame is a major limitation, in addition to not including variables such as product type and other measures of price volatility. Future research should expand the sampling frame and include other variables as well as other aspects of price volatility.
Practical implications – These findings provide insights into advertised price claims in the information rich internet age. Managers also benefit from the finding that the internet, particularly price comparison, influences external reference price. Consequently, managers must be cautious with their advertised price claims and not exaggerate the value of offerings or cost savings too much.
Originality/value – This topic is important because retailers extensively use reference price or price comparison to increase consumers' perception of the product value. However, not much research attention has been given to this topic.

Keywords Prices, Consumer behaviour, Product specification, Pricing policy, Shopping

Paper type Research paper

The concept of reference price is well established in the marketing literature and has received considerable research attention (see Biswas *et al.*, 1999; Burman and Biswas, 2004; Erdem *et al.*, 2001; Garbarino and Slonim, 2003; Grewal *et al.*, 1998a; Kalyanram and Winer, 1995; Mazumdar and Papatla, 2000; Monroe, 1976; Monroe and Lee, 1999). Reference price has been defined as the standard against which consumers evaluate the actual price of products they are considering (Rosch, 1975). To successfully compete in today's value-conscious environment, sellers must somehow establish the value of their offers as superior to others (Grewal *et al.*, 1998a). One strategy used by marketers is to increase consumers' perception of the product value through reference price or price comparison (Alvarez and Casielles, 2005; Compeau *et al.*, 2002; Miranda, 2001). For example, sellers can help establish a reference price by comparing a lower selling price to a higher advertised reference price, e.g. was \$200, now \$150, or retail value \$10, our price \$7.5 (Grewal *et al.*, 1998a). Popularity of this strategy is evidenced by the fact that price promotion represents a major component of marketing strategy for retail firms, with firms spending approximately \$5 billion annually to advertise some form of price promotion (Friedman and Haynes, 1990). However, despite the research focus, our understanding of the factors determining reference price is less than adequate (Monroe and Lee, 1999) especially in today's internet based information rich environment. This study will investigate the relationship between market driven factors (i.e. price volatility, opportunity to compare prices and search for products), consumer assessment of their own knowledge, and their orientation towards reference price. This is particularly interesting because of the question raised by Mazumdar and Papatla (2000) that the usage of internal reference price (IRP) and external reference price (ERP) may not be exclusive or unambiguous.

Several studies have approached the topic of reference price from very divergent perspectives. Although research has shown that consumers tend to discount advertised price claims (Monroe and Lee, 1999), many studies indicate that comparative price claims, including implausible or exaggerated reference claims, still influence consumers' perception of value and behavioral intention (Biswas and Blair, 1991; Grewal *et al.*, 1996; Licata *et al.*, 1998; Lichtenstein and Bearden, 1989; Lichtenstein *et al.*, 1991; Urbany *et al.*, 1988). Extant literature also suggests that reference price could be visualized as consisting of two types

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based on the location of information about the price – i.e. internal and external (Mazumdar and Papatla, 2000).

Previous studies have primarily focused on the types of reference price (internal or eternal) and the factors that influence reference price such as consumer characteristics and consumer knowledge. With the emergence of the internet, consumers have gained unprecedented access to vast amounts of information (see Alba *et al.*, 1997; Rohm and Swaminathan, 2004). Now consumers have a new and convenient way of acquiring information and knowledge. Since the formation of reference price to a great degree depends on consumers' awareness of information about products and their prices (Chandrashekaran and Grewal, 2001; Grewal *et al.*, 1998a; Vanhuele and Drèze, 2002), we speculate that this new found information source will exert a significant influence on how consumers form reference price.

This study will advance the knowledge of reference price in a number of ways. First, to the best of our knowledge, there is still no direct investigation of how market characteristics and consumer knowledge influences the formation of reference price, especially within today's context dominated by a powerful information search tool like the Internet. This study will provide empirical support for the assumption that consumer knowledge influences reference price. Second, we adopt the perspective that the reference price can be divided into two types (i.e. internal and external reference price). Towards this goal, we first discuss the changing shopping environment such as internet that are relevant for reference price formation then discuss the concept of consumer knowledge and reference price before presenting our hypotheses. This is followed by the research method and analyses sections. Finally, we present a discussion of our results followed by managerial and future research implications, and limitations of this study.

