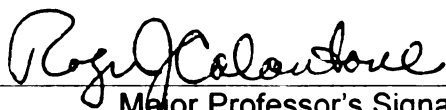This is to certify that the
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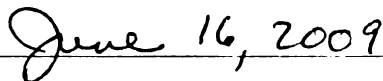INTERFACES

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PERCEPTION VERSUS REALITY: A COMPREHENSIVE EXAMINATION OF
BRAND QUALITY DYNAMICS, MARKET SIGNALING, AND PERFORMANCE
INTERFACES

By

Melike Billur Akdeniz

A DISSERTATION

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ABSTRACT

PERCEPTION VERSUS REALITY: A COMPREHENSIVE EXAMINATION OF
BRAND QUALITY DYNAMICS, MARKET SIGNALING, AND PERFORMANCE
INTERFACES

By

Melike Billur Akdeniz

Quality is described as one of the key forces leading to long-term success of products.
Given continuous changes in technology and market forces, firms find themselves under
increasing pressure to attain quality competencies. This dissertation contributes to the
understanding of the quality phenomenon, its drivers, and outcomes in the marketing
literature by focusing on the two frequently addressed dimensions of quality: objective
and perceived quality. It is posited that in general consumer's perception of quality does
not match the objective quality of a product. Yet, the dynamics of the relationship
between two types of quality still remain enigmatic for both researchers and managers.
Three studies in this dissertation provide a comprehensive examination of the relationship
between perceived and objective quality of brands from the firm's and consumer's
standpoints.

The first study adopts signaling theory and investigates the drivers of the
perceived quality of brands using aggregate level, archival data from the U.S. automobile
industry. The main objectives are to examine the dynamic relationship between objective
and perceived quality and to analyze the interaction effects between marketing-mix
signals and objective quality; and between similar and dissimilar type marketing-mix
signals on perceived quality.

The second study adopts the information asymmetry and signaling theory to examine the drivers and performance implications of the quality perception gap. The primary objectives of this study are to provide a new approach in understanding how changes in perceived versus objective quality affect the brand performance and how the marketing strategy of a brand influences the discrepancy between two types of quality. The aggregate-level data of the first study are used to test the hypothesized relationships.

The third study adopts cue diagnosticity and utilization frameworks to examine the effects of marketing cues and third party quality ratings on the consumer's perception of quality. The key objectives are to examine how the valence of a marketing cue strengthens the diagnosticity of other cues in quality evaluations and to investigate how quality ratings interact with marketing cues to influence perceived quality. A series of lab experiments are conducted to obtain primary data for the analyses.

This dissertation has specific contributions to the marketing literature. Substantially, it provides a new approach in understanding the antecedents and consequences of quality phenomenon. It conducts a longitudinal investigation of signaling theory with a comprehensive set of marketing-mix signals. It empirically examines the competing theoretical conjectures on the interaction between quality information and marketing-mix signals on perceived quality. Methodologically, it conducts econometric estimation on real industry data and statistical analyses on primary experimental data. Managerially, it provides implications for investment in a portfolio of signals and the alignment of marketing and quality strategy of brands.

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I am truly grateful to a very special person, Dr. Muzaffer Bodur, who actually prepared me for the PhD journey mentally and physically. During my masters studies at Bogazici University, she introduced me to the dynamics of marketing research, believed in me when I told her about my dream of pursuing a PhD, and encouraged me to follow my dreams in the U.S. I am also deeply grateful to Dr. S. Tamer Cavusgil for his

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of this journey, the light and love within him has continued to salute and honor the light and love within me. He held me together and had absolute confidence in me even when I completely lost my self-confidence. He has given a special meaning to everything in my life including this dissertation, to which his contributions from the inception till the end have been indispensable. I feel very blessed and special simply by his existence and I am genuinely grateful to him from deep in my heart.

Having completed my dissertation and doctoral studies, I am very happy that I followed my dream and I achieved it. All in all, words are just not enough to express my gratitude to all the people, whom I could name only a few here, for supporting me through this life-changing experience. Thank you!

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CHAPTER 1: DISSERTATION INTRODUCTION

Quality is described as one of the key forces leading to long-term success of products. The search for quality has been not only the most important consumer trend but also a key concern of the firms' strategy in 1980s (Parasuraman et al. 1985). Back then, research demonstrated that consumers are in demand of higher quality and firms find themselves under pressure to attain higher quality more than ever (Juran 1985; Takeuchi and Quelch 1983; Phillips et al. 1983; Zeithaml 1988). Due to quality's profound impact on consumption behavior, researching quality has remained a "hot" topic for businesses and researchers for over 30 years. The ever-increasing popularity of the quality concept in the extant marketing-literature is mainly due to numerous studies that have well-established the importance of quality in driving product and firm performance in the marketplace. Previous work shows that strategic benefits of increasing quality include increase in sales, profitability (Aaker and Jacobson 1994; Cho and Pucik 2005), market share (Kordupleski et al. 1993; Tellis 2009), return-on-investment (Anderson and Zeithaml 1984), stock market returns (Tellis and Johnson 2007), perceived quality (Hellofs and Jacobson 1999; Mitra and Golder 2006), and premium pricing (Tellis and Wernerfelt 1987; Zhao 2000).

A review of the literature suggests that the quality concept is highly elusive, complex, and multidimensional. It has been a major component of marketing, yet it is also inseparable from engineering, economics, and strategy. Quality has been defined and measured in so many ways across disciplines that there is a substantial amount of disparity regarding its meaning, components, and measurement. Garvin (1984) summarizes five different approaches to quality as 1) the transcendent approach of

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philosophy, 2) the product-based approach of economics, 3) the user-based approach of marketing, 4) the manufacturing-based, and 5) the value-based approaches of operations management. This dissertation focuses on the product- and user-based approaches of quality, where product-based quality is referred to as objective quality and user-based quality as perceived quality. Objective quality is defined as the actual superiority or excellence of a product, whereas perceived quality is defined as the consumers' subjective evaluation with respect to a product's overall superiority or excellence (Zeithaml 1988). Research suggests consumers' perceptions of quality do not usually match the objective quality of a product (Clark et al. 2007; Jacoby and Olson 1985; Parasuraman et al. 1985). It has been also demonstrated that objective quality has a significant impact on perceived quality (Boulding et al. 1993; Mitra and Golder 2006). However, it takes time for consumers' perceptions to adapt and reflect products' true quality (Bolton and Drew 1991a; Mitra and Golder 2006). There has been evidence that company managers also suffer from this delayed relationship as follows:

• *"One of the challenges we have as a company is that there is a perception lag from what we are actually doing in the market place in terms of vehicle quality, and where the customer perceives the quality of the vehicles to be."(GM spokesperson Dan Flores; Wall Street Journal 2004).*

• *"J.D. Power's 2008 Initial Quality Study finds Honda bested the Ford brand by a scant 2 problems per 100 cars, while Mercury actually bested Honda by two points. Ford's burden is to make the public aware of recent quality gains. Ford's president of Americas Mark Fields says, 'Our quality now matches Honda... For us to change perceptions is more of a challenge than building great products." (Consumer Guide Automotive 2009)*

The main objective of this dissertation is to conduct a comprehensive examination

of the relationship between perceived and objective quality of brands from both the

firm's and the consumer's standpoint. The three studies in this dissertation specifically

present three different perspectives on the subject matter. They also respond to interests

in the Marketing Science Institute's (MSI) most recent research priorities (2008-2010) in

the fields of marketing strategy and customer behavior. In the first study, the focal

construct is perceived quality and a longitudinal investigation of the impact of objective

quality and market signaling on perceived quality of brands is provided with evidence

from the U.S. automobile industry. In the second study, the focal construct is the quality

perception gap, which is defined as the gap between perceived and objective quality of a

brand. Using longitudinal data from the U.S. automobile industry, antecedents and

consequences of the quality perception gap are thoroughly examined. In the third study,

the focal construct is also perceived quality. Based on the data collected from lab

experiments, an analysis of the relationships between the objective quality, marketing-

related cues and the consumer's perception of quality is conducted. In the first two

studies, market-focused economic theories such as information asymmetry and signaling

theory constitute the theoretical backgrounds. In the third study, consumer-focused

behavioral theories such as cue utilization and diagnosticity form the basis for the

conceptual background. Regarding the data sources and methodology, this dissertation

pursues a multi-method investigation (i.e., fixed effects, instrumental variable estimation

via two-stage least squares, general linear models and planned contrasts via) using

primary (i.e., data collected in lab experiments) and secondary data (i.e., archival data

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from the U.S. automobile industry). The key objectives of each study and the contributions to the extant marketing literature can be summarized as follows.

Study #1: This study has three key objectives:

- to examine the dynamic relationship between objective and perceived quality at the brand level,

- to analyze the impact of marketing-mix signals on the relationship between objective and perceived quality,

- to test the interaction effects between various type marketing-mix signals on perceived quality.

