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An Econometric Approach to Resolving
How Consumers Form Perception of Economic Value

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Abstract

Most marketing activity involves exchanges of perceived economic value, yet the manner in which perceptions of economic are formed is not clear. Some researchers in marketing consider perceived value to be the result of quality per unit price assessments (ratio form), whereas others consider perceived value to result from net utility differences between quality and price (linear difference form). These differences in value formation have substantive, practical implications with respect to “value pricing,” since each form gives rise to different recommendations on value prices. To shed light on the manner by which perceptions of value are formed, we present a general econometric model (Box-Cox) that subsumes both value formation rules as nested cases. We then test which value formation rule best represents how consumers assess value using experimental data collected across a variety of conditions designed to reflect different situations in which a consumer may assess value. Implications of this research in terms of how the value formation rules impact value pricing, communication of value, and consumer choice are discussed.
An Econometric Approach to Resolving
How Consumers Form Perceptions of Economic Value

The concept of value is central to marketing as most marketing activity involves the exchange of value (e.g., Hunt 1976; Kotler and Keller 2005). Yet, the notion of value itself has been the subject of considerable debate both in terms of what it represents and how it is formed. Within marketing, the two disciplines of pricing and services have been active in their research on value. In service marketing, value is often construed in the context of whether a service transaction was "worth it" (an ex-post evaluation), whereas in pricing, it is often viewed as the basis for whether or not the product or service is worth acquiring (an ex-ante evaluation).

Though the two areas differ in the stage of the consumption cycle when they focus on value (ex-ante versus ex-post consumption), both disciplines conceptualize it as a trade off between benefits and sacrifices (e.g., Monroe 2003, Zeithaml 1988). While the terms 'benefits' and 'sacrifices' are rather broad, these terms are usually operationalized in terms of quality (benefits) and price (monetary sacrifice) when considering perceptions of economic value. However, the exact process (or trade-off) by which economic value is formed is the subject of some controversy and remains unresolved. For the remainder of this paper, we will abbreviate the phraseology of ‘economic value’ to simply ‘value.’

For much of history, scholars have proposed different means by which consumers arrive at value perceptions (Georgescu-Roegen 1973). Contemporary authors, such as Gale (1994), Sawyer and Dickson (1984), Hauser and Shugan (1983), and Hauser and Simmie (1981) argue that value is the ratio of quality to price (ratio rule), whereas others such as Blackwell, Miniard and Engel (2006), Dodds, Monroe, and Grewal (1991) and Rust and Oliver (1994) argue that
value is the utility of quality minus the disutility of price (linear difference rule). Some authors meanwhile acknowledge both rules. Monroe's pricing text (2003) presents both alternative formation rules, an evolution from Monroe (1990), which discusses value formation in ratio form. By contrast, Kotler and Keller (2005), in their managerial marketing text, only reference the ratio rule indirectly but clearly enunciate the linear difference rule, thus indicating a leaning towards the linear formation rule.

This issue of how consumers arrive at perceptions of economic value is of importance to managers when it comes to "value-pricing," a concern addressed by practitioners and academicians alike (Nagle and Hogan 2006; Kotler and Keller 2005; Mam, Roegner, and Zwada 2004; Monroe 2003). The following example illustrates how the two different value formation rules arrive at two different "value" prices. Imagine that Alpha Corporation sells a commercial paint sprayer with a life of 1,000 hours for $500 ($0.50 per hour) and that painting contractors receive an hourly wage of $10 per hour when using this machine. Now imagine that Beta Corporation plans to introduce a new paint sprayer with identical features and benefits, but with a longer product life of 20 additional hours (1,020 total hours). Now, the issue is "What price should Beta Corp. charge for its paint sprayer based purely on the value delivered, setting aside other considerations such as brand equity, customer price sensitivity, etc.?"

According to the ratio model, buyers’ purchases will be based on the relative utility received per dollar paid. If managers were to employ the ratio rule for value pricing, the maximum price Beta could charge, and yet deliver value equivalent to Alpha, would be $510 ($0.50 per hour x 1,020 total hours). Under the linear difference rule, however, the maximum price Beta could charge would be $700, given that an additional 20 hours would be valued at $200 ($10 x 20 hours).
In this instance, sellers clearly would be much better off setting prices using the linear difference rule rather than the ratio rule, if buyers similarly followed the linear difference rule to calculate relative value when making the purchase decision. Of course, if buyers followed the ratio rule and expected lower prices, but Beta set higher prices using the linear difference rule, then Beta’s sales would languish until Beta brought its pricing back into line with buyers’ perceptions of value. The question therefore: Which rule – linear difference or ratio – do buyers follow when making purchase decisions? is of considerable importance.

Given that both academics (e.g., Day 1990; Woodruff 1997) and practitioners (e.g., Band 1991; Gale 1994, 1997) stress the need for firms to compete on value, not much research has been directed at determining the precise trade off by which value perceptions are formed (e.g., ratio rule or difference rule). A resolution of which rule best described consumer’s judgment of value was attempted by Hauser and Urban (1986). Using data on consumers’ ordering of consumer durables along value for a given budget, Hauser and Urban employed linear programming techniques at the individual level to determine whether the ratio rule or difference rule predicts the consumer’s priority ordering of products based on value. Unfortunately, their results were inconclusive, and they state “the empirical evidence for the hypotheses presented earlier suggests that both are reasonable; we are comfortable with proposing both for further testing (p. 458).”

In this paper, we take up the challenge of testing for the cognitive algebra of value perceptions. From a managerial perspective, the value formation rule is central to proper value pricing, as shown in the previous example. However, differences in value formation rules could also lead to different choices. We reproduce Table 6 of Hauser and Urban (1986, p. 459) as Table 1 of our paper which illustrates how different value formation rules result in different
orderings of value. As one can see from Table 1, if value is constructed using the ratio rule, the food processor is the first choice. By contrast, if value is constructed using the linear difference rule, then the home improvement project is the first choice.

The value formation rules also imply how changes in value are perceived. This can be seen by taking the first derivative of value with respect to either quality or price using the ratio and linear-difference functional form respectively. This differentiation reveals that implicit in the ratio form of value formation is the notion that consumers perceive value changes relative to the current value they perceive in the existing product or service. By contrast, the linear difference rule implies that absolute value changes (as opposed to relative value changes) are registered by consumers. Thus, the value formation rules could potentially impact the manner in which changes in value are sought to be communicated.