Changing consumer shopping environment

The shopping environment faced by shoppers has seen some very dramatic changes in the recent past and a key driver to these changes is the emergence of internet. In the context of reference price, internet has three important features that influence consumers' perception and formation of reference price. The first and most important feature is that Internet offers an easy opportunity for price comparison (see Burke, 2002; Evanschitzky *et al.*, 2004; Lee and Overby, 2004; Rohm and Swaminathan, 2004) and when consumers avail of this opportunity, it helps set and reset their reference price. The nature of reference price is price comparison. Thus when consumers can easily compare prices on the Internet it has direct impact on their reference price. Consumers now can choose from a large number of comparison shopping agents. Yahoo lists ten comparison shopping agents that focus primarily on books such as Bestbuybook.com, Dealpilot.com and Addall.com. Consumers can also choose from a wide range of comparison shopping agents that focus on goods, such as mysimon.com and pricescan.com. The rise of comparison shopping agents is forcing internet retailers to set the price of mass produced physical goods equal to cost or on par with others (Clay *et al.*, 2002). Lynch and Ariely (2000) also found that lower search cost of the internet can increase price sensitivity. Hardesty and Suter (2005) found that internet or online retail phenomenon seem to impact consumer reference price in a significant manner. They found that brick and mortar reference prices seem to have a greater effect on consumer perception than on-line prices, and that consumers expect to pay a lower price on internet. Based on these findings we argue that this increased opportunity for price comparison is likely to result in consumers engaging in price comparison more often (see Rohm and Swaminathan, 2004; Wind and Mahajan, 2002), especially because of its ease.

The second feature is product search opportunity (see Burke, 2002; Evanschitzky *et al.*, 2004; Lee and Overby, 2004; Rohm and Swaminathan, 2004). Many consumers use the internet to acquire not only price but also product related information. Web sites such as Auto Vantage.com, AutoWeb.com and Carpoint.com do not sell or deliver cars, but shift much of the consumer search, comparison, and decision-making connected with auto purchase from the physical platform of the traditional dealer to the virtual world of the web (Kannan and Kopalle, 2001). Today's consumers are savvy enough and switch between cyber environment and traditional shopping environment to get the best of both worlds. That is, they posses characteristics of both cyber customers and traditional customers. They may search product information online but may purchase in the storefront or vice versa (Wind and Mahajan, 2002).

The third feature is price volatility (see Burke, 2002; Evanschitzky *et al.*, 2004; Grewal *et al.*, 1998a; Lee and Overby, 2004; Rohm and Swaminathan, 2004). Almost all consumer products that are sold at posted prices in conventional channels are also sold at posted prices on the Internet. However, the prices are changed more frequently on the Internet, than in the conventional channel environment (Brynjolfsson and Smith, 2000). In addition, the range (or dispersion) of prices may also be high especially across online and conventional stores (Burman and Biswas, 2004; Hardesty and Suter, 2005; Vanhuele and Drèze, 2002). In this study we focus on the dynamism (i.e. frequency of change) aspect of volatility. Kannan and Kopalle (2001) in an empirical study of prices of popular titles at online stores found that the posted prices of some books changed several times a day and the posted prices of others daily. The ever-changing price may cause confusion among consumers. Vanhuele and Drèze (2002) notice that if a product category has many different items and volatile prices it will be more difficult for consumers to remember and recall the prices, than an environment where things remained relatively stable. Based on these evidences, we focus on three consumer shopping environment related factors that are relevant to reference price – price comparison propensity, product search opportunity, and volatile pricing.

Consumer knowledge

In the consumer behavior literature pertaining to reference price, consumer knowledge usually refers to consumer's knowledge or expertise about a product category. Consumers obtain their knowledge through use or purchase of a product and prior search and use of information about a product (Vanhuele and Drèze, 2002; Frankenberger and Liu, 1994). Studies show that consumers' knowledge can influence their judgment and formation of reference price (Monroe and Lee, 1999). Extant consumer behavior research suggests that prior knowledge about a product category can affect the cognitive processes used by consumers to arrive at consumer judgments (Bettman, 1979; Lynch and Srull, 1982). Empirical results

indicate that consumers with higher-knowledge levels tend to use attribute-based cognitive processing, whereas consumers with lower-knowledge levels rely on abstract and affective processing; and that difference in processing between consumers with high- and low-knowledge levels is influenced by the presence of a prime or external anchor (Bettman and Sujan, 1987; Herr, 1989). Others have found that information search is effectively lowered when consumers are high in knowledge (Brucks, 1985; Simonson *et al.*, 1988).

In addition to the product knowledge, researchers have also suggested the price knowledge to be an important part of consumer knowledge (Johnson, 1994; Monroe and Lee, 1999; Vanhuele and Drèze, 2002). Vanhuele and Drèze (2002) concluded that consumer price knowledge is influenced by both shopping environment and consumers' idiosyncrasies. They further argue that consumer may not possess accurate knowledge of price and hence cannot accurately recall prices. However, they do have a working fuzzy knowledge of prices which drives the reference price effects in choice models. Consumers' knowledge about a product category comprises both price and product related information, however, to the best of our knowledge there is no explicit investigation of the effect of consumer knowledge on reference price (Biswas and Sherrell, 1993; Frankenberger and Liu, 1994). In this study we focus on consumers' self assessed price and product knowledge, the two components of consumer knowledge as determinants of reference price orientation.