In order to test the hypotheses, an aggregate-level panel dataset from multiple secondary sources (e.g., J.D. Power, Harris Interactive, Consumer Reports, Automotive News Market Data Book) is compiled. It is comprised of annual observations at the brand-level (i.e., automobile makes) in the U.S. automobile industry. In the automobile industry, data can be collected at different levels including firm, make, and model. Some firms (e.g., Ford Motor Co.) manufacture cars under different makes (e.g., Ford, Lincoln, Mercury), and under these makes (i.e., brand names) different models (e.g., Ford Focus, Mercury Milan) exist. The dataset includes 33 brand names that have existed between 1990 and 2007 in the U.S. automobile industry. A fixed-effects model of two equations accounting for unobserved heterogeneity over time is developed.

The specific contributions to the marketing literature are:

- it examines the dynamic relationship between perceived and objective quality of brands in the automotive industry,

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- on contrary to the previous studies, it focuses on a comprehensive set of marketing signals including price (e.g., Rao and Monroe 1989), advertising expenditures (e.g., Kirmani and Wright 1989), warranty (e.g., Boulding and Kirmani 1993), and brand reputation (e.g., Price and Dawar 2002),
- it empirically examines competing theoretical conjectures on the joint effects of the marketing-mix signals and objective quality on perceived quality with longitudinal, real industry data,
- it empirically tests theoretical propositions on the interaction effects between similar and dissimilar marketing-mix signals on perceived quality with longitudinal, real industry data,
- it provides managerial implications regarding the relationship between the marketing and the quality strategy of a firm (Teas and Agarwal 2000).

Study #2: This study has two key objectives:

- to examine the brand performance implications of the gap between perceived and objective quality in the long-term,
- to investigate how the marketing strategy of a brand affects the gap between perceived and objective quality over time.

The aggregate-level dataset of the Study #1 is used to test these relationships. The reasons to choose automobile industry in both studies include the fact that quality is an indispensable attribute of cars yet there is a large discrepancy in the objective and perceived quality among different brands. Furthermore, cars are categorized as complex and experience-related products, which make the discrepancy and the relationship between perceived and objective quality unequivocal and market signaling mechanisms

highly relevant. Instrumental variable estimation, via two-stage least squares (2SLS), is employed to resolve the potential endogeneity problem.

The specific contributions to the marketing literature are:

- it introduces a new "gap" model, which explains the discrepancy between perceived and objective quality at the brand level,

- it empirically examines the market signaling antecedents and performance consequences of the quality perception gap,

- on contrary to the previous literature, it empirical tests the proposed "gap" model with longitudinal and real industry data from the automotive industry.

Study #3: This study has two key objectives:

- given certain marketing-related cues, it examines how the existence and valence of a cue strengthens the diagnosticity of another cue in consumer's quality evaluations,

- given third party actual quality ratings and marketing-related cues, it investigates how these ratings interact with marketing-related cues and affect the consumers' quality perceptions.

A series of general linear models (GLMs) and planned contrasts are used to test the specified relationships based on the data collected via two different experiments conducted with a hypothetical car purchase scenario.

The specific contributions to the marketing literature are:

- it provides a parsimonious conceptual framework to examine the simultaneous impacts of multiple quality signals,

- it presents clear empirical evidence for the credibility and diagnosticity of brand reputation when presented with other marketing signals,

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- it empirically examines how the interaction between third party quality ratings and marketing strategy of a brand affects the consumers' quality inferences, and

Overall, this dissertation provides a variety of complementary perspectives on the dynamic relationship between perceived and objective quality of brands and the marketing interfaces of this relationship. In the first two studies, it draws on market-focused economic theories, whereas in the third study, it adopts behavioral theories from the consumer behavior literature. It pursues panel data estimation methods along with multivariate data analysis techniques using secondary as well as primary data. Since the overarching topic of this dissertation is relevant for both researchers and managers, the findings provide valuable implications for both parties. The organization of the dissertation is as follows. Next, Study #1, #2, and #3 will be presented in Chapter 2, 3, and 4, respectively. In Chapter 5, the overall conclusions along with further research avenues will be provided. The appendix, showing the automotive brands' perceived and objective quality trends in the U.S. automobile industry for the past 18 years and the list of the references conclude the dissertation.

CHAPTER 2: A LONGITUDINAL INVESTIGATION OF THE IMPACT OF OBJECTIVE QUALITY AND MARKET SIGNALING ON PERCEIVED QUALITY: EVIDENCE FROM THE U.S. AUTOMOBILE INDUSTRY

2.1 INTRODUCTION

"But perception is not always reality." Consumer Reports 2008.

Given continuous changes in technology and market forces, firms find themselves under more pressure to attain quality competencies. The importance of quality in determining a product's success or failure in the marketplace has been a high priority issue in the marketing literature. It is shown that increases in quality lead to an increase in several performance measures such as market share (Tellis et al. 2009), profitability (Cho and Pucik 2005), stock market returns (Tellis and Johnson 2007), and perceptions of quality (Mitra and Golder 2006). Among these performance measures, perception of quality has been of considerable interest to marketing scholars and managers (e.g., Aaker and Jacobson 1994; Helloffs and Jacobson 1999; Zeithaml 1988). A fairly important but relatively less examined antecedent of perceived quality is the actual quality of a product. Researchers acknowledge that there is a distinction between objective and perceived quality of a product. At the same time, they discuss that objective quality is influential on consumers' perceptions of quality through various mechanism both in the short-term and in the long-term.

In the marketing literature, one of the mechanisms explaining the difference as well as the relationship between objective and perceived quality is the information asymmetry paradigm. In complex and experience product categories, the relationship between perceived and objective quality is especially affected by the information asymmetry between the firms and customers (Erdem and Swait 1998; Rindova et al.

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2005). For example, in the automobile industry, consumer perceptions do not always match with the automaker's actual quality. GM spokesperson, Dan Flores explains this situation as follows: "One of the challenges we have as a company is that there is a perception lag from what we are actually doing in the market place in terms of vehicle quality, and where the customer perceives the quality of the vehicles to be" (Wall Street Journal 2004). The more difficult it is for consumers to assess product quality, the more time it takes for the actual quality levels to affect perceived quality. To communicate the quality of their products, firms often choose to use marketing-mix signals providing information external to the product, and consumers are likely to rely on market signaling to form quality perceptions.

There is very scarce evidence on the relationship between objective quality and perceived quality over time and with industry data in the marketing literature. This gap calls for more longitudinal studies with real industry data. In understanding the credibility of market signaling, previous research is limited to employing one or two marketing-mix signals, and therefore calls for the need to employ a wide range of marketing signals to provide a more complete picture. An important limitation in the existing literature is the investigation of the interaction effects between marketing signals on perceived quality. Since signals seldom operate in isolation, managing the investments on multiple marketing signals is a highly relevant topic for managers. The interaction effects between various signals have been tested mainly through experimental designs in the behavioral marketing research. Besides Basuroy et al.'s (2006) work in the motion pictures industry, no study has examined the dynamics of various signals and their interactions with real industry data. Another limitation in the prior research is the mixed theoretical

mechanisms and empirical tests on the interaction effects between marketing-mix signals and objective quality. This study attempts to address these limitations with the following objectives and contributions.

The objective of this study is three-fold. First, it examines the dynamic relationship between objective and perceived quality at the brand level. Second, it analyzes the impact of marketing-mix signals on the relationship between objective and perceived quality. Third, it tests the interaction effects between various marketing-mix signals on perceived quality. Based on these objectives, this study has three research questions: 1) does the objective quality of a brand affect its perceived quality?, 2) how do the interactions between the marketing-mix signals and objective quality affect the perceived quality of a brand?, and 3) how do the interactions between similar and dissimilar marketing-mix signals affect the perceived quality of a brand?

It is argued that quality generalizations across different product categories are difficult for both researchers and managers (Zeithaml 1988). In this study, the focus is on a single industry, which is the U.S. automobile industry. The reasons to choose automobile industry include the fact that quality is an indispensable attribute of cars yet there is a large discrepancy in the objective and perceived quality among different brands. Cars are categorized as complex, experience products, which make the relationship between perceived and objective quality more important and market signaling mechanisms more relevant. For these reasons, a panel dataset was compiled from multiple secondary sources (e.g., J.D. Power and Associates, Harris Interactive, Consumer Reports, etc.). It was comprised of yearly observations at the brand-level in the U.S. automobile industry (e.g., Ford, Honda, etc.) including all brands that have existed

between 1990 and 2007. To test the hypothesized relationships, this study develops a fixed-effects model of two equations accounting for unobserved brand-level heterogeneity over time.

This study has several contributions to the marketing literature. First, it examines the dynamic relationship between perceived and objective quality of brands in the automotive industry. Second, on contrary to the previous studies employing one or two marketing-mix signals, it focuses on a comprehensive set of marketing signals including price (e.g., Rao and Monroe 1989), advertising expenditures (e.g., Kirmani and Wright 1989), warranty (e.g., Boulding and Kirmani 1993), and brand reputation (e.g., Price and Dawar 2002). Third, it empirically examines competing theoretical conjectures on the joint effects of the marketing-mix signals and objective quality on perceived quality with longitudinal, real industry data. Fourth, it empirically tests theoretical propositions on the interaction effects between similar and dissimilar marketing-mix signals on perceived quality with longitudinal, real industry data. Finally, it provides managerial implications regarding the relationship between the marketing and the quality strategy of a firm (Teas and Agarwal 2000). Providing implications for the investment on a portfolio of marketing-mix signals, it explicates how some brands have higher perceptions of quality and some don't.