In our paper we show how the two value formation rules are special cases of the more general Box-Cox model formulation. This then enables us to test the two value formulation rules using value perception data generated under a variety of situations in which consumers could be expected to assess value. Further, this approach allows us to determine whether segments of consumers who exist who follow one rule or the other.

Accordingly, our paper is structured as follows. First, we outline the concept of value and its constituent components. Second, we discuss the logic of the experiment carried out to determine the value formation rule employed by consumers to arrive at judgments of value. Third, we describe the experiment employed to generate the empirical data and the econometric approach we employ to analyze the data. Fourth, we discuss the experimental results and the implications of our findings. Last, we conclude with limitations of our work and suggest avenues for future research.
VALUE DEFINITION AND FORMATION

The term “value” has been the subject of investigation in several disciplines and has acquired different meanings in different contexts. Hence, it is not unusual to hear terms such as personal value, social value, family value, organizational value, occupational value, economic value, product value, etc. (Burns 1993, p. 24).

In marketing, Sweeney and Soutar (2001) have captured the complexity of value in their value scale which is presented as having four dimensions, e.g., emotional value, social value, price/value for money, and performance/quality. For purposes of this paper, we have chosen to restrict our focus on economic value, which encompasses the price/value and performance/quality component of the Sweeney and Soutar scale.

Our conceptualization of economic value focuses on the customer’s value derived from the product’s use (Reuter 1986; Wind 1990). We adopt Zeithaml’s (1988) definition of value as the “consumer’s overall assessment of the utility of a product based on perceptions of what is received and what is given,” implicit in which is a consumer trade-off between a “get” and a “give” component.

Though Zeithaml’s use of the “get” and “give” components are in terms of the benefits and sacrifices involved in consumer use of a product or service, it has been operationalized in terms of the trade-off between quality (benefit) and cost (price) when applied to studies of economic value in both the pricing and service literatures (e.g., Monroe 2003, Bolton and Drew 1991). Authors such as Gale (1994), Sawyer and Dickson (1984), Hauser and Shugan (1983), and Hauser and Simmie (1981) conceptualize value in ratio form. Monroe (2003, p. 104) summarizes this ratio view that “buyers’ perceptions of value represent a mental trade-off between the quality or benefits they perceive in the product relative to the sacrifice they perceive by paying the price:
Perceived value = perceived benefits (gain) / perceived sacrifice (give).” This ratio conceptualization derives from the classical economic formulation in which consumers make purchase decisions subject to a budget constraint (Srinivasan 1982).

By contrast, authors such as Rust and Oliver (1994), Bolton and Drew (1991), Chen and Dubinsky (2003), Cravens, Holland, Lamb and Moncrief (1988), Cronin, Brady and Hult (2000), Dodds, Monroe and Grewal (1991), Monroe (2003), and Sweeney and Soutar (2001) conceptualize economic value as a perceived quality minus perceived cost tradeoff. This linear difference (or net utility) conceptualization derives from the conjoint analyst approach of treating price as simply an attribute over which utility is maximized, rather than as part of the budget constraint (Srinivasan 1982).

Finally, in the economics and choice literature, value is often implicitly assumed to be pre-consumption, since value (or utility) is used as a measure of the relative merits of different choices. By comparison, in the service marketing literature, value is usually thought of as ex-post in terms of whether a service performance was "worth it" or not (Bolton and Drew 1991). Thus, the sense in which value is used differs by the stage of consumption cycle. In our paper, we have chosen to focus on pre-consumption value, which is more consistent with the pricing and choice literatures' use of the concept.

MATHEMATICAL REPRESENTATION AND ANALYSIS OF VALUE FORMATION

As noted earlier, there are two schools of thought with regard to how economic value perceptions are formed. One school (e.g., Rust and Oliver 1994), influenced by the conjoint analysis paradigm, regard value as the net utility of quality remaining after the disutility of price has been subtracted (linear difference rule). This formation rule can be expressed as:

\[
\text{Perceived value} = \frac{\text{perceived benefits (gain)}}{\text{perceived sacrifice (give)}}
\]
\[ V = \alpha Q - \beta P \quad (1) \]

In (1), \( V \) stands for the subjective value perception, \( Q \) stands for the perceived utility of quality, \( P \) stands for price, and \( \alpha \) and \( \beta \) are the relative weights given to quality and price perceptions.

The other school (e.g., Gale 1994; see also Monroe 2003 for a summary), influenced by traditional micro-economics, regards value as the utility per unit dollar. This rule can be written as:

\[ V = \frac{Q^\alpha}{P^\beta} \quad (2) \]

Equation (2) is a general formulation and subsumes the typical case of \( Q/P \) when \( \alpha \) and \( \beta \) are set to unity. Though (2) looks different from (1), it shares a very similar mathematical structure to (1). Taking the logarithm of (2), we get a log-linear formulation, namely:

\[ \ln(V) = \alpha \ln(Q) - \beta \ln(P) \quad (3) \]

Thus, though (1) and (3) share a linear structure, they are not nested within each other. That is, (1) cannot be recovered from (3), and similarly, nor can (3) be recovered from (1). This implies that they are truly different formulations.

**Box-Cox Generalization**

Fortunately, both formulations can be represented as special cases of the Box-Cox transformation. The Box-Cox transformation has found extensive use in econometrics to compare linear formulations against log-linear formulations (Greene 2003). The Box-Cox transformation involves transforming a variable (say, \( x \)) as \( x' = \frac{x^{1/\lambda} - 1}{\lambda} \), where \( x' \) is the Box-Cox transformed variable and \( \lambda \) is the Box-Cox parameter. It is easy to see that when \( \lambda \) is 1, the original variable is recovered (provided there is a constant in the regression to absorb the value
of -1). By contrast, it is not immediately obvious that \( x' \) becomes \( \ln(x) \) when \( \lambda \) is 0. In fact, as \( \lambda \) approaches 0, \( x' \) approaches the indeterminate form \( \frac{0}{0} \). However, if one applies the L’Hospital’s rule in calculus for such indeterminate forms, \( x' \) can be shown to equal \( \ln(x) \) in the limit when \( \lambda \) approaches 0 (Greene 2003; Maddala 2002).