Internal reference price and external reference price

There is a general agreement that reference price could be anchored internally or externally (see Erdem *et al.*, 2001; Mazumdar and Papatla, 2000; Mayhew and Winer, 1992). The prevalent view is that the internal reference price (IRP) is a memory based approach. While the underlying assumptions pertaining to the formation of internal reference price vary across the studies, they all share the view that internal standards are influenced by previous price encounters (see Vanhuele and Drèze, 2002; Grewal *et al.*, 1998a; Mazumdar and Papatla, 2000; Monroe and Lee, 1999) and such can change as a result of exposure to new information (Yadav and Seiders, 1998). However, Vanhuele and Drèze (2002) recently questioned the method of measuring consumers' price knowledge. They argue that previous studies focus only on recall and short-term memory and therefore underestimate consumers' price knowledge. They propose to use a combination of price recall, price recognition, and deal recognition to measure consumers' knowledge. They suggest that price knowledge involved in reference price often may not be accessible to recall but shows up in price recognition and deal recognition. Similar arguments have been made by Monroe and Lee (1999). The alternative view assumes that reference price is formed during a purchase occasion on the basis of the prices observed (e.g. prices on the shelf labels). Consequently, external information in the purchase environment determines what consumers think they should pay for a brand (Burman and Biswas, 2004; Hardesty and Suter, 2005; Hardie *et al.*, 1993; Mazumdar and Papatla, 2000; Mayhew and Winer, 1992). This type of reference price is therefore called external reference price (ERP). Although Mazumdar and Papatla (2000) suggest that the usage of internal reference price (IRP) and external reference price (ERP) may not be exclusive or unambiguous, and that consumers may use both depending on product and consumer characteristics.

Two major theories, adaptation-level theory and assimilation contrast theory (for discussion see Biswas and Blair, 1991; Burman and Biswas, 2004; and Kalyanram and Winer, 1995 among others) are jointly used to explain the concepts of internal and external reference price. Adaptation-level theory suggests that consumers have a range of internal reference prices against which advertised external prices are judged. The major implication derived from adaptation-level theory is that consumers rely on a range of acceptable prices for any given product and any external price information that falls within this range is not likely to shift the consumer's internal reference price (Biswas *et al.*, 1999). Assimilation contrast theory suggests that consumers have latitude of acceptance around their price beliefs that influence their reaction to an external reference price. The major implication of this theory is that external prices can be either assimilated into or contrasted against the consumer's internal reference price range. Thus, the internal reference price of a consumer, and consequently the range of acceptable prices, is likely to shift in accordance with information acquired from external sources such as reference price advertisements (Lichtenstein *et al.*, 1991; Monroe *et al.*, 1977). More recently, researchers have viewed ERP and IRP as two components of reference price. Rajendran and Tellis (1994) demonstrate that this approach leads to a significant improvement in fit over a model that includes only one. Support for this line of thinking also comes from Mazumdar and Papatla's (2000) finding that consumers use both IRP and ERP. Relying on this stream of research we use both external reference price (ERP) and internal reference price (IRP) in our study for a more comprehensive understanding of reference price and its antecedents, and focus on consumer's orientation towards IRP and ERP.

Hypothesis development

Extant literature on reference price have alluded to and investigated the notion of contextual factors influencing reference price (see Biswas and Blair, 1991; Biswas and Sherrell, 1993; Burman and Biswas, 2004; Grewal *et al.*, 1998a, b; Hardesty and Suter, 2005; Mazumdar and Papatla, 2000). Our discussion so far has led us to identify several antecedents to reference price - price comparison propensity, product search opportunity, volatile pricing, and self assessed price and product knowledge. We next examine the relationships between these antecedents and consumer reference price orientation.

Several studies have suggested that as consumers engage in price comparison and product search (Burke, 2002; Evanschitzky *et al.*, 2004; Lee and Overby, 2004; Rohm and Swaminathan, 2004) it enhances their knowledge about the product and price range. This is particularly relevant in today's day and age where internet provides an unparalleled opportunity for both price comparison and product search (see Burman and Biswas, 2004 and Hardesty and Suter, 2005). Bourdeau *et al.* (2002) identified several functional values that motivate people to use the internet. One of them is learning or acquiring new knowledge or information (Alba *et al.*, 1997; Rohm and Swaminathan, 2004). Vanhuele and

Drèze (2002) suggest that consumers who extensively engage themselves in price search should also be the ones having best knowledge of price as well as product. Thus we propose the following:

H1. Price comparison propensity will be positively associated with product knowledge.

H2. Product search opportunity will be positively associated with product knowledge.

H3. Price comparison propensity will be positively associated with price knowledge.

H4. Product search opportunity will be positively associated with price knowledge.