The analyses show that changes in objective quality affect the changes in perceived quality positively and over time. Moreover, the findings imply both complementary and substitute effects of marketing-mix signals on the relationship between objective and perceived quality. For example, one of the most impactful signals on perceived quality, price, when presented together with objective quality, weakens the

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impact of objective quality on perceived quality; whereas, warranty, also known as insurance signal, has a strengthening role on the influence of objective quality on perceived quality. Regarding the interactions between marketing-mix signals, it is found that since price and advertising by themselves are very strong signals of quality, they steal from each other's signaling power when presented together. The results also reveal the uniqueness of brand reputation being a richer signal than individual marketing-mix signals via the positive interactions between brand reputation and price, advertising, and warranty on perceived quality.

The organization of this study is as follows. First, it presents the conceptual background on product quality, information asymmetry paradigm, and signaling theory. Second, it develops research hypotheses. Third, it explains the data, empirical model, and the research method. Fourth, it presents the findings of the analyses. Fifth, it provides the discussion of the findings, with their implications for managers and researchers. Finally, it discusses the limitations of the study and future research avenues.

2.2 LITERATURE REVIEW AND HYPOTHESES

2.2.1 Conceptual Background on Product Quality, Information Asymmetry and Market Signaling

Quality is a highly ambiguous concept to define and measure. In marketing literature, Garvin (1984) summarizes five different approaches to quality as 1) the transcendent approach of philosophy, 2) the product-based approach of economics, 3) the user-based approach of marketing, 4) the manufacturing-based, and 5) the value-based approaches of operations management. This research focuses on the product- and user-based approaches

of quality, where product-based quality refers to the engineering related, innate characteristics of products and the user-based quality refers to a subjective assessment of quality. In the previous literature, the two types of quality are given various names, for example product-based quality is referred to as manufacturing, actual or mechanistic quality; whereas user-based quality is also known as humanistic or subjective quality (e.g., Holbrook and Corfman (1985). In this study, similar to Mitra and Golder (2006), product-based quality is referred to as objective quality and user-based quality as perceived quality of a product.

Researchers have emphasized the distinction between objective and perceived quality (e.g., Clark et al. 2007; Jacoby and Olson 1985; Mitra and Golder 2006; Parasuraman et al. 1985). In general, objective quality is defined as the actual superiority or excellence of a product, whereas perceived quality is defined as the subjective evaluation of consumers with respect to a product's overall superiority or excellence (Zeithaml 1988). Objective quality consists of the features that are present whether or not anyone realizes or acknowledges them (e.g., the engine, fuel economy, transmission of a car) and can be objectively measured most of the time. Perceived quality consists of the idiosyncratic judgment of those features from the customer's point of view and trial or experience is not always necessary to have a perceived quality of the product.

Zeithaml (1988) proposes that perceived quality of a product can be referred to a higher level of abstraction rather than a specific attribute, a global assessment that resembles attitude, a judgment usually made within a consumer's evoked set; and is different from objective quality of a product. Although there can be various mechanisms that cause a difference between the perceived and the objective quality of a product, this

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study focuses on the information asymmetry mechanism. According to the information economics paradigm, markets often have imperfect and asymmetrical structures (Shapiro 1982). Specifically, parties involved in a transaction have different amounts of information regarding the transaction causing an information asymmetry problem (Akerlof 1970; Bergen et al. 1992; Mishra et al. 1998).

In certain product categories, the relationship between perceived and objective quality is frequently affected by the information asymmetry between the firms and customers since firms possess more information about the quality of their products and control the degree of communicating those quality levels to the customers to a great extent. This causes consumers to have imperfect information about the product quality, uncertainty in the evaluation of quality levels, and risk regarding the actual purchase (Erdem and Swait 1998). There is a rich literature suggesting that consumers are imperfectly informed of the actual quality of complex, experience type products (i.e., the quality of these products can be evaluated with use and over time, or require high levels of specialized expertise to evaluate) since quality is hard to assess immediately in these product categories (Nelson 1970; Rindova et al. 2005; Tellis and Wernerfelt 1987; Tellis and Johnson 2007). As it becomes harder for consumers to assess product quality prior to purchase, they are more likely to rely on market signaling to form expectations about quality.

Drawing on the information economics paradigm, the main premise of the signaling theory is that parties to a transaction have asymmetric information regarding the transaction. Spence (1974) defines signals as manipulative attributes that deliver information about the characteristics of the agents (e.g., firms, products, customers) in the

market and the main purpose of the signaling theory is to determine whether a signal credibly conveys information (Spence 1973; Tirole 1988). In the marketing context, the actions that the firms can take to convey information about the unobservable product quality to the customer are referred to as signals (Rao et al. 1999). When a market is characterized by asymmetric information, it can serve as a competitive advantage for a firm to deliver true information to their customers. The asymmetric structure affects the strategies of all parties. For example, customers not having as much information as firms do try to assess the quality of the product based on the information provided by the firms, and this assessment usually influences the amount and the type of information firms decide to provide (Kirmani and Rao 2000).

Signaling theory posits a rational consumer expecting a firm to stick to the implicit commitment behind the signals because it would be economically unwise for the firm to not keep the bond promised by the signals (Aiken and Bousch 2006; Boulding and Kirmani 1993). If firms choose to "cheat" by promising high quality but deliver low quality, they will lose return on their product investments, future profits and reputation (Erdem and Swait 1998; Rao et al. 1999). The key mechanism at work is that sending a false signal puts the market agent in a worse situation than the situation where no signal is conveyed, because a false signal might imply a more unattractive probability distribution than no signal (Wernerfelt 1988). However, quality signals are credible only if firms do not find it economically profitable to deceive the customer by delivering false quality claims (i.e., by charging a high price for a low quality product). It is also possible that the low quality firms can mimic the actions of high quality firms (as long as signaling costs will reach a level that low quality firms cannot mimic any more) and

misinform the customers about its unobserved quality in order to capture some undeserved returns in the market. This leads to a situation, where the high quality firm wishes to inform customers truly whereas the low quality firm wishes to cheat them. Therefore, the customer in order to get the best value from his/her purchase should distinguish the high quality firm from the low quality one. At this point, customers can benefit from the signals in order to differentiate the high quality product from the low quality product if the high quality firm has an incentive (i.e., enhanced revenues in the future) to use a specific signal and the low quality firm has a disincentive (i.e., high opportunity costs, loss of revenues versus the case of no signaling) to use the same signal and consequently a "separating equilibrium" occurs. On contrary to this, if the market forces are not strong enough to encourage firms to choose different actions, a "pooling equilibrium" occurs, in which the customer cannot use the firm's signals to anticipate the product quality (Basuroy et al. 2006; Boulding and Kirmani 1993; Kirmani and Rao 2000; Spence 1973; 1974).

In marketing strategy, information asymmetry and market signaling have become well recognized aspects of firm-to-consumer relationships. To communicate the unobserved quality of the products to their consumers, firms often choose to use marketing-mix variables to signal the not so easily recognized quality attributes. Instead of directly addressing these attributes relevant to a product's quality (i.e., internal cues), signals provide information external to the product (i.e., external cues), through which consumers can make quality inferences. Several quality signals have received attention in the marketing literature. This study focuses on four of them; price (e.g., Rao and Monroe

1989), advertising (e.g., Kirmani and Wright 1989), warranties (e.g., Boulding and Kirmani 1993), and brand reputation (e.g., Price and Dawar 2002).

Price: In signaling theory, it is posited that costly signals can communicate the unobserved product quality credibly since these costs can be recouped in the future once the product's true high quality is discovered. They also exclude the sellers of low quality products because low quality sellers cannot recover these costs once the true quality is discovered. According to this premise, charging a high price is costly to the firm since it restricts demand (i.e., risks the future revenues) as long as customers are price insensitive and quality sensitive (e.g., Kirmani and Rao 2000). It is argued that price appears to function as a proxy to quality when the consumer has inadequate information about other intrinsic and extrinsic attributes (Zeithaml 1988). Rao (2005) asserts that, even if other attributes are available to consumers, consumers find making quality judgments based on price efficient since evaluating more direct information about quality across a variety of products is overwhelming (i.e., cognitive miser argument). In addition, a high price is said to signal high demand for excellent quality or high production costs associated with high quality (Erdem and Swait 1988) because it can be assumed that higher quality products cost more to produce in terms of materials and craftsmanship. Similar to this, higher prices can also serve as an assurance that a firm has no incentives to increase its sales amount by reducing investments that lead to quality products (Shapiro 1983).