**Design Logic**

Thus, the basic logic of our approach to determine which of the two rules best captures the judgment of value is to collect perceptions of value, quality, and price perceptions for a variety of products and then analyze these data with the Box-Cox transformation. Thus, the Box-Cox transformation is applied to both the dependent variable of value perception and the independent variables of price and quality perceptions to see which \( \lambda \) value best explains the data using maximum likelihood estimation. Thus, if the data supports \( \lambda \) values closer to 0 then this would provide support for a log-linear formation of value perceptions. Correspondingly, if the data turn out to support a \( \lambda \) value of 1, then this would provide support for a linear formation of value perceptions.

Note that while price and quality are treated as independent variables, this does not preclude price perceptions from influencing quality perceptions and quality perceptions from influencing price perceptions. This is allowed by the free correlation between the two variables.

**Estimation**

The loglikelihood for Box-Cox regression is given below:

\[
\text{LL} = \frac{-n}{2} \ln(2\pi) - n \ln\sigma - \frac{1}{2\sigma^2} \sum_{i=1}^{n} (y'_i - x'_i \beta_k)^2 + (\lambda - 1) \sum_{i=1}^{n} \ln(y'_i) \tag{4}
\]

where:
LL represents the log-likelihood;
n represents the number of cases/respondents;
\( \sigma \) represents an estimate of the standard error;
y_i' represents the Box-Cox transformed dependent variable for ith respondent;
x_{ik}' represents the Box-Cox transformed independent variable for ith respondent on kth attribute;
\( \beta_k \) represents the parameter that captures the effect of x_{ik}' on y_i;
\( \lambda \) represents the Box-Cox parameter.

The log likelihood function is not unlike that of ordinary regression, except for the last term which captures the Jacobian of the Box-Cox transformation of the dependent variable (Greene 2003). The estimation procedure employed is the iterative procedure of Oberhofer and Kmenta (1974). Basically, each time a new estimate of \( \sigma \) is employed in the log-likelihood till no further improvement in \( \sigma \) value exists. The estimate of \( \sigma \) is computed from the residuals of the non-linear (Box-Cox) regression.

**Simulation Study**

Before collecting the experimental data, we conducted a simulation exercise to determine whether the Box-Cox regressions correctly recovered the functional form and the relative weights associated with price and quality. For purposes of the simulation, we set alpha and beta values at .6 for quality and 0.4 for price (note that in Equations 1 and 3, the negative sign in front of price is already present). Value perceptions were constructed under the linear difference rule (\( V = \alpha Q - \beta P + \varepsilon \)) and the log-linear/ratio rule (\( \ln(V) = \alpha \ln(Q) - \beta \ln P + \varepsilon \)). The error terms in each instance were generated from a normal distribution in Gauss 5.0 (Aptech 2003).
Sample size was fixed at 50 and 100. Small sample sizes were chosen deliberately to see how well the general Box-Cox regression recovered the appropriate value of the Box-Cox parameter (1 for linear rule and 0 for log-linear rule) when sample sizes were small. This was done to reflect the small number of subjects in experimental studies. Furthermore, the independent variables of price and quality perceptions were generated from a standard normal distribution centered at 4 so that 3 standard deviations around this mean value (99% confidence interval) covered the range from 1 to 7. This was to ensure that the values generated faithfully represented the 7-point scales used in the subsequent experiment to capture value, quality, and price perceptions.

Data thus generated were analyzed as per the maximum likelihood procedure outlined. All estimation was done in Gauss 5.0 (Aptech 2003). For each of the two sample sizes, 100 independent data sets were generated and the parameters ($\lambda$, $\alpha$, $\beta$) estimated. The average of the estimates across the 100 datasets, along with the average of the standard errors, is reported in Table 2 for each of the two sample sizes chosen. From Table 2, we see that the maximum likelihood routine correctly returns lambda values close to 1 when the value formation rule is the linear difference rule and lambda values of 0 when the value formation rule is the log-linear/ratio rule. This is quite remarkable given the small sample sizes involved in the simulation. Also, the signs of the coefficients are in the right direction (positive coefficient for quality and positive coefficient for price given that the negative sign is incorporated into the functional form in Equations 1 and 3) in both instances, e.g., when value perceptions are constructed using the linear and log-linear rule. Not surprisingly, as sample size increases, the precision of the estimates increases. This can be witnessed by the smaller standard errors associated with the larger sample size estimates.
EXPERIMENTAL STUDY DESIGN

The design of this study is based on the contingent processing perspective advanced by several researchers (e.g., Bettman and Kakkar 1977; Bettman Luce and Payne 1998; Bettman and Sujan 1987; Cohen and Basu 1987; Kahneman and Tversky 1984; Lussier and Olshavsky 1979; Olshavsky, Alyesworth and Kempf 1995). In this perspective, because of their limited processing capacity, consumers could resort to alternative evaluation strategies depending on the cognitive demands generated by a particular situation. Accordingly, the contingent processing perspective has been employed as the guiding focus for our choice of conditions under which to test subjects' value formation behavior.

In this study, we explore how consumers make judgments of value under different purchase conditions. The commonly occurring purchase situations have been classified along the lines of presentation format, comparability of attributes, and particular price endings. The rationale for the same is presented, and the effect of these conditions on value formation rules across two different focal products is studied to examine the consistency of the results across divergent product types.

Presentation framing has been found to be a significant factor in understanding how consumers acquire and process product information (Bettman and Kakkar 1977; Kahneman and Tversky 1979; Thaler 1985). This effect has been shown to affect consumers' judgments across various domains, including comparative price advertisements (Della Bitta, Monroe and McGinnis 1981), consideration of health risks (Chandran and Menon 2004), evaluation of product costs (Gourville 1998), and product bundle evaluations (Janiszewski and Cunha 2004). One presentation format of particular interest here is the case where type of presentation (comparative vs. non-comparative presentation of each option) has been known to generate preference reversals. That is, subjects'
preferences have been found to reverse between the comparative and non-comparative presentation formats (Hsee and Leclerc 1998; Hsee, Loewenstein, Blount and Bazerman 1999; List 2002; Sevdalis and Harvey 2006). The evaluability hypothesis has been posited as an explanation – attributes are evaluated differently in comparative presentations than when each option is presented alone because the comparative presentation provides a different reference standard than what the individual may generate from his/her memory when considering the focal offering in the non-comparative presentation. Drawing from this research stream, the present study manipulated presentation format (comparative vs. non-comparative) to investigate its potential effect on how consumers judge value.