In comparison, price volatility is likely to have a negative impact on consumer knowledge (Vanhuele and Drèze, 2002). When consumers conduct extensive product search and price comparison, they will acquire more price and product knowledge and become more familiar with the products and their prices. However, when prices change frequently either on the internet or at brick and mortar stores, it may confuse consumers and make it difficult for consumers to remember the correct price and even the information about the product. Similar notion has been suggested by researchers looking at frequent discounts (see Grewal *et al.*, 1998b). Therefore, we argue that price comparison and product search opportunity in today's day and age of information rich market place will compound the confusion in consumer's mind if this information overload is also coupled with frequent changes in price. Hence, price volatility will be negatively related to price and product knowledge.

H5. Price volatility will be negatively associated with product knowledge.

H6. Price volatility will be negatively associated with price knowledge.

Based on our discussions so far and the evidence from the extant literature we further argue that the price comparison propensity, product search opportunity, and price volatility will not only influence consumer knowledge about price and product, and subsequently the ERP and IRP orientation, but will also affect the usage of IRP and ERP in a more direct manner. Continuing with this line of thinking, we argue that since the formation of internal reference price is primarily based on the consumer's past experiences and recall of price from memory (Monroe and Lee, 1999; Vanhuele and Drèze, 2002), an opportunity to search for product or compare prices would probably have no direct influence on it, at least in the short run. It is possible that after a considerable period of time this opportunity for product search and price comparison may alter the IRP, but in the short run, it seems highly unlikely. Based on these arguments we speculate that internal reference price usage will not be associated with either the price comparison propensity or the product search opportunity. In comparison, volatile prices will in fact make it difficult for consumers to remember the prices they were exposed to or rely on their internal reference price with any degree of certainty (Johnson, 1994; Vanhuele and Drèze, 2002). Thus, we hypothesize that as prices change frequently (i.e. price volatility) consumers are less likely to use their internal reference price.

H7. Price comparison propensity will not be associated with internal reference price orientation.

H8. Product search opportunity will not be associated with internal reference price orientation.

H9. Price volatility will be negatively associated with internal reference price orientation.

When it comes to external reference price orientation, easy opportunity to compare prices, either on internet or at brick and mortar shops, is likely to enhance their knowledge about or makes them more aware of prices. Extant literature suggest that many consumers search for price and product information on the internet before purchasing products or going to brick and mortar stores (see Burke, 2002; Evanschitzky *et al.*, 2004; Lee and Overby, 2004; Rohm and Swaminathan, 2004). Hardesty and Suter (2005) found that consumers expect to pay less for products available online, but the external reference price based on brick and mortar prices had a stronger effect on consumer attitude than the ERP based on the internet prices. This opportunity for price comparison can improve the consumer's judgment on external reference price when they compare selling prices with advertised prices in different stores and web sites, and we argue that this would probably result in greater use of external reference price. Thus, we propose a positive relationship between the opportunity and propensity to compare price over internet and the use of external reference price. In comparison, the opportunity to search for products either on or off internet is less likely to have any influence on ERP, because consumers may search for product information without any attention to or concern for price related information. Although one could argue that price comparison and product search go hand in hand, but we take the stance that it is not very prevalent and speculate that product search opportunity will not be associated with external reference price usage. Price volatility on the other hand, captures frequent changes in prices and is likely to create confusion in consumer's mind regards product prices. On the one hand frequent price changes may lead to consumers becoming more vigilant of external reference price to get the best out of a very volatile situation, and on the other hand, one could argue that frequent changes in prices may lead to consumers making decisions based on transaction specific prices and not a reference price, internal or external. Extant literature has alluded to a negative relationship between price volatility and ERP (Johnson, 1994). Similar notion was suggested in a study of price discounts by Grewal *et al.* (1998b). Thus we hypothesize that:

H10. Price comparison propensity will be positively associated with external reference price orientation.

H11. Product search opportunity will not be associated with external reference price orientation.

H12. Price volatility will be negatively associated with external reference price orientation.

Finally, based on the discussions so far and evidence found in extant literature (Mazumdar and Papatla, 2000) we speculate that consumer knowledge, especially the price related knowledge, would be positively related to both external and internal reference price usages. This assumption is reasonable since knowledgeable consumers will be more aware of what is going on in their shopping environment in terms of price and may even internalize such information. If they feel confused by price volatility, they are likely to clarify the confusion caused by price volatility when they actively compare price and search product information. This knowledge about prices of various products in their consideration set is likely to positively influence their usage of both internal and external

reference price. However, the knowledge about product *per se* is less likely to be associated with the consumer reference price – either internal or external. Consequently, we hypothesize that both ERP and IRP will be positively associated with consumer knowledge about prices, but not with consumer knowledge about product *per se*.

H13. Product knowledge will not be associated with internal reference price orientation.

H14. Price knowledge will be positively associated with internal reference price orientation.

H15. Product knowledge will not be associated with external reference price orientation.

H16. Price knowledge will be positively associated with external reference price orientation.

Figure 1 represents a pictorial representation of the hypothesized relationships.