In both the economics and marketing literature, price as a signal of product quality has a long history (e.g., Gabor and Granger 1966; Monroe 1973) with mixed findings. The relationship between price and perceived quality is found to be positive but of low magnitude (Lichtenstein and Burton 1989; Swan 1974), negative (Riesz 1978),

nonlinear (Peterson 1970; Peterson and Jolibert 1976), highly variable across individuals (Shapiro 1973), or variable across products being judged (Gardner 1971; Lichtenstein and Burton 1989); but in the end it has become irrefutable (Rao and Monroe 1989).

Advertising Expenditures: In the marketing literature, there have been different views of the role of advertising expenditures as a signal of product quality. More than three decades ago, Nelson (1970) suggests that quality information is generally provided by the level of advertising expenditures since providers of high quality products or services have more incentive to advertise than providers of low quality products or services regardless of the content of the advertisements. According to the information economics view, Nelson (1974) asserts that although the main purpose of advertising is selling more of a product, there should also exist a mechanism to make the selling aim of advertising convey information to the consumer. He makes a distinction between search (i.e., attributes that can be determined by inspection prior to purchase) and experience (i.e., attributes that are not determined prior to purchase) attributes of a brand. Kirmani and Rao (2000) state that the content of advertising conveys information about the search attributes whereas the execution of advertising (e.g., the quantity of advertising) conveys information about the experience attributes. According to this classification, consumers have more power over the truthfulness of the content of advertisement than its execution since consumers can inspect the advertised claims on search attributes more easily compared to experience attributes. This condition can give the firms more opportunity to make a false claim about the experience attributes. However, if a firm spends large amount of money on advertising, then the claims about the unobservable product quality should be true. Otherwise heavy advertising leads to trial and purchase revealing the true

quality, which can hinder repeat purchases and eventually the firm would not be able to recover the costs of advertising (Kihlstrom and Riordan 1984; Milgrom and Roberts 1986; Nelson 1974).

Similar to this idea, Kirmani and Wright (1989) identify the first and foremost role of advertising expenditure as an indicator of the firm's overall marketing effort enabling the consumer to infer about the product quality. Specifically, it is an indication of the perceived advertising effort, which buyers can interpret as a sign of the seller's commitment in a product's success (e.g., Kopalle and Lehmann 2001; Moorthy and Zhao 2000; Tellis and Fornell 1988). Investment in advertising signals that a firm is confident in its product's superior quality and in forecasting long-term profits (Conchar and Zinkhan 2002). Moreover, Erdem and Swait (1998) explicate that consumers perceive high advertising expenses as a firm's commitment to its brand since sellers of low quality brands cannot afford to spend a lot of money on advertising.

Warranty: Consumers rely heavily on the level of warranty as a reliable signal of product quality when they are not perfectly informed about the product (Blair and Innis 1998; Tan et al. 2001). The main purpose of a warranty is to modify the payoff to the consumer in case of a breakdown in order to increase the expected utility of owning the product (Spence 1974). The premise underlying the signaling function of a warranty is that sellers with low quality products have a higher chance of facing higher and more frequent repair costs for the same level of warranty than the sellers with high quality products (e.g., Boulding and Kirmani 1993). In other words, warranty fulfillment costs would be higher for poor quality products because they are likely to have higher failure rates (Rao et al. 1999). This leads the low quality firm to self-select a marketing strategy offering shorter

period and more limited warranties. Therefore, consumers can distinguish high quality products from the low quality products in terms of the duration and extent of warranty coverage (Kirmani and Rao 2000).

Warranty as a credible signal works when the provision of a high warranty by a firm with a low quality product raises the costs to a higher level than that of the firm with a high quality product. Otherwise, if the firm with the low quality product offers a high length of warranty with extended conditions and can offset higher costs of warranty fulfillment by charging a higher price, warranties become non-credible signals of quality (Grossman 1981; Lutz 1989). In the literature, mixed results have been found regarding the credibility of the warranty signal (Balachander 2001). Cooper and Ross (1985) discuss that there is not a consistent relationship between the warranty level and overall performance of the product. More specifically, reliable sellers may offer either more, less or equal warranties than less reliable sellers.

Brand Reputation: Under information asymmetry, brand name can serve as a quality assurance device through helping the firms to provide potential buyers with greater information to reduce evaluation uncertainties. Brand names are repositories for reputation that can ensure high quality firms to have a larger customer base since fewer customers will churn and more will be retained in the long-term (Rogerson 1983). Reputation is referred to as the historical notion that credibility is based upon the sum of past behaviors (Herbig and Milewicz 1993; Herbig and Milewicz 1995; Herbig et al. 1994). It deters the problems caused by information asymmetry through discouraging moral hazard as a sanctioning device and adverse selection as a signaling device. For example, brand reputation can deter moral hazard by acting as a sanctioning device or

reputation ratings from sources such as Consumer Reports help consumers to select higher quality goods, and that in turn allows a better matching of buyers and sellers and a more efficient market (Dellarocas 2005). If the consumers punish the brands with histories of bad behavior and if the present value of punishment exceeds the gains from cheating, consumers' threat on the firm's cheating behavior provides rational sellers with sufficient incentives to not repeat the same mistakes.

In essence, if the firm's assertion about a brand is one of high quality whereas the brand is indeed one of poor quality, consumers can punish the brand through stopping repeat purchase, spreading negative word-of-mouth, etc. (Montgomery and Wernerfelt 1992; Rao et al. 1999; Wernerfelt 1988). Therefore, brand reputation is a credible signal to the extent that a firm with a low quality product cannot recoup its investments to build a high reputation brand once its low quality is realized (Erdem and Swait 1998; Kirmani and Rao 2000). These investments can be called a "bond" between the brand and the customer and the greater the investment on building a reputation, the higher the bond and therefore the more credible the signal becomes (Ippolito 1990).

2.2.2 Hypothesis Development

2.2.2.1 The Relationship between Objective and Perceived Quality

In the marketing literature, there is a significant amount of studies showing that objective quality is one of the primary components of a brand's perceived quality (e.g., Boulding et al. 1993; Mitra and Golder 2006). In adverse selection contexts, it is generally assumed that the objective quality of a product is constant from one transaction to another (Kirmani and Rao 2000). However, there exist several product categories such as

appliances, computers, automobiles, etc. with varying objective quality levels over time (e.g., Clark et al. 2007; Klein and Leffler 1981; Tirole 1988). In the literature, it is discussed that the variation in objective quality impacts the variation in perceived quality through mechanisms such as consumers' observation, trial, and experience of the product, and quality signals (Archibald et al. 1983; Moorthy and Zhao 2000; Tellis and Johnson 2007).

The findings on the relationship between objective quality and perceived quality in multiple contexts can be summarized as follows. Rao and Monroe (1988) indicate that objective intrinsic product attributes affect the consumers' product quality assessments significantly. In a service context, Bolton and Drew (1991a) find that changes in consumers' perceptions of the service quality are sensitive to changes in actual service performance. In the context of durable goods, Moorthy and Zhao (2000) conclude that objective quality has a positive impact on perceived quality even in the presence of other marketing variables. In the context of new product quality expectations, Kopalle and Lehmann (1995) find that the objective quality of a product has a positive and greater impact on consumers' expectations than the advertised quality. Söderlund (2002) examines the changes in consumers' perceptions of quality along with changes in actual product performance levels and found a positive relationship. All these studies conclude with a significant and positive impact of objective quality on perceived quality in the same time period and mostly in experimental settings.

There is scarce evidence on the relationship between objective quality and perceived quality over time and with real industry data. Bolton and Drew (1991b) find that the effect of actual quality on the following period's perceived quality is significant

and positive; however smaller than the effect in the same period. In another lab experiment, Prabhu and Tellis (2000) indicate that providing actual quality information contributes to consumers' learning in the marketplace even higher than the market share information. Recently, Mitra and Golder (2006) explain the dynamic effects of the objective quality on perceived quality at brand level over time and with real industry data on multiple product categories. They find that there is a significant positive effect of objective quality on perceived quality over time where the long-term effect of quality is greater than the short terms effects of quality on consumers' perception of quality. Informational limitations due to asymmetric information, behavioral limitations due to bounded effort and cognitive ability, prominence of past experiences, word-of-mouth effects (e.g., Tellis and Gaeth 1988) are amongst the reasons that impede the changes on objective quality to be fully captured by changes in perceived quality instantly and that trigger significant delays in updating consumers' perceptions. In operations management literature, Narasimhan et al. (1993) examine how the actual quality of a product affects its perceived quality with the recognition that alterations in actual quality seldom have contemporaneous effects on consumers' perceptions. Furthermore, Narasimhan et al. (1996) investigate the relationship between the continuous quality improvements and the persistence of quality perceptions. In the light of previous research, it is expected that the current and the previous objective quality of a brand has a positive effect on its perceived quality and the latter effect is greater than the former effect. Thus, it is hypothesized that:

H1a: The objective quality of a brand affects its perceived quality positively.

H1b: The impact of the brand's earlier objective quality on its current perceived quality is positive and greater than the impact of the brand's current objective quality.