Comparability of attributes has also been shown to affect the processing of information. Humans have long been known to possess limited information processing capacity (Bettman 1979; Craik and Lockhart 1972; Miller 1956). Although individual differences in ability and degree of task familiarity can mitigate the problem, significant demands on consumers’ limited cognitive resources can still lead to errors in processing and/or to development of simplifying heuristics to deal with the evaluation task (Bettman and Park 1980, Miyazaki et al. 2005; Kardes et al. 2004; Monroe 2003). This intrinsic preference for simplification in processing suggests that attributes such as miles per gallon might be easier to process than attributes such as styling which are more difficult to compare for lack of an accepted metric. This difference in requirement of cognitive effort across the two types of attributes could impact the value formation rule employed. For example, it is possible that a numeric attribute might lead consumers to favor the ratio/log-linear rule because of the relative ease with which numeric attributes can be manipulated in division. Given this difference in degree of difficulty in processing across the two types of information, an
additional factor in the experimental design involved manipulating product-feature type (quantifiable vs. non-quantifiable attribute).

Similarly, different price-ends could present consumers with greater task difficulty. For example, odd price-ends could make it more difficult for individuals to use division than subtraction and this might lead consumers to favor the linear formation rule (cf. Estelami 2003; ct. Guido and Peluso 2004). To explore this possibility, we manipulated prices to be expressed in odd and even endings.

Finally, to gain insight into the degree of consistency of results across product type, we chose two products of varying complexity. Two different T-Mobile cellular phone National Calling Plans (phone included) and two different automobile models (2005 Toyota Scion xA configurations) were employed as experimental treatments. These two products were chosen because of their rather high interest among college students who would be serving as subjects. In addition, they differ considerably in terms of their product category, use characteristics and potential involvement levels.

Thus, the resulting study involved a mixed design, with product category (cellular calling plan with phone/automobile) as the within subject factor and the other factors as between-subjects factors, e.g., 2 (comparative/non-comparative format) * 2 (numeric/non-numeric attribute) * 2 (odd/even price ends).

DATA COLLECTION

Two hundred and thirty three undergraduate students from a northeastern U.S. university were recruited for the experiment, for which they received academic credit. At this stage in our research we felt students were acceptable to test basic psychological processes in the context of a
carefully controlled study of behavioral processes. We base this on Calder, Phillips, and Tybout's (1983) recommendation that student subjects are appropriate when the objective of the research is theoretical in nature. This view is echoed by Kardes' (1996) when he states that student subjects are appropriate when “process generalization is more important than effect generalization” (p. 287).

**Perception Measures**

Measures of perceived quality, value and price were adapted from scales previously used in the pricing literature (Berkowitz and Walton 1980; Della Bitta Monroe and McGinnis 1981; Dodds, Monroe and Grewal 1991; Suri and Monroe 2003; Varki and Colgate 2001). Quality perceptions were measured using three items (“The product shown appears to be of” (1=No Quality at all, 7=Very High Quality), “The product shown is” (1=Extremely Undesirable, 7=Extremely Desirable), and “I think this product would deliver” (1=No Benefits at all, 7=Excellent Benefits). Factor analysis confirmed that these three items loaded on a single factor and the reliability for the quality scale was 0.9 and .91 for phone and car respectively. Accordingly, the average of the three scale items was used as a measure of quality perceptions. Value was measured using three items (“Considering the product’s overall quality in relation to its costs, the product represents” (1=No Value for Money, 7=Excellent Value for Money), “The product represents” (1=A Very Poor Buy, 7=An Excellent Buy), and “To what extent is the product worth its price” (1=Worth Very Little, 7=Worth a lot). Factor analysis revealed that all three items loaded on a single factor and the reliability of this scale was 0.94 for the phone data and 0.92 for the car data. Accordingly, the average of the three scale items was used as a measure of value perceptions. Price perceptions were originally measured using two scale items “The stated price is” (1=Very Low, 7=Very High) and “The stated price represents” (1=No
Sacrifice, 7=Very Great Sacrifice,). However, the second item ("sacrifice measure") was dropped because respondents indicated difficulty in understanding it. This was confirmed in a reliability check that revealed a Cronbach alpha of slightly less than 0.7 for both car and phone data. Hence, only the first item (direct question on price perceptions) was retained for further analysis.\(^1\) Potential covariates of product ownership, interest, and knowledge were not included because they were shown to have insignificant effects on value perceptions in a preliminary study (n=67).

**Manipulations and Procedures**

The comparative format involved showing alternatives side-by-side, with position of alternatives randomized to control for order of presentation effects. An example of a comparable product presentation is shown in Figure 1. The non-comparative format involved each alternative being evaluated in isolation of the other alternative. For the phone product, numeric comparison was accomplished by manipulating the quantitative attribute of number of cellular calling-package minutes (800 minutes vs. 600 minutes), whereas the non-numeric comparison was accomplished by manipulating plan type. In the case of the car, manipulation of the quantitative attribute involved a comparison of warranties (36K vs. 72K miles) and the non-quantitative attribute manipulation involved one alternative having a moon-roof and the other having remote keyless entry. The manipulation of odd vs. even price ends, along with the product-feature manipulations are shown in Table 3.

The experimental procedure involved presenting stimuli and response forms on computer-controlled workstations with two screens. After each student had entered their student ID, each experimental stimulus was displayed on the left-hand screen and response forms were presented on the right-hand screen. After subjects reviewed a product offer and made the relevant

\(^1\) Regressions were also performed using the individual scale items, and the substantive conclusions do not change.
responses, they could advance to the next offer at their own pace. Responses were collected instantaneously at a central server and collated for analysis according to student ID number.

**Manipulation Checks**

Checks were conducted on the price and product-feature manipulations for both the cell phone and car stimuli. ANOVA results show that, in the comparative treatment conditions, subjects correctly perceived feature differences between the cell phone models \[F(15,209) = 4.34; p < .000\] and the car models \[F(15,209) = 9.73; p < .000\]. Subjects in these conditions were also aware of manipulated price differences between the choice options for the cell phone \[F(15,208) = 11.54; p < .000\] and the car \[F(15,209) = 5.73; p < .000\] products. These results suggest that the experimental manipulations were successful in the intended manner. In addition, the researchers individually quizzed a number of randomly chosen subjects regarding the stimuli presentations, confirming that subjects were cognizant of the features of the offer and had taken the experiment seriously.