Method

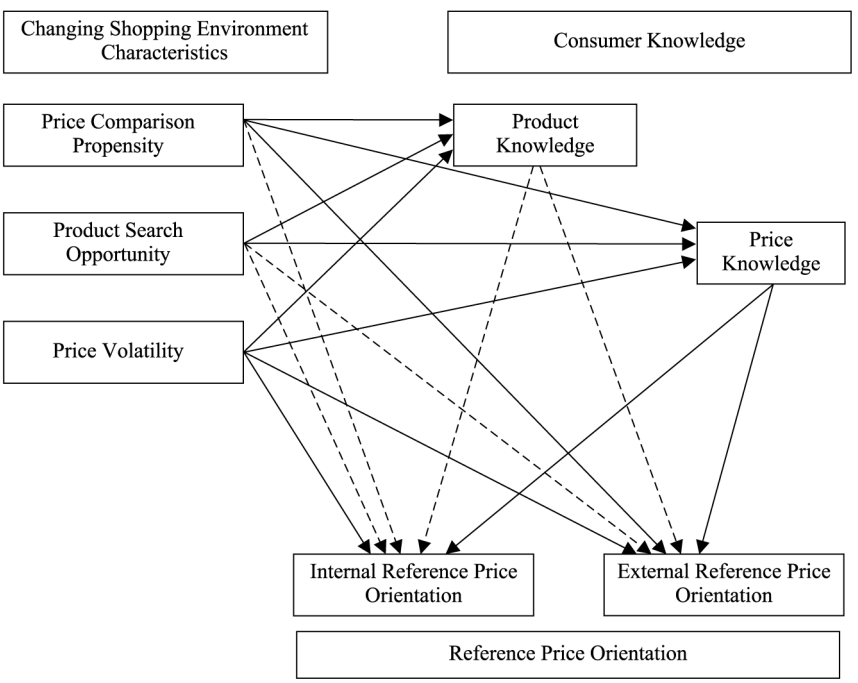
An online survey was conducted at a major state university in southwestern USA. A total of 850 people viewed the online survey web page and 280 of them participated in the survey. The respondents were requested that they fill out the survey only if they had used Internet for either shopping or looking of information. After deleting invalid cases, 265 cases were retained and used in the hypotheses testing (response rate of 31.17 per cent). Respondents to the survey are predominantly female (63.3 per cent), in the age group of 21-40 year old (70.19 per cent), and are married (53.26 per cent). They are evenly distributed across different income groups – incomes of less than $20,000 (39.61 per cent), $20,001-40,000 (22.75 per cent), and $40,001-80,000 (21.96 per cent). Early respondents were compared with late respondents on all of the measured variables as well as the individual demographic variables of gender, income, marital status, and age. No significant differences were found between early and late respondents, thus suggesting temporal stability of data.

Measure development, reliability and validity

Since we did not find measurement scales that we could borrow for our study in the extant literature, the scale items for measuring the constructs identified in this study were either developed based on descriptions of the construct domain in the extant literature or adapted from the existing studies. For example, scale items for measuring price comparison propensity and product search opportunity are rooted in studies such as Burke (2002), Dickerson and Gentry (1983), Evanschitzky *et al.* (2004), Lee and Overby (2004), and Rohm and Swaminathan (2004); price volatility and price knowledge in Vanhuele and Drèze (2002) study, product knowledge in Bloch *et al.* (1989) study; internal reference price orientation and external reference price orientation in studies such as Grewal *et al.* (1998a), Hardesty and Suter (2005) and Mazumdar and Papatla (2000). The responses to the scale items were measured on a five-point scale, with 1 representing strongly agree and 5 strongly disagree, for all questions. The questions measuring the seven constructs were first subjected to exploratory factor analysis. During the scale purification process nine items (out of 38) were deemed problematic after the exploratory factor analysis because they either exhibited a low factor loading (<0.50), or had a high cross-loading (>0.30). On closer inspection, these items were also problematic in terms of verbiage.

We next tested the scale items for internal consistency and found that the constructs have acceptable Alpha. Each of the reliability estimates is greater than 0.74, with the exception of IRP and ERP orientation which have Alpha values of 0.67 and

Figure 1 Conceptual model: antecedents to reference price orientation



Note: The paths in dotted line denote 'no relation' hypotheses

0.64 respectively (Nunnally, 1978). These factor scale items were also subjected to confirmatory factor analysis using LISREL and the fit indices were found to be above the acceptable levels. Tables I-III present the rotated factor structure matrix, their reliability scores, and CFA fit indices.

Finally, we assessed the convergent validity and discriminant validity of the scale items for each construct with an inter-item correlation matrix. A high correlation between items within same construct confirms convergent validity, whereas a low correlation between items across different constructs confirms discriminant validity (Churchill, 1979). An examination of the correlation matrix reveals that all constructs have acceptable convergent validity and discriminant validity.