2.2.2.2 The Interaction Effects between Marketing-mix Signals and Objective Quality

on Perceived Quality: A Complementary and a Substitutive Perspective

Objective quality is an important determinant of a brand's perceived quality but it is not

the only determinant. As mentioned above, to communicate the actual quality of a

product to the consumers, firms often use marketing-mix variables as signals. Addressing

the first important limitation in the prior market signaling research, it empirically

investigates the influence of marketing-mix signals on the relationship between objective

and perceived quality with longitudinal data.

It is both managerially and academically relevant to understand how a

combination of marketing-mix signals and objective quality rating of a product affects its

perceived quality; and whether the existence of a marketing signal either intensifies or

weakens the effect of the objective quality. In the previous marketing literature, this topic

has been of interest to some researchers (e.g., Das et al. 2000). Conceptually, Kirmani

and Rao (2000) in their seminal piece on market signaling mention that the relative

importance of quality versus marketing for a firm's success has not been clearly set.

Later, Narasimhan and Mendez (2001) discuss that perceived quality is determined over

time by actual quality; however marketing-related factors such as price, advertisement,

and promotions can influence this relationship. Whereas, two decades prior to these

studies, in Klein and Leffler's (1981) model, it is asserted that firms that produce high

quality products use firm-specific capital such as advertising campaigns to convince

consumers about their quality and to retain them for future transactions. In a recent study

by Hennig-Thurau et al. (2006), it is addressed that producing a high quality product

simply is not enough for success but a firm needs to implement marketing activities to

inform and influence customers about the high quality. In this study, given the scarcity of prior theoretical and empirical research pertaining to the impact of marketing-mix signals on the relationship between objective and perceived quality, two hypotheses are proposed predicting both a substitutive and complementary relationship in a competing fashion.

A substitutive relationship between marketing signals and objective quality indicates a negative interaction effect on the perceived quality. The earliest support for a substitutive relationship comes from the empirical work by Albrecht (1981), following the theoretical contributions to signaling theory by Arrow (1973), Spence (1974), and Stiglitz (1975). The similarity between his framework and this research's framework is the type of signals employed and their interactions. In Albrecht's (1981) context, the education level represents an ideal observable signal to infer other unobservable traits of employees when employers lack information about job applicants. This is similar to the marketing-mix signals, which help consumers make inferences about unobserved product quality in this study's context. Moreover, the information level representing the amount of existing information that the employer has about the job applicant is similar to the objective quality ratings of products made publicly available by third party sources. On the contrary to the signaling theory's prediction that employers should depend on the applicant's education level, Albrecht (1981) finds that in the presence of both education and other external but relevant information, the positive effect of education decreased and the interaction effect between education and information level is negative. Later, this finding mostly influenced the development of marketing literature in understanding the joint effect of information provided by third parties (e.g., movie critics, quality ratings) and marketing signals on the marketing strategy of a firm. Recently, Basuroy et al. (2006)

examine the interaction effect between independent information (i.e., critics' review) and advertising and sequels in the motion picture industry. They find that critics' review can reduce the information asymmetry about the movie's quality and therefore when aligned together with the advertising or sequel strategy of a movie, it leads to a negative interaction effect on box office revenues.

In juxtaposition to the view above, a complementary relationship between marketing signals and objective quality indicates a positive interaction on the perceived quality. After Albrect (1981), Archibald et al. (1983) propose a hedonic assumption, which suggests that the correlation between marketing signals and perceived quality increases with the introduction of third party product reviews, and they analyze the interaction between published quality ratings and marketing signals such as price and advertising. The results show that in the presence of marketing and third party information signals, the effect on the quality of a product increased. The results further contemplate on the fact that third party product reviews are less frequently read by consumers; however price and advertisement signals are more pervasive, reaching customers easily, and changing their perceptions more frequently. Therefore, marketing strategy of a firm should be better aligned with its product quality and eventually both consumers and firms will benefit from this synergy. Recently, Chen and Xie (2005) have brought a comprehensive perspective to the interaction between third-party "infomediaries" and a firm's marketing strategy. The results indicate that the interaction of the independent, relevant information to a firm's products or services (i.e., third-party reviews) and a firm's marketing strategy has two conceptually different effects. First, the interaction will be negative since third party product reviews and marketing signals

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constitute a substitutive relationship and they weaken the consumer's need for each other effect (akin to Albrecht's view). Second, the interaction will be positive due to a complementary relationship between third party product reviews and marketing variables and they increase the effectiveness of each other (akin to Archibald et al.'s view).

Thus, based on the theoretical support by Albrecht (1981) and the first view in Chen and Xie (2005), it is hypothesized that the interaction between marketing-mix signals and objective quality can generate a substitution effect and a negative impact on perceived quality. Because, marketing-mix signals can serve as surrogates for the actual quality information, they provide short-cuts for the consumer to infer about the not so easily observed product quality attributes, and they eventually reduce the effectiveness of objective quality ratings. Thus, it is hypothesized that:

H2a: The interaction effect between marketing-mix signals and objective quality on perceived quality is negative.

Competing with H2a, based on the theoretical support by Archibald (1981) and the second view in Chen and Xie (2005), it is also hypothesized that the interaction between marketing-mix signals and objective quality can generate a complementary effect and a positive impact on perceived quality. Because, marketing-mix signals are a firm's tools to promote the actual quality attributes in a product and they are expected to accentuate the relationship between objective and perceived quality of a product through providing more aligned information with the quality strategy. Thus, it is hypothesized that:

H2b: The interaction effect between marketing-mix signals and objective quality on perceived quality is positive.

2.2.2.3 The Interaction Effects between Similar and Different Type Marketing-mix Signals on Perceived Quality

Addressing the second important limitation in the prior market signaling research, this study also empirically examines the interactions between marketing-mix signals on perceived quality in a longitudinal sense. Firms often use marketing-mix variables as signals of their product quality in the marketplace. However, signals seldom operate in isolation. Therefore an important concern is to understand how to manage the mix of marketing-signals. Understanding the conceptual and empirical nature of interactions between marketing-mix signals has received very limited attention in marketing literature (Basuroy et al. 2006; Kirmani and Rao 2000).

Bhattacharya (1980) categorizes signals into two groups as nondissipative and dissipative signals. He states that the term "nondissipative," used in the spirit of the usage in Rothschild and Stiglitz's (1976) or Michael Spence's term "contingent contract" or simply "costless signal," communicates the same notion that there is no "deadweight" loss, relative to the full information equilibrium, in the signaling equilibrium. Later, Rao et al. (1999), corresponding to Bhattacharya (1980), assert that signaling power can emerge from two sources as dissipative signals and nondissipative signals, where the former involves an up-front expenditure that will be forfeit if quality turns out to be lower than the claimed level and the latter does not involve any up-front expenditure but place only future profits at risk. Most recently, Kirmani and Rao (2000) categorize the signals into default-independent and default-contingent groups. Default-independent signals (akin to dissipative signals) involve the up-front expenditure of money whereas default-contingent signals are costless at the time the signal is transmitted (akin to nondissipative

signals). The essence of default-independent signals is that the firm plans to recover current signal expenditures through future profits. However, with default-contingent signals, future earnings depend on whether the firm's quality claims are credible or not.

Theoretically, Kirmani and Rao (2000) suggest that the nature of an interaction between two marketing signals is contingent on the types of the signals. Drawing on their framework, Basuroy et al. (2006) conjecture the interaction between two dissimilar type signals to be positive. The theoretical mechanism behind the positive effect is when two dissimilar signals come together, they convey the message that the firm has such confidence in its product that it not only incurs current expenditures but also makes credible commitments for future in order to communicate the unobserved quality. Compared to the perceived credibility of one type of signal, consumers are likely to perceive the existence of both types of signals more credible. Therefore, the existence of two dissimilar types of signals creates a complementary effect because they increase the effectiveness of each other. On the other hand, cue-consistency theory (Maheswaran and Chaiken 1991) predicts that when two similar signals come together, a negative interaction occurs. It is assumed that each signal by itself has its own credibility and this credibility is weakened when accompanied by another similar type signal. The existence of two similar type signals creates a substitutive effect, where a similar type signal reduces the effectiveness of another signal in the consumer's eye. In this study, based on Kirmani and Rao's (2000) typology, the theoretical conjecture suggests that the interaction effect between price and advertising expenditure and warranty and advertising expenditure are expected to be positive since price and warranty are default-contingent whereas advertising expenditure is a default-independent signal; whereas the interaction

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effect between price and warranty is negative since both are similar type. Thus, it is hypothesized that:

H3a: The interaction effect of two similar type marketing-mix signals on the perceived quality is negative.

H3b: The interaction effect of two different type marketing-mix signals on perceived quality is positive.

When it comes to brand reputation, Kirmani and Rao (2000) state that it is both a default-independent and default-contingent signal. It is a richer signal and qualitatively different from other individual marketing signals (Basuroy et al. 2006). Besides, according to the extant literature, the effects of mixed-signals can cause mixed findings and their credibility can be limited (Erdem and Swait 1998). This limitation sets the brand name/reputation as a product quality signal apart from individual marketing-mix variables since it embodies the cumulative effect of all past marketing strategies and actions (Wernerfelt 1988). Another view in the literature posits that brand reputation provides a higher level context affecting the interpretations of the other signals sent by the firm. For example, the price premium that the high reputation brands have, can be evaluated either as a return on reputation or as an incentive payment to induce quality maintenance (Shapiro 1983). Any individual marketing signal is evaluated, among other factors, via the reputation of the source by the consumers (Heil 1988). Thus, it is hypothesized that:

H3c: The interaction effect between brand reputation and each of the marketing-mix signals on perceived quality is positive.