**ANALYSIS AND RESULTS**

Data were analyzed across each of the treatment effects individually to assess the main effects of different treatments on the Box-Cox values \((\lambda)\). These results are reported individually for each of the stimuli in Table 4. On examining Table 4, one notices that the estimates don't change appreciably by stimuli. As expected, perceived product quality has a positive effect on value perceptions and price has a negative effect (price estimate is positive, since the negative sign is already incorporated in Equations 1 and 3). Also, the Box-Cox parameter estimates are uniformly close to 1.² This result is stable across comparative and absolute (non comparative)

² Constructing a 95% confidence interval around each of the estimates given the standard errors, one can see that the value of 0 is not included.
product presentations; across comparable and non-comparable attribute differences; and across even and odd price ends.

**Analyzing Treatment Effects via Hierarchical Regression**

The Box-Cox approach can be adapted to determine the significance level of various treatments and determine how robust the value formation rules are to different experimental conditions. Accordingly, we re-analyzed the phone and car data via a hierarchical model in which λ was modeled as a linear, additive function of the individual factors that were controlled for in the study. Thus, λ was parameterized as follows:

\[
\lambda = \gamma_0 + \gamma_1 D_1 + \gamma_2 D_2 + \gamma_3 D_3,
\]

where:

- \(\gamma_0\) is the parameter that captures the base value of the Box-Cox parameter;
- \(\gamma_1, \gamma_2, \gamma_3\) are the parameters that capture the effect of the various treatments on the Box-Cox parameter (λ);
- \(D_1\) is a dummy variable that takes the value 1 when the presentation format is comparative (and 0 when the presentation format is absolute),
- \(D_2\) is a dummy variable that takes the value 1 when attributes are comparable (and 0 when the attributes are non-comparable);
- \(D_3\) is a dummy variable that takes the value 1 when prices are even (and 0 when prices are odd);

Results of this hierarchical regression for each of the stimuli are reported in Table 5.

Interestingly, these results show that none of the treatment effects had a significant effect on the Box-Cox parameter, except for the treatment effect of comparable or quantifiable attributes which had a marginally significant effect on the Box-Cox parameter value. The 95% confidence interval around the base value of the Box-Cox parameter clearly includes the value of 1. More importantly, the value of 0 is not included, thus ruling out the ratio or loglinear rule. It is
interesting to note that the value formation rule remains invariant even with completely different stimuli (phone service plan and automobile) and across different treatment conditions.

Model Comparison Tests

Since the linear and loglinear formulations are restricted cases of the more general Box-Cox model, the likelihood ratio test enables one to test for these special cases against the more general model formulation in which the Box-Cox parameter is unrestricted. If a restriction is valid ($\gamma_0 = 0$ in case of loglinear and $\gamma_0 = 1$ in case of linear), then the loglikelihood of the unrestricted Box-Cox model should not decrease appreciably. Conversely, if the restriction is not valid, then the loglikelihood should decrease appreciably (Greene 2003). In this case, the LR statistic of $-2*(L_u - L_r)$ is distributed chi-square with one degree of freedom because only one restriction is imposed ($\gamma_0 = 0$ or 1).

To conduct the LR test, we re-estimated the Box-Cox model of (4) with the hierarchical regression in (5) with the complete data, subject to the constraints of zero value for $\gamma_0$ (log-linear case) and one for $\gamma_0$ (linear case). The results are reported in Table 6. From Table 6, one can see that constraining the Box-Cox parameter to 0 reduces the fit significantly ($\chi^2 = 61.88$, p-value < .001 for phone data, $\chi^2 = 61.70$, p-value < .001 for car data). By contrast, constraining the Box-Cox parameter to 1 does not reduce fit significantly ($\chi^2 = .38$, p-value > .50 for phone data, $\chi^2 = .20$, p-value > .60 for car data).

In this context, the LR test provides clear evidence that a linear formulation (as specified by imposition of unity value for Box-Cox parameter) is a better, more parsimonious representation of the value formation process than the general model because it provides comparable model fit with one less parameter.
We also compare the three models (i.e., general model and two special cases) along Akaike Information Criterion (AIC, Akaike 1974) and Bayesian Information Criterion (Schwarz 1978). AIC is credited with choosing the model with the best predictive value (Atkinson 1980; Varki, Cooil, and Rust 2000), whereas BIC is credited with choosing the best scientific model (Rust et al. 1995; Varki, Cooil and Rust 2000; Woodroofe 1982). As one can see from the AIC and BIC criteria (lower values are better), it is evident that the restricted model favoring a linear formulation of value perceptions is the superior model. Thus, in contrast to the earlier efforts of Hauser and Urban (1986), we find clear evidence from our econometric approach that subjects are treating price as an attribute and integrating it into their value construction using the linear difference rule.

Segment Structure

Another advantage of using the Box-Cox approach is that it can be easily adapted in value research to study whether segments of consumers exist who follow one rule or the other. We examine this issue by positing two segments within a latent class framework and then estimating the Box-Cox regression within this latent class framework. If there are indeed two different segments, then the various model selection criteria such as BIC (Schwarz 1978) and AIC (Akaike 1974) should pick the two-segment model over the one-segment model estimated earlier.

The loglikelihood of this latent class version of the Box-Cox regression is given below in (6) in a format consistent with (4) to facilitate comparison.

\[
LL = \ln \left( \sum_{s=1}^{2} \theta_s \exp \left[ \left( -\frac{n}{2} \ln(2\pi) - n \ln \sigma_s - \frac{1}{2\sigma_s^2} \sum_{i=1}^{n} (y'_{oi} - y'_{oi} \beta_{sk})^2 + (\lambda_s - 1) \frac{r}{ \sum_{i=1}^{r} \ln(y_{oi}')} \right) \right] \right)
\]

where the additional notation is defined as follows:

\(\theta_s\) refers to the latent segments \(s=1, 2\);
\( \sigma_s \) represents the standard error in segment ‘s’;

\( y'_s \) refers to the Box-Cox transformed dependent variable for \( i \)th respondent in segment ‘s’;

\( x'_{sk} \) refers to the Box-Cox transformed independent variable for the \( i \)th respondent on \( k \)th attribute in segment ‘s’;

\( \beta_{sk} \) refers to the parameter that captures the effect of \( x'_{sk} \) on \( y'_s \); and

\( \lambda_s \) refers to the Box-Cox parameter value for segment ‘s’.

The above model was estimated in Gauss 5.0 for all the phone and car data, and results are provided in Table 7. Results for both the phone and car products clearly show that only one segment exists. The AIC and BIC value of the two-segment solution are worse than that of a one-segment solution (lower values are better). This is corroborated by the fact that the two-segment solution results in one segment size of close to unity, with the other being forced to zero. Thus, the data shows clear evidence of a single segment of consumers who perceive value as a net (linear) utility.