Hypotheses testing and results

The hypothesized relationships depicted in Figure 1 were tested using the structural equation modeling (SEM) procedure with latent constructs. The results of the SEM analyses are presented in Tables IV and V (Table IV – measurement model; Table V – structural model). The

Table I Consumer knowledge: rotated factor structure and CFI fit indices

	Factor 1	Factor 2
Self assessed product knowledge		
v27 I know the advantages and disadvantages of the major brands of the products I often use	0.773	
v30 I am generally a knowledgeable person on product issues	0.743	
v28 I know the basic and most important indicators of the quality of the products I often purchase	0.726	
v25 I have better general product knowledge relative to most of my friends	0.682	
(CFI Fit Indices: Ch-Square=0.65, df=2, *p*-value=0.723; GFI=1.00; AGFI=0.99; RMR=0.01)		
Self assessed price knowledge		
v17 I can remember the accurate prices of the products I often buy		0.794
v18 The accuracy of my price recall on frequently purchased products falls within +/−5% to +/−10%		0.764
v19 I still remember the price of the products I recently bought		0.763
v21 I can tell if the price of a product is increased or decreased	0.416	0.547
(CFI Fit Indices: Ch-Square=4.64, df=2, *p*-value=0.098; GFI=0.99; AGFI=0.96; RMR=0.02)		
% of Variance explained	31.05	28.07
Alpha	0.75	0.76
Factor mean	2.22	2.35
Factor SD	0.544	0.673

Table II Changing shopping environment characteristics: rotated factor structure matrix and CFI fit indices

	Factor 1	Factor 2	Factor 3
Price comparison propensity			
v6 I use the internet to compare prices more often than other ways	0.845		
v2 I make it a rule to compare price on the internet before buying anything	0.834		
v5 I often compare prices on the net	0.829		
v1 It is more convenient to compare prices on the net	0.757		
v3 I saves a lot of money by comparing price	0.650		
(CFI Fit Indices: Ch-Square=26.28, df=5, *p*-value=0.000; GFI=0.96; AGFI=0.89; RMR=0.032.)	0.634		
Product search opportunity			
v9 Internet is a good source of product information		0.762	
v11 It is easier and more convenient to get product information	0.378	0.731	
v12 By knowing more about a product can help make better decision		0.684	
v10 Searching product information saves a lot of money		0.668	
(CFI Fit Indices: Ch-Square=6.53, df=2, *p*-value=0.038; GFI=0.99; AGFI=0.94; RMR=0.031)			
Price volatility			
v14 The price on the net changes more often than traditional stores			0.825
v16 The price of some products on the internet changes more often than that of others			0.730
v15 The price of the product I bought changes when I repurchase it			0.722
v13 The price on the net is volatile			0.707
(CFI Fit Indices: Ch-Square=3.51, df=2, *p*-value=0.173; GFI=0.99; AGFI=0.97; RMR=0.023)			
% of variance explained	26.334	17.76	17.47
Alpha score	0.88	0.74	0.74
Factor mean	2.16	1.74	2.75
Factor SD	0.85	0.54	0.58

Table III Internal and external reference price orientation: rotated factor structure matrix and CFI fit indices

	Factor 1	Factor 2
Internal reference price (IRP) orientation		
V33 I decide the credibility of the price on the basis of the retailers' price	0.736	
V34 I judge the price of a product on the basis of the price I paid before	0.712	
V35 I use the advertised reference price to decide the value of the product	0.642	
V31 I determine the price of a product on the basis of the prices I saw before	0.592	
V32 I determine the attractiveness of the price on the basis of average market price	0.504	
(CFI Fit Indices: Ch-Square=11.05, df=5, *p*-value=0.050; GFI=0.98; AGFI=0.95; RMR =0.038)		
External reference price (ERP) orientation		
V37 I compare the prices of the same product at different stores to determine the value of the product		0.807
V36 I look at the prices of competing brands to judge the value of a product		0.751
V38 I sometimes compare the selling prices against the price of the similar products my friends paid for		0.664
(CFI Fit Indices: Not applicable.)		
% of variance explained	26.33	23.96
Alpha	0.67	0.64
Factor mean	2.45	2.1
Factor SD	0.53	0.59

Table IV Measurement relationships – SEM analyses results: price comparison propensity, product search opportunity, price volatility; product and price knowledge; IRP and ERP orientation