2.3 DATA AND METHOD

2.3.1 Data

The dataset is comprised of yearly observations of the car brands in the U.S. automobile industry between 1990 and 2007. In general, previous research on product quality using secondary data has focused on multiple product categories (e.g., Helloffs and Jacobson 1999; Mitra and Golder 2006). However, it is argued that quality generalizations across different product categories are difficult for both researchers and managers (Zeithaml 1988). In this research, a specific industry is chosen as the research context to eliminate the variance in the conceptualization and operationalization of the objective and the perceived quality in various products; and to increase the internal validity accordingly. The main reasons to choose the automobile industry are three-fold. First, quality is an indispensable attribute of cars yet there is a large discrepancy in the objective and perceived quality among different brands. Second, cars are complex products with technical specifications not easily discernible to every consumer. Third, cars are generally categorized as high-involvement products and consumers are willing to spend more time and effort to evaluate every piece of information to buy the "right" car.

The data were compiled from multiple secondary sources as depicted in Table 2.1. The dependent variable in this research is perceived quality (PQ). Perceived quality scores were obtained from Harris Interactive's Equitrend brand equity data. In the Equitrend study, Harris Interactive conducts online surveys with 20,000 to 45,000 consumers aged 15 years or older to determine their perceptions of over 1,000 brands across 35 product categories since 1989. Harris's Equitrend data are popular in the industry and the academia, and have been used in the previous research (e.g., Aaker and

Jacobson 1994; Clark et al. 2007, 2008; Helloffs and Jacobson 1999; Mitra and Golder

2006). In this research, perceived quality of 33 auto brands measured on a 0-10 scale,

with "0" meaning poor and "10" meaning excellent quality is obtained from Equitrend

data.

The independent variables are objective quality and marketing-mix signals.

Objective quality ratings were obtained from J.D. Power and Associates' Initial Quality

Study (IQS). IQS surveys owners and lessees regarding the problems with their new

vehicles, and provides in-depth information on vehicle quality after 90 days of

ownership. The study includes quality comparisons by manufacturer, assembly plant,

model, and platform. Results are presented as a "number of defects-per-100 vehicles"

metric and they are also known as "things-gone-wrong" statistics. In the previous

literature, quality ratings from Consumer Reports are also used to operationalize the

construct of objective quality (Zeithaml 1988; Curry and Faulds 1986; Mitra and Golder

2006). In line with the literature on the use of this measure as an objective quality, there

exist reservations due to the fact that Consumer Reports actually reflect consumers'

subjective opinions on a number of attributes, which have caused conflicts among the

manufacturers, experts, researchers, and consumers. Therefore, this research used another

well-known measure of quality in the automotive industry reflecting the leading Japanese

philosophy where quality means "zero defects" and doing it right the first time (Zeithaml

1988). Moreover, the main aim is to capture the "out of box" quality of a car to

understand the actual engineering excellence of a product. Therefore, in the dataset,

objective quality of 33 auto brands is measured as the number of defects-per-100 vehicles

in the first 90-day of ownership provided from a well-known and credible third party

quality ratings agency. In this rating, higher numbers mean worse quality, in other words, objective quality is inversely measured.

Marketing-mix signals such as retail price, advertising expenditures, warranty, and brand reputation, constitute the other independent variables. The manufacturer suggested retail price (Price) data of the car brands were collected from Consumer Reports. Since the annual price information is provided at the model level, the price for the make level (i.e., brand level) was calculated by taking an average of the prices of different models under the same brand name. The annual advertising expenditure (AdvExp) data in million dollar amounts were obtained from TNS Media Intelligence through Ad$pender and Advertising Age, which deliver advertising expenditure information on brands across all media such as magazines, newspapers, network television, etc. The annual warranty (Warr) data for car brands were obtained from the Car Book by Jack Gillis (Douglas et al. 1993). In this book, a warranty rating index, which is a compound assessment of the basic, powertrain, corrosion warranties, deductibles, and transfer fees of each brand on a yearly basis is provided. The index gives the most weight to the basic and powertrain components of warranty and the higher numbers indicate better warranties.

Finally, the brand reputation (Rep) data were obtained from Consumer Reports. Although firm reputation has a long history and been measured by various independent sources, it is not as easy to find a reputation measure at the brand level as at the firm level. However, Consumer Reports is a well established source in providing car reliability brand reputations as independent third-party ratings.

Table 2.1: Measures and Sources of the Variables

Variables	Notation	Measure	Data Source
Perceived Quality	PQ	Scale of 0 - 10 (0: poor quality and 10: excellent quality)	Harris Interactive's Brand Equity Study
Objective Quality	OQ	Number of defects per hundred cars in t6he first 90-day of ownership	J.D.Power and Associates' Initial Quality Study
Retail Price	Price	The average of manufacturer suggested retail prices of all models under each brand.	Consumer Reports
Advertising Expenditures	AdvExp	Dollar amount (in millions) spent in all media	TNS Media Intelligence / Advertising Age
Warranty	Warr	A composite index including basic, powertrain warranty, corrosion warranties, deductibles, and transfer fees (larger numbers indicate higher	The Car Book by Jack Gillis
Brand Reputation	Rep	Scale of 1 - 5 (1: low reputation and 5: high reputation)	Consumer Reports
Controls Variables			
Age of the Brand	Age	Number of years passed since the brand's first launch	Automakers' corporate websites
Number of Dealerships	Dealer	The total number of dealers of a car brand in USA.	Automotive News Data Center
Country of Origin	COO	Dummy variable indicating nationality of the car brand	Automakers' corporate websites

Dyer and Hatch (2006), Adler et al. (1999), and Rhee and Haunschild (2006) used

Consumer Reports' ratings to measure brand reputation at the make level in the

automobile industry. In this research, reputation is measured on a 1-5 scale, 1 meaning

low and 5 meaning high reputation. The annual reputation scores for each model under

each brand name were averaged to find the overall brand reputation score.

As control variables, number of dealerships (Dealer), brand age (Age), and

country of origin (Coo) were included in the analyses. The annual data on the number of

dealerships of a car brand in USA were obtained from the Automotive News Data Center.

Brand age was operationalized as the number of years passed since the brand's first

launch and the data were collected from the automakers' corporate websites. Finally,

country of origin was operationalized as a dummy variable, the existing country of

origins in the data set are USA, Japan, Germany, Korea, UK, and Sweeden.

2.3.2 Empirical Model and Estimation

The empirical model in this research consists of two main equations: Equation 1 tests the

effects of the interactions between marketing-mix signals and objective quality on

perceived quality and Equation 2 tests the effects of the two-way interactions between

marketing-mix signals on perceived quality. For both equations, there exist yearly

repeated measures across the existing automobile brands in the dataset. On the basis of

the theoretical hypotheses, the first equation is defined as follows:

$$
\begin{aligned}
(1)\ PQ_{it} = {} & \beta_0 + \beta_1 OQ_{it} + \beta_2 OQ_{i,t-1} + \beta_3 Price_{it} + \beta_4 AdvExp_{it} + \beta_5 Warr_{it} \\
& + \beta_6 Rep_{it} + \beta_7 (Price * OQ)_{it} + \beta_8 (AdvExp * OQ)_{it} \\
& + \beta_9 (Warr * OQ)_{it} + \beta_{10} (Rep * OQ)_{it} + \beta_{11} Age_{it} + \beta_{12} Dealer_{it} \\
& + \delta dCoo_i + \gamma dYear_t + a_i + u_{it}
\end{aligned}
$$

In Equation 1, "i" and "t" denote the car brand and the observation year, respectively. So, for brand "i" at year "t", PQ denotes the perceived quality, OQ denotes objective quality, and Price, AdvExp, Warr, Rep denote the average manufacturer suggested retail price, advertising expenditures in million dollars, warranty index, brand reputation, respectively. The interaction effects between the marketing mix-variables and objective quality are also added to Equation 1. Regarding the controls, Age denotes the brand age, Dealer denotes the brand's total number of dealers in the U.S., Coo represents the dummy variables for each country of origin in the data set; Year represents the dummy variables for each year. Finally, "a_i" captures all unobserved, time-constant factors that affect the PQ and "u_{it}" is the idiosyncratic error term. Equation 2 assesses the interaction effects of the marketing-mix signals on perceived quality as depicted below:

$$
\begin{aligned}
(2)\ PQ_{it} = \ &\beta_0 + \beta_1 OQ_{it} + \beta_2 OQ_{i,t-1} + \beta_3 Price_{it} + \beta_4 AdvExp_{it} + \beta_5 Warr_{it} \\
&+ \beta_6 Rep_{it} + \beta_7 (Price * AdvExp)_{it} + \beta_8 (Price * Warr)_{it} \\
&+ \beta_9 (Price * Rep)_{it} + \beta_{10} (AdvExp * Warr)_{it} \\
&+ \beta_{11} (AdvExp * Rep)_{it} + \beta_{12} (Warr * Rep)_{it} + \beta_{13} Age_{it} \\
&+ \beta_{14} Dealer_{it} + \delta dCoo_i + \gamma dYear_t + a_i + u_{it}
\end{aligned}
$$

The only difference in Equation 2 is the inclusion of the interaction terms between marketing-mix signals rather than the interaction effects between the marketing-mix signals and the objective quality. First, these equations were estimated using pooled OLS (POLS) regression models. One major drawback of this method is that it cannot produce consistent estimators of βs unless the assumption of no correlation between the unobserved effect "a_i" and the independent variables "x_{it}" holds. According to ordinary least squares (OLS) estimation, it is assumed that the composite error term $v_{it} = a_i + u_{it}$ is

uncorrelated with "x_{it}" for OLS to consistently estimate the regression parameters (βs).