**DISCUSSION AND CONCLUSION**

Most marketing activity involves exchanges of perceived economic value, yet the manner in which perceptions of economic are formed is not clear. Some have argued that the value formation rule is linear and some have argued that it is ratio-form. This lack of clarity is also reflected in introductory textbooks in marketing.

It is this ambiguity or uncertainty about a construct of central importance to the field of marketing that prompted our investigation. Another reason for our investigation stems from our consulting experience where we have found managers applying different rules to value pricing.
and arriving at different “value” prices. The reason for this, we suspect, is the basic lack of consensus in the discipline itself.

However, we are not the first to attempt such an investigation. Srinivasan (1982) examined the issue theoretically, which Hauser and Urban (1986) followed up empirically. Unfortunately, Hauser and Urban did not obtain conclusive results. There are several points of difference between the approach of Hauser and Urban and that of ours. They examined valuations across product categories, whereas we consider valuations within a product category. Further, we study the value formation rule under different situations/conditions for two separate product categories. Hauser and Urban employ linear programming techniques whereas we apply a well-established econometric technique for analyzing the problem. This econometric technique is based on our insight that the ratio form can be written in log-linear form. Thus, we are able to compare both cognitive representations (linear and log-linear) as special cases of the more general Box-Cox model. Furthermore, we are able to exploit our econometric structure to explore whether there are different segments of consumers who follow different value formation rules.

The approach of using mathematical representations of cognitive processes has a rich history in decision theory and information processing (Anderson 1974). Given our general inability to directly observe cognitive processes as they occur within consumers’ minds, cognitive researchers have sought to characterize several perceptual and judgment phenomena with simple algebraic models (Anderson 1974). In marketing, for example, such algebraic models as the Theory of Reasoned Action (Ajzen and Fishbein 1980) have found great application. Such representations are referred to as paramorphic models which Dabholkar (1994, p. 113) explains as: “while such models are not equivalent to reality, they provide good explanations and predictions of real phenomena.”
In experiments designed exclusively to test for the customers’ value formation process, we find more evidence for the linear rule than the log-linear rule. Further, this rule exhibited stability across a variety of prominent evaluative contexts that previous research has identified as affecting consumer information processing activities. Specifically, it showed stability across consumers’ evaluation of different products (phone calling plan vs. car); whether alternatives offerings for each of those products were evaluated in isolation or relative to a competing alternative; whether the manipulated product attribute(s) differed according to a relatively easy-to-evaluate attribute (quantitative) or a relatively difficult-to-evaluate attribute (non quantitative); and whether prices of the alternative(s) were expressed in a form that allowed relatively easy computation (even price endings) or in a form that allowed relatively difficult computation (odd price endings).

The invariance of the value formation process is not necessarily inconsistent with the research in contingent information processing that suggests that different evaluation contexts evoke distinct evaluative heuristics among consumers. This is because it is possible that while consumers may adopt alternative heuristics to facilitate information acquisition and interpretation in various evaluative contexts, they may still use an invariant mental calculus for the determination of value.

Our finding of a linear difference value formation is consonant with some of the recent criticism (Smith and Nagle 2005a, 2005b) aimed at the consulting industry’s use of the ratio model to link the pricing of products and services to the value delivered by these products and services (e.g., Leszinski and Marn 1997; Marn, Roegner and Zwada 2004). In an article aimed at practitioners, Smith and Nagle (2005a, 2005b) note that in industry applications of the ratio model, a paintbrush that enables one to paint a house in half the time that a conventional brush
takes would, at double the price of a conventional brush, be assessed as providing value equivalent to that of the conventional brush. The authors consider this counterintuitive, and they point out that the reason for this counterintuitive result is the fact that the utility attached to the outcome of higher quality is not considered in industry applications of the ratio model. As Smith and Nagle note, in many applications the ratio model frequently “underestimates the value of the more differentiated products in a market and overestimates the value of the less differentiated products.” However, in a linear difference model (which Smith and Nagle recommend), such valuations are naturally incorporated when one considers the utility of quality and the disutility of price.

Given the need to conduct a carefully controlled experiment, we used student subjects based on Calder, Phillips, and Tybout (1983) argument that student subjects are appropriate when the objective of the research is theoretical in nature and Kardes’ (1996) support of student subjects as being appropriate when “process generalization is more important than effect generalization.” Thus, our use of student subjects for an initial exploration into the subject area of value formation process was considered justified. However, future researchers in the area of value research should seek to replicate our findings across other subject populations using the econometric approach articulated.

In addition, there are several other avenues for further research in this area. First, researchers could seek to determine whether there are systematic category effects on value formation rules. This was not fully explored by us given the number of factors that we needed to include in our study and the limited subject pool. Specifically, one could seek to explore whether experiential, search, and credence attributes have an effect on value formation. Second, one could seek to replicate our experiment with non-US populations to see if there are cultural differences in the
formation of value perceptions. This line of inquiry could be expanded to include whether value formation rules differ across various ethnic groups, given that basic marketing texts often draw reference to ethnic differences in consumers' valuations of quality and brand names (e.g., Pride and Ferrell 2000). Third, one could undertake studies to examine the effect of brand equity on value formation. In our experiments, we used known brands. However, if one were to replicate our experiment using both known and unknown brands, it would enable detection of any brand equity influence on consumers' formation of value perceptions. Such a study would be of considerable managerial interest. Lastly, as stated at the outset of our study, we focused on the pre-consumption stage of the value formation process of the consumer. Gardial et al. (1994) provide some evidence to suggest that judgments of value are impacted by consumption stage. Thus, future research could benefit from replicating our approach across the various stages of the consumption cycle to see whether consumption stage has an influence on the value formation process.

Conclusion

The value formation process has significant implications with respect to value pricing, choice, and the communication of value. In this research, our focus is on delineating the process by which consumers combine quality and price perceptions to form value perceptions. We identify two formation rules (ratio and net utility) in the literature that have been discussed in the past but without resolution as to which rule best represents consumers' value perceptions. In contrast to earlier studies, our study takes an econometric approach and shows how these two value formation rules can be seen as special cases of a more general formulation (Box-Cox model). Further, this approach allows value researchers to examine whether the value formation rules differ by segment. In our paper, we test all three formulations with experimental data.
collected under a variety of theoretically determined experimental conditions. The experimental data suggests that there is a single segment of consumers for whom the linear formation rule best describes how they construct their value perceptions from quality and price perceptions. This formation rule is found to hold across product categories as disparate as cell phone calling plans and automobiles. Accordingly, managers should consider dis-adopting the ratio rule in favor of the net utility rule when "value" pricing their products, since the ratio rule usually leads to underestimating the worth of their product's differentiation (as illustrated in earlier examples).