Latent construct	Variable (Path)	Std. Coeff.	*t*-stats
Price comparison propensity	V6 (λ1)	0.99	λ set to 1.00
	V2 (λ2)	0.94	14.62
	V5 (λ3)	0.98	16.26
	V1 (λ4)	0.61	13.43
	V3 (λ5)	0.5	10.64
Product search opportunity	V9 (λ6)	0.35	7.94
	V11 (λ7)	0.59	10.06
	V12 (λ8)	0.3	7.66
	V10 (λ9)	0.64	λ set to 1.00
Price volatility	V14 (λ10)	0.65	λ set to 1.00
	V16 (λ11)	0.43	7.72
	V15 (λ12)	0.42	7.83
	V13 (λ13)	0.43	7.65
Product knowledge	V27 (λ14)	0.46	8.71
	V30 (λ15)	0.53	λ set to 1.00
	V28 (λ16)	0.42	9.16
	V25 (λ17)	0.51	8.66
Price knowledge	V17 (λ18)	0.78	λ set to 1.00
	V18 (λ19)	0.44	7.79
	V19 (λ20)	0.74	11.28
	V21 (λ21)	0.43	8.69
IRP orientation	V33 (λ22)	0.39	6.11
	V34 (λ23)	0.46	7.41
	V35 (λ24)	0.39	4.99
	V31 (λ25)	0.49	λ set to 1.00
	V32 (λ26)	0.34	6.2
ERP orientation	V37 (λ27)	0.57	λ set to 1.00
	V36 (λ28)	0.45	6.82
	V38 (λ29)	0.38	5.91

hypothesized model demonstrated acceptable fit indices – i.e. Chi-Sq=672.65, df=358, *p*-value=0.00; RMSEA=0.057; GFI=0.85; AGFI=0.82; RMR=0.047; NFI=0.87; NNFI=0.92; CFI=0.93; IFI=0.93 (Bagozzi and Yi, 1988; Bentler, 1990; Bentler and Bonett, 1980; and Mulaik *et al.*, 1989).

The results in Table V provide support for most of the hypotheses. Specifically, support was found for the following hypotheses – *H2*: Product search opportunity is positively associated with product knowledge (t-stats=3.75); *H4*: Product search opportunity is positively associated with price knowledge (*t*-stats=2.89); *H5*: Price volatility is negatively associated with product knowledge (*t*-stats= − 3.94); *H6*: Price volatility is negatively associated with price knowledge (*t*-stats = − 2.79); *H9*: Price Volatility is negatively associated with IRP orientation (*t*-stats= − 2.2); *H10*: Price Comparison propensity is positively associated with ERP orientation (*t*-stats=4.74); and *H16*: Price Knowledge is positively associated with ERP orientation (*t*-stats=3.99).

In addition, as expected, no support was found for the following hypotheses – *H7*: Price comparison propensity is not associated with IRP orientation (*t*-stats=1.16); *H8*: Product search opportunity is not associated with IRP orientation (*t*-stats= − 0.10); *H11*: Product Search opportunity is not associated with ERP orientation (*t*-stats= − 1.92); *H13*: Product Knowledge is not associated with IRP orientation (*t*-stats=1.31); and *H15*: Product Knowledge is not associated with ERP orientation (*t*-stats = 0.54).

However, contrary to our expectation, support was not found for following four hypothesized relationships – *H1*: Price comparison propensity is positively associated with product knowledge (*t*-stats= − 0.46); *H3*: Price comparison propensity is positively associated with price knowledge (*t*-stats= − 0.69); *H12*: Price Volatility is negatively associated with ERP orientation (*t*-stats= − 0.87); and *H14*: Price Knowledge is positively associated with IRP orientation (*t*-stats=1.51).

Table V Structural relationships – SEM analyses results: price comparison propensity, product search opportunity, price volatility; product and price knowledge; IRP and ERP orientation

Hypotheses	Independent construct	Dependent construct	Std. coeff.	*t*-stats
H1 **+ ve relation**	Price comparison propensity	Product Kn.	−0.05	−0.46
H2 **+ ve relation**	Product search opportunity	Product Kn.	0.44	3.75
H3 **+ ve relation**	Price comparison propensity	Price Kn.	−0.07	−0.69
H4 **+ ve relation**	Product search opportunity	Price Kn.	0.33	2.89
H5 **− ve relation**	Price volatility	Product Kn.	−0.31	−3.94
H6 **− ve relation**	Price volatility	Price Kn.	−0.22	−2.79
H7 **No relation**	Price comparison propensity	IRP orientation	0.13	1.16
H8 **No relation**	Product search opportunity	IRP orientation	−0.01	−0.1
H9 **− ve relation**	Price volatility	IRP orientation	−0.21	−2.2
H10 **+ ve relation**	Price comparison propensity	ERP orientation	0.57	4.74
H11 **No relation**	Product search opportunity	ERP orientation	−0.27	−1.92
H12 **− ve relation**	Price volatility	ERP orientation	−0.21	−0.87
H13 **No relation**	Product knowledge	IRP orientation	0.13	1.31
H14 **+ ve relation**	Price knowledge	IRP orientation	0.13	1.51
H15 **No relation**	Product knowledge	ERP orientation	0.05	0.54
H16 **+ ve relation**	Price knowledge	ERP orientation	0.35	3.99

In summary, price comparison propensity has no influence on both product and price knowledge. In comparison, product search opportunity positively influences product and price knowledge, and price volatility negatively influences both product and price knowledge. Price comparison propensity and product search opportunity, and product and price knowledge have no influence on consumers' internal reference price orientation. Only price volatility seems to influence IRP orientation (negatively). In comparison, price comparison propensity and product knowledge was associated with external reference price. Product search opportunity and price volatility did not influence consumer's ERP orientation.