So, in Equation 1 and 2, even if the idiosyncratic error term (u_{it}) is uncorrelated with

"x_{it}", POLS will be biased and inconsistent if "a_i" and "x_{it}" are correlated. This possible

resulting bias is called heterogeneity bias, which occurs from the omission of a time-

constant variable in the regression equation (Wooldridge 2003). One way to take into

account this bias occurring from unobserved effects in the regression equations is to first-

difference the regression equations, where "a_i" will not appear anymore. However, in this

study, first-differencing will cause a huge decrease in the number of observations due to

the unbalanced nature of the dataset. Therefore, in the second step, Equation 1 and 2 are

estimated using fixed-effects regression models to account for the brand-level unobserved

heterogeneities. Fixed effects estimators (i.e., within estimator) are POLS estimators that

are based on time-demeaned variables. Since fixed-effects models cannot estimate the

parameters of time-constant variables like country of origin and year dummies as well as

the variables whose change across time is constant like age of the brand, the control

variables will drop out from Equation 1 and 2.

2.4   RESULTS

Table 2.2 presents the Pearson pairwise correlations with significance levels and the

descriptive statistics of the variables included in the analyses. Table 2.3a and 2.3b present

the results of POLS and fixed-effects models, respectively. It is seen that parameter

estimates in fixed-effects models are different from POLS models since the unobserved

heterogeneity is accounted for in fixed effects estimations. Results are presented for both

models for comparison purposes. However, for the hypothesis testing purposes fixed-effects results in Table 2.3b are used since they take into account the potential unobserved confounding effects such as the segment of the brand, competitive intensity, etc. on the existing parameter estimates.

Model 1 includes the effects of current period and one period-lagged objective quality on perceived quality. Results of Model 1 support the findings in the extant literature that an increase in the current period and one period lagged objective quality leads to an increase in the perceived quality of a brand where the latter effect is greater than the former one ($\beta = -0.0026$ and $\beta = -0.0039$, $p < 0.01$, respectively). The negative sign in front of the parameter estimates is due to the fact that objective quality is measured as the number of defects in this study. That means, as the number gets higher the objective quality of the brand worsens. Therefore, while evaluating the parameters of objective quality at time t and t-1, the numbers need to be compared in absolute values. These results are consistent across fixed-effects and POLS estimations with higher parameters in POLS results as expected. According to Model 1 results, both H1a and H1b are supported. For further analysis, more lags including second, third, fourth, and fifth lag of objective quality are inserted into the model; however no significant results are found.

Next, Model 2 and 3 are developed to incorporate the interaction effects along with the main effects in the regression equations. In order to calculate the interaction effects, the variables entering the interaction term are mean-centered to resolve potential multicollinearity and to eliminate the possibility of interpreting interaction effects at the nonexistent values of the variables (e.g., the impact of objective quality on perceived

Table 2.2: Descriptive Statistics and Correlations

Variable	Perceived Quality	Objective Quality	Price	Advertising Expenditure	Warranty	Brand Reputation	Age of the Brand	Number of Dealerships
Perceived Quality	1.000							
Objective Quality	-0.624***	1.000						
Price	0.659***	-0.309***	1.000					
Advertising Expenditures	-0.070	0.004	-0.216***	1.000				
Warranty	-0.161***	0.012	0.223***	-0.140***	1.000			
Brand Reputation	0.194***	-0.118	0.135***	0.180***	0.268***	1.000		
Age of the Brand	0.022	0.100**	0.102**	0.301***	-0.185***	-0.226***	1.000	
Number of Dealerships	-0.189***	0.069	-0.352***	0.549***	-0.402***	-0.304***	0.572***	1.000
# of obs.	365	417	571	548	566	533	581	577
Mean	6.79	133.1	32,987.65	218.1	1,109.98	3.49	60.43	1,260.71
Std. Dev.	0.76	38.62	16,750.08	199	258.72	0.74	26.37	1,213.12
Minimum	3.92	54	9,721	0.6	648	1.71	1	30
Maximum	8.6	333	108,862	1,022.2	2,154	4.91	105	4,850

*, **, *** indicate a significance level of < 0.10, < 0.05, and < 0.01, respectively.

quality when price equals zero) (Wooldridge 2003). Moreover, price, advertising expenditures, and warranty entered into the equation in natural log forms. Model 2 incorporates the marketing-mix signals and their interactions with objective quality. It is found that while price ($\beta = 0.270$, $\rho < 0.05$), advertising ($\beta = 0.154$, $\rho < 0.01$), and reputation ($\beta = 0.019$, $\rho > 0.10$) have a positive effect on perceived quality, warranty ($\beta = -0.067$, $\rho > 0.10$) has a negative effect; and only price and advertising expenditures impact the perceived quality of a brand significantly. In POLS estimation, the directionality of the main effects of the marketing signals are the same; however they all significantly impact perceived quality with higher effect sizes. When it comes to the interactions of these signals with objective quality, similar to the evaluation in Model 1, the signs of the interaction effects have to interpreted in the opposite way since objective quality variable is measured reversely. Model 2 reveals that, except the interaction between warranty and objective quality, all the other interaction effects between marketing-mix variables and objective quality have negative effects on perceived quality. The interactions between price and objective quality, and advertising expenditures and objective quality deteriorate the perceived quality of a brand significantly ($\beta = 0.005$, $\rho < 0.01$ and $\beta = 0.002$, $\rho < 0.10$, respectively). However, the interaction effect between warranty and objective quality enhances the perceived quality significantly ($\beta = -0.004$, $\rho < 0.10$). Finally, the interaction effect between reputation and objective quality is also found positive but insignificant ($\beta = -0.001$, $\rho > 0.10$). Therefore, the results mostly support the substitutive effects of the marketing-mix signals (H2a) when they come together with the objective quality ratings except in the case of warranty, which complementarily accentuates the impact of objective quality on perceived quality (H2b).

Table 2.3a: Perceived Quality Pooled OLS Models

Variables	Model 1	Model 2	Model 3	Model 4
Objective Quality$_t$	-0.008 ***	-.0054 ***	-.0034 **	-.0034 **
	(0.0019)	(.0019)	(.0016)	(.0014)
Objective Quality$_{t-1}$	-0.011 ***	-.0052 ***	-.0043 ***	-.0056 ***
	(0.0016)	(.0016)	(.0015)	(.0012)
log (Price$_t$)		1.328 ***	1.211 ***	.615 ***
		(.1076)	(.1130)	(.1018)
log (AdvExp$_t$)		.229 ***	.259 ***	.307 ***
		(.0440)	(.0483)	(.0453)
log (Warr$_t$)		-.414 ***	-.365 ***	-.320 **
		(.1228)	(.1357)	(.1599)
Rep$_t$		.130 **	.113 *	.003
		(.0569)	(.0670)	(.0632)
log (Price$_t$) * Objective Quality$_t$		.007 **		-.003
		(.0029)		(.0023)
log (AdvExp$_t$) * Objective Quality$_t$		.002		-.002
		(.0018)		(.0014)
log (Warr$_t$) * Objective Quality$_t$		-.008 *		.0005
		(.0043)		(.0037)
Rep$_t$ * Objective Quality$_t$		-.0004		-.003 **
		(.0014)		(.0012)
log (Price$_t$) * log (AdvExp$_t$)			-.318 ***	-.253 ***
			(.0627)	(.0552)
log (Price$_t$) * log (Warr$_t$)			1.022 ***	.095
			(.3714)	(.4188)
log (AdvExp$_t$) * log (Warr$_t$)			.049	-.137
			(.1790)	(.1537)
log (Price$_t$) * Rep$_t$			-.167	-.025
			(.1147)	(.1057)
log (AdvExp$_t$) * Rep$_t$			$1.82*10^{-6}$	.014
			(.0594)	(.0477)
log (Warr$_t$) * Rep$_t$			.090	.459 ***
			(.1530)	(.1297)
Age of the Brand				.003 ***
				(.0011)
Number of Dealerships				-.0002 ***
				(.00004)
Japan				-.21 **
Germany				.27 ***
Korea				-1.18 ***
UK				.11
US				-.23 *
Adjusted R-squared	*.54*	*.70*	*.73*	*.85*
Number of obs.	*288*	*270*	*270*	*270*