While limitations are inevitable in studying a variable of such vast scope, we see our study as providing an approach for value researchers to further explore the subject of how consumers assess value in different situations and contexts, across specific groups, cultures, and product-markets. Some possible research topics in value assessment are presented.
Table 1: Example of Value Formation Rule Affecting Choice

(Example reproduced from Hauser and Urban 1986, p. 459)

<table>
<thead>
<tr>
<th>Product</th>
<th>Utility</th>
<th>Price ('000)</th>
<th>U/P</th>
<th>Rank</th>
<th>U-P</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Improvement</td>
<td>.994</td>
<td>.6</td>
<td>1.7</td>
<td>3</td>
<td>.394</td>
<td>1</td>
</tr>
<tr>
<td>Landscaping</td>
<td>.657</td>
<td>.3</td>
<td>2.2</td>
<td>2</td>
<td>.357</td>
<td>2</td>
</tr>
<tr>
<td>Food Processor</td>
<td>.328</td>
<td>.08</td>
<td>4.1</td>
<td>1</td>
<td>.248</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 2: Simulation Study Results (Average over 100 replications)

**A: Data Generated Using Linear Difference Rule**

<table>
<thead>
<tr>
<th></th>
<th>Seeded Values/True Values</th>
<th>n (sample size) = 50</th>
<th>n (sample size) = 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Coefficient (a)</td>
<td>.6</td>
<td>.62 (.04)</td>
<td>.60 (.02)</td>
</tr>
<tr>
<td>Price Coefficient (β)</td>
<td>0.4</td>
<td>.41 (.03)</td>
<td>.40 (.02)</td>
</tr>
<tr>
<td>Box-Cox Parameter (γ)</td>
<td>1</td>
<td>1.03 (.16)</td>
<td>0.99 (.10)</td>
</tr>
</tbody>
</table>

**B: Data Generated Using Log-Linear (Ratio) Rule**

<table>
<thead>
<tr>
<th></th>
<th>Seeded Values/True Values</th>
<th>n (sample size) = 50</th>
<th>n (sample size) = 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Coefficient (a)</td>
<td>.6</td>
<td>.95 (.11)</td>
<td>.88 (.07)</td>
</tr>
<tr>
<td>Price Coefficient (β)</td>
<td>0.4</td>
<td>0.56 (.10)</td>
<td>.54 (.07)</td>
</tr>
<tr>
<td>Box-Cox Parameter (γ)</td>
<td>0</td>
<td>.29 (.55)</td>
<td>.44 (.35)</td>
</tr>
</tbody>
</table>

Note:

1. The negative effect of price is already incorporated into the functional form (refer to Equations 1 and 3 on page 9).

2. The numbers in parenthesis are the standard errors.
Table 3: Product Feature and Price Manipulations

### A. T-Mobile Telephone Calling Plan

<table>
<thead>
<tr>
<th></th>
<th>600 minute plan OR</th>
<th>800 minute plan OR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>unlimited calling</td>
<td>unlimited mobile-</td>
</tr>
<tr>
<td></td>
<td>to family members</td>
<td>to mobile calls</td>
</tr>
<tr>
<td>Odd Prices</td>
<td>$39.55</td>
<td>$49.67</td>
</tr>
<tr>
<td>Even Prices</td>
<td>$40.00</td>
<td>$50.00</td>
</tr>
</tbody>
</table>

### B. 2005 Toyota Scion 4-Door Hatchback

<table>
<thead>
<tr>
<th></th>
<th>36,000 mile Warranty</th>
<th>72,000 mile Warranty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR Keyless Entry</td>
<td>OR Tilt/Slide</td>
</tr>
<tr>
<td></td>
<td>System</td>
<td>Moon roof</td>
</tr>
<tr>
<td>Odd Prices</td>
<td>$12,355</td>
<td>$12,967</td>
</tr>
<tr>
<td>Even Prices</td>
<td>$12,350</td>
<td>$12,960</td>
</tr>
</tbody>
</table>
Table 4: Experimental Results (233 subjects)

A. Phone Plan Data

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Treatment 1 - Presentation</th>
<th>Treatment 2 - Attributes</th>
<th>Treatment 3 – Price Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comparative (side-side)</td>
<td>Absolute</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presentation</td>
<td>Presentation</td>
<td></td>
</tr>
<tr>
<td>$\lambda$</td>
<td>1.05 (.21)</td>
<td>1.07 (.22)</td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>.60 (.07)</td>
<td>.67 (.09)</td>
<td>.61 (.06)</td>
</tr>
<tr>
<td>Price</td>
<td>.21 (.08)</td>
<td>.14** (.09)</td>
<td>.47 (.08)</td>
</tr>
</tbody>
</table>

B. Car Data

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Treatment 1 - Presentation</th>
<th>Treatment 2 - Attributes</th>
<th>Treatment 3 – Price Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comparative (side-side)</td>
<td>Absolute</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Presentation</td>
<td>Presentation</td>
<td></td>
</tr>
<tr>
<td>$\lambda$</td>
<td>1.04 (.21)</td>
<td>1.08 (.22)</td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>.60 (.07)</td>
<td>.67 (.09)</td>
<td>.61 (.06)</td>
</tr>
<tr>
<td>Price</td>
<td>.21 (.07)</td>
<td>.14** (.09)</td>
<td>.46 (.08)</td>
</tr>
</tbody>
</table>

Note: The numbers in parenthesis are the standard errors
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Estimates for Phone Data</th>
<th>Estimates for Car Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \gamma_0 ) (base value)</td>
<td>1.10 (.16)</td>
<td>1.11 (.16)</td>
</tr>
<tr>
<td>( \gamma_1 ) (effect of absolute presentation format)</td>
<td>-.008 (.04)</td>
<td>-.006 (.04)</td>
</tr>
<tr>
<td>( \gamma_2 ) (effect of comparable attribute)</td>
<td>.09 (.04)</td>
<td>.10 (.04)</td>
</tr>
<tr>
<td>( \gamma_3 ) (effect of even price endings)</td>
<td>-.01 (.04)</td>
<td>-.008 (.04)</td>
</tr>
<tr>
<td>Quality</td>
<td>.60 (.05)</td>
<td>.60 (.05)</td>
</tr>
<tr>
<td>Price</td>
<td>.33 (.06)</td>
<td>.33 (.05)</td>
</tr>
</tbody>
</table>