Discussion

The results provide an interesting peek into the antecedents to consumers' reference price. While price volatility influences consumers' internal reference price in a negative manner, only price comparison propensity positively influences consumers' internal reference price. This is in line with some of the suggestions made in extant literature (see Fibich *et al.*, 2005; Monroe and Lee, 1999; Vanhuele and Drèze, 2002). Vanhuele and Drèze (2002, p. 72) suggest that "price knowledge in reference prices may often not be accessible to recall but shows up in price recognition and deal recognition". Similar notion was proposed by Monroe and Lee (1999, p. 207) when they argue that "Price information not consciously remembered can still influence internal reference price and product evaluation". These may be explanation for the lack of support (insignificant effect) for the relationship between price knowledge on internal reference price. The explanation for the significant negative effect of price volatility may lie in the fact that frequent changes in price may make consumers less confident of their IRP. However, this very characteristic may also make it difficult for consumers to accurately recall the external price. In the case of external reference price, the opportunity and propensity to compare price makes it easy for consumers to check the external price and set their reference mark. Similar arguments may be used to explain the relationship between price knowledge and ERP orientation.

Taking a step back into the relationships between shopping environment characteristics and consumer knowledge, we find that only product search opportunity and price volatility influence both product and price knowledge. Price comparison propensity does not influence either product or price knowledge. Arguments similar to the ones presented earlier may provide explanation for these relationships. The lack of support for the relationship between price comparison ability and consumers' price and product knowledge may lie in the fact that the ability to compare price may make consumers lazy and less prone to relying on their own knowledge base. Taken together, the results from Tables IV and V indicate that price volatility has a negative impact on consumer knowledge (both price and product) and internal reference price orientation. In comparison, prices comparison propensity and price knowledge influences external reference price orientation.

Implications and limitations

The findings of this study have interesting implications. First, the shopping environment related characteristics (price and product comparison opportunity and price volatility) significantly influence consumer knowledge. In addition, price volatility and product knowledge influence consumers' internal reference prices orientation. Finally, opportunity to compare prices helps consumers form external reference prices. When consumers compare prices and search product information, they improve their price and product related knowledge. Price volatility in contrast negatively influence product and price knowledge and IRP orientation, The three features of the internet have greater impact on product knowledge than they do on price knowledge. Furthermore, the internet driven factors influence not only consumer knowledge, but also reference price directly. The results suggest that the while price volatility influence internal reference price, price comparison ability primarily influence external reference price.

A second finding is that consumers' price and product knowledge is positively related to their reference price. Knowledgeable consumers have better judgment of reference price. This provides support for the belief that consumer knowledge can influence consumers' reference price.

These findings provide both policymakers and managers with insights into advertised price claims in the information rich internet age. From the viewpoint of consumer protection, the government and consumer protection agency should encourage consumers to use the internet to compare price and search product information because price comparison and product search can improve consumers' knowledge, especially product knowledge and the judgment of advertised price claims. This should help mitigate public policymakers' concern that widespread use of reference price may lead to deceptive effect of reference price on consumers (Biswas *et al.*, 1999; Bolton *et al.*, 2003). However, price volatility reduces consumer's product and price knowledge as well as their reliance on IRP. Managers can also benefit from the finding that the internet, particularly price comparison, mainly influence external reference price. Consequently, managers must be cautious with their advertised price claims and not exaggerate the value of offerings or cost savings too much. Otherwise they take the risk of loosing consumers' trust, since people now have a new and more convenient option to obtain price and product information. In addition, managers should provide more information, especially price related information to their consumers. It may help form external reference price.

Despite the contributions discussed above, this study is not without its limitations. The sample frame consists of primarily faculty, staff and students from a university setting. Despite our argument that our respondents are similar to anyone else in the broader society, future studies should replicate this study using a sampling frame from the wider population. We also did not measure the respondent's internet usage behavior. We simply instructed the respondents to fill out the questionnaire only if they had used internet in the past. However, given that our respondents work in a University setting, internet usage could be taken for granted. Our study also does not look at different classification of products, such as expensive products and daily consumer products, etc. and measure the influence of the internet driven information abundance on consumer knowledge and reference price in terms of different product categories. The internet influence may be product specific, because people usually spend more time on price comparison and product search when they purchase expensive products. The classification based approach may capture the influence of the internet on consumer knowledge and reference more accurately, and future research should focus of different product types for investigating antecedents to consumer reference prices. Finally, we focused only on the frequency of change aspect of price volatility and did not include dispersion or range aspect. Future research may want to look at both aspects of price volatility.

In conclusion, we hope that we have provided a glimpse into the antecedents to reference prices. We also hope that this study provides an impetus for future studies to focus on this topic in the information rich internet context.

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