Table 2.3b: Perceived Quality Fixed Effects Models

Variables	Model 1	Model 2	Model 3	Model 4
Objective Quality$_t$	-.0026 *** (.0007)	-.0025 *** (.0008)	-.0020 *** (.0007)	-.0022 *** (.0008)
Objective Quality$_{t-1}$	-.0039 *** (.0006)	-.0024 *** (.0007)	-.0024 *** (.0007)	-.0024 *** (.0007)
log (Price$_t$)		.270 ** (.1133)	.359 *** (.1134)	.349 *** (.1144)
log (AdvExp$_t$)		.154 *** (.0386)	.216 *** (.0482)	.225 *** (.0493)
log (Warr$_t$)		-.067 (.1055)	-.147 (.1129)	-.098 (.1237)
Rep$_t$		.019 (.0368)	.026 (.0398)	.022 (.0408)
log (Price$_t$) * Objective Quality$_t$		.005 *** (.0016)		.003 * (.0014)
log (AdvExp$_t$) * Objective Quality$_t$		.002 * (.0009)		.002 * (.0009)
log (Warr$_t$) * Objective Quality$_t$		-.004 * (.0022)		-.003 * (.0013)
Rep$_t$ * Objective Quality$_t$		-.001 (.0007)		.0003 (.0007)
log (Price$_t$) * log (AdvExp$_t$)			-.344 *** (.0753)	-.319 *** (.0790)
log (Price$_t$) * log (Warr$_t$)			.416 (.2983)	.309 (.3217)
log (AdvExp$_t$) * log (Warr$_t$)			.065 (.1024)	.033 (.1060)
log (Price$_t$) * Rep$_t$			.130 ** (.0624)	.117 * (.0666)
log (AdvExp$_t$) * Rep$_t$			.007 (.0289)	.007 (.0293)
log (Warr$_t$) * Rep$_t$			.235 *** (.0779)	.216 ** (.0846)
R-squared within	.69	.74	.77	.77
R-squared between	.63	.50	.60	.56
R-squared	.42	.38	.50	.46
Number of obs.	288	270	270	270

In Tables 2.3a and 2.3b:
. *, **, *** indicate a significance level of < 0.10, < 0.05, and < 0.01, respectively.
. Standard errors in parentheses.
. Year dummies are included in each model during estimation; the results are not reported due to space constraints.

The directionality and significance of these findings is consistent across POLS estimation.

Next, Model 3 results indicate the interactions between substitute and complementary marketing-mix variables. First, the interaction between two similar signals is expected to have a negative impact on perceived quality. However, it is found that the interaction effect between price and warranty is positive and not significant ($\beta = 0.416$, $\rho > 0.10$). Therefore, H3a is not supported. Second, the interaction effect between two dissimilar signals is expected to have a positive impact on perceived quality. In Model 3, it is found that the interaction effect between price and advertising is negative and significant ($\beta = -0.344$, $\rho < 0.01$) and the interaction effect between advertising and warranty is positive but insignificant ($\beta = 0.065$, $\rho > 0.10$). Therefore, H3b is not supported. Finally, the interaction effects between marketing-mix signals and brand reputation are expected to be positive due to the richer signaling properties of brand reputation. The results show that the interaction effect between price and reputation is positive and significant ($\beta = 0.130$, $\rho < 0.05$), between advertising and reputation is positive but insignificant ($\beta = 0.007$, $\rho > 0.10$), and between warranty and reputation is positive and significant ($\beta = 0.235$, $\rho < 0.01$). Indeed among the three interactions, warranty and reputation has the greatest effect size. Therefore, H3c is supported. In the POLS results, the directionality of the estimates look similar but in terms of the effect sizes and significance levels they demonstrate some differences from the fixed-effects results regarding the interaction between price and warranty (positive and significant estimate); price and reputation (negative estimate), and warranty and reputation (insignificant estimate). Overall, in Model 3, no support is found for the theoretical

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conjectures between similar and dissimilar signals; however there was significant support

for the brand reputation's characteristics as a higher level and qualitatively different

signal from individual marketing-mix signals.

Model 4 shows the results of a complete model specification, which reveals all the

hypothesized relationships together. Similar to the results stated above, the fixed-effects

full model results indicate support for H1a, H1b, partial support for H2, and support for

H3c. The full model (Model 4) in POLS estimation allows us to include the control

variables. The results reveal that the age of a brand has a positive impact ($\beta = 0.003$, $\rho <$

0.01) whereas the size of a brand's dealership network has a negative impact on

perceived quality ($\beta = - 0.0002$; $\rho < 0.01$). Also, the dummy variables for country of

origins showed that German brands have the highest contribution to the perceived quality

of the car ($\beta = 0.27$; $\rho < 0.01$) and Korean brands affect the consumer's perception of the

car, negatively ($\beta = - 1.18$; $\rho < 0.01$) significantly. Overall, these results both lend support

to previous findings in the literature and provide some unexpected support for some

"counterintuitive" explanations, which will be further discussed in the next section.

2.5   CONCLUSIONS AND DISCUSSION

Using longitudinal, brand-level data on 33 automotive brands that have existed in the

U.S. automobile industry between 1990 and 2007, the main purposes of this research are

to understand the dynamic relationship between objective and perceived quality and the

impact of market signaling on perceived quality. Based on these purposes, three research

questions are: 1) how does the objective quality of a brand affect its perceived quality, 2)

how do the interactions between the marketing-mix signals and objective quality affect

the perceived quality of a brand, and 3) how do the interactions between similar and dissimilar marketing-mix signals affect the perceived quality of a brand. The findings to answer these questions present several interesting conclusions and implications for managers and researchers.

First, there is a significant and positive relationship between the objective quality and perceived quality of a car brand. The difference and the interaction between two types of quality have been of great interest to company managers. Consumer Reports' 2008 Car Brand Perception Survey results revealed that consumers' views do not accurately reflect the automaker's actual record. As an example, although Mercedes-Benz was placed 33rd out of 36th in Consumer Reports' actual quality ratings the brand was placed in top five according to consumers' perception of the car quality. As well as these differences can be attributed to many factors, this study adopts the information asymmetry paradigm between automakers and consumers in terms of the not so easily observed car quality attributes due to the cars' being complex and experience products and this paradigm is supported well in the results. Similar to the extant literature (e.g., Boulding et al. 1993; Mitra and Golder 2006; Parasuraman et al. 1985), it is found that although there is a positive impact of the changes in objective quality on perceived quality, the effect size is not large. In the same time period, a decrease of 10 defects per hundred cars (i.e., objective quality increases) leads to an increase of only 0.02 in the rating of perceived quality on a scale of 1 to 10. The results also support the findings in the previous literature regarding the fact that the rate of change in perceived quality is much slower than the rate of change in objective quality (e.g., Mitra and Golder 2006). Significant results are found only for the effect of one period-lagged objective quality on

perceived quality, which turned out to be larger than the contemporaneous effect (i.e., a

decrease of 10 defects per hundred cars leads to an increase of 0.04 in the next year's

perceived quality rating). Ford's president for the Americas, Mark Fields, in Wall Street

Journal in Oct. 2008, referred to the efforts in trying to close the quality gap with

Japanese brands. He emphasized that although some of the Ford's models are equal to

Japanese auto makers with respect to quality to change the current perceptions takes time.

The results of this study with respect to the main effects of marketing-mix signals

on perceived quality provide interesting insights for the managers. It is found that price

and advertising expenditure signals affect perceived quality positively and very

significantly whereas warranty has a negative and insignificant impact and brand

reputation has a positive and insignificant impact. For both the role of price and

advertising expenditure, the previous literature has addressed mixed findings. This study

supports them as credible signals, which are frequently used by consumers to make

quality judgments about cars. However, it is found that warranty and brand reputation are

not as credible as price and advertising to affect consumers' perceptions about car brands.

Especially, in the case of warranty, it has a negative impact on perceived quality. This

result is counterintuitive to the signaling hypothesis in terms of warranty's being a

credible signal for the consumer to differentiate the high quality product from the low

quality product (e.g., Boulding and Kirmani 1993). The rationale appears to be that if the

brand is already a high quality one, it does not necessarily offer more than the industry

average warranty to convince the customer about its quality. If it does so, consumers are

more likely to perceive the brand advertising its quality based on the warranty and trying

to distinguish itself from other brands in terms of the quality rather than emphasizing the

insurance role of warranties against failure (Cooper and Ross 1985; Balachander 2001). Related with this, in April 2008 issue of Consumer Reports, the survey results of more than 8,000 readers in December 2007 revealed that extended warranties only sell expensive "peace of mind" for future repairs that probably will not occur and 75 percent of all respondents did not think it is a good value.

Second, the interaction of the marketing signals and objective quality offers intriguing conclusions about the competing theoretical conjectures and the brands' marketing strategies. In the U.S. automobile industry, companies employ several marketing-mix strategies to change the consumers' perceptions about the actual quality. For example, based on the notion that consumers are