Note: The numbers in parenthesis are the standard errors
### Table 6: Model Selection Tests

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Log Likelihood</th>
<th>Likelihood Ratio Test Statistic&lt;sup&gt;1&lt;/sup&gt;</th>
<th>BIC value&lt;sup&gt;2&lt;/sup&gt;</th>
<th>AIC value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A: Phone Plan Data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unrestricted Model (general Box-Cox model)</td>
<td>-317.88</td>
<td>--</td>
<td>657.46</td>
<td>643.76</td>
</tr>
<tr>
<td>Restricted Model ($\gamma_0 = 0$)</td>
<td>-348.78</td>
<td>61.88</td>
<td>713.93</td>
<td>703.56</td>
</tr>
<tr>
<td>Restricted Model ($\gamma_0 = 1$)</td>
<td>-318.07</td>
<td>0.38</td>
<td>652.49</td>
<td>642.14</td>
</tr>
<tr>
<td><strong>B: Car Data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unrestricted Model (general Box-Cox model)</td>
<td>-319.09</td>
<td>--</td>
<td>659.98</td>
<td>646.18</td>
</tr>
<tr>
<td>Restricted Model ($\gamma_0 = 0$)</td>
<td>-349.94</td>
<td>61.70</td>
<td>716.23</td>
<td>705.88</td>
</tr>
<tr>
<td>Restricted Model ($\gamma_0 = 1$)</td>
<td>-319.19</td>
<td>0.20</td>
<td>654.70</td>
<td>644.38</td>
</tr>
</tbody>
</table>

Note:

1. LR statistic is $\chi^2$ distributed with one degree of freedom because only one restriction is imposed. The .05 cutoff value for $\chi^2$ from the chi-square tables is 3.84.
2. In the BIC calculation, $n$ refers to the number of subjects (233) and $np$ refers to the number of parameters which are 4 in case of unrestricted loglikelihood and 3 in case of the two restricted models.
### Table 7: Search For Segment Structure

#### A: Phone Data

<table>
<thead>
<tr>
<th></th>
<th>2 segment solution</th>
<th>1 segment solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment size</td>
<td>0.999</td>
<td>.001</td>
</tr>
<tr>
<td>Lambda (Box-Cox Parameter)</td>
<td>1.09 (.13)(^a)</td>
<td>1.11 (.04)</td>
</tr>
<tr>
<td>Quality Coefficient</td>
<td>.61 (.05)</td>
<td>.86 (.04)</td>
</tr>
<tr>
<td>Price Coefficient(^b)</td>
<td>0.31 (.05)</td>
<td>0.90 (.04)</td>
</tr>
<tr>
<td>LL(^c)</td>
<td>317.88</td>
<td>317.89</td>
</tr>
<tr>
<td>Number of Parameters</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>BIC</td>
<td>684.82</td>
<td>657.46</td>
</tr>
<tr>
<td>AIC</td>
<td>653.76</td>
<td>643.76</td>
</tr>
</tbody>
</table>

#### B: Car Data

<table>
<thead>
<tr>
<th></th>
<th>2 segment solution</th>
<th>1 segment solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment size</td>
<td>0.999</td>
<td>.001</td>
</tr>
<tr>
<td>Lambda (Box-Cox Parameter)</td>
<td>1.09 (.15)</td>
<td>1.12 (.04)</td>
</tr>
<tr>
<td>Quality Coefficient</td>
<td>.61 (.05)</td>
<td>.87 (.04)</td>
</tr>
<tr>
<td>Price Coefficient</td>
<td>0.31 (.05)</td>
<td>0.90 (.04)</td>
</tr>
<tr>
<td>LL</td>
<td>319.0</td>
<td>319.09</td>
</tr>
<tr>
<td>Number of Parameters</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>BIC</td>
<td>687.09</td>
<td>659.98</td>
</tr>
<tr>
<td>AIC</td>
<td>656</td>
<td>646.18</td>
</tr>
</tbody>
</table>

Note. (a) Standard errors are reported in parentheses. (b) The negative effect of price is already incorporated into the functional form (refer Equations 1 and 3 on page 9). (c) Sample size is 233 in case of phone and 234 in case of car.
Figure 1: Car Stimuli Employed in Study

(Comparative Presentation Format, Comparable/Numeric Attribute, and Odd Prices)

2005 Toyota Scion xA
4-door Hatchback
Price: $13,467

2005 Toyota Scion xA
4-door Hatchback
Price: $12,855

- 1.5 Liter, 4-cylinder engine - 31 City/38 Hwy mpg
- Air Conditioning
- Power Windows, Door Locks & Mirrors
- Driver and Passenger Front Airbags
- 4-Wheel Anti-Lock Brakes (ABS)
- Pioneer AM/FM/6-disk CD Unit With 6-Speakers
- 72 Months/72,000 Miles Bumper to Bumper Warranty

- 1.5 Liter, 4-cylinder engine - 31 City/38 Hwy mpg
- Air Conditioning
- Power Windows, Door Locks & Mirrors
- Driver and Passenger Front Airbags
- 4-Wheel Anti-Lock Brakes (ABS)
- Pioneer AM/FM/6-disk CD Unit With 6-Speakers
- 36 Months/36,000 Miles Bumper to Bumper Warranty
REFERENCES


Janiszewski, Chris, and Marcus Cunha, Jr. (2004), "The Influence of Pricing Discount Framing


The University of Rhode Island started to offer undergraduate business administration courses in 1923. In 1962, the MBA program was introduced and the PhD program began in the mid 1980s. The College of Business Administration is accredited by The AACSB International - The Association to Advance Collegiate Schools of Business in 1969. The College of Business enrolls over 1400 undergraduate students and more than 300 graduate students.

Mission

Our responsibility is to provide strong academic programs that instill excellence, confidence and strong leadership skills in our graduates. Our aim is to (1) promote critical and independent thinking, (2) foster personal responsibility and (3) develop students whose performance and commitment mark them as leaders contributing to the business community and society. The College will serve as a center for business scholarship, creative research and outreach activities to the citizens and institutions of the State of Rhode Island as well as the regional, national and international communities.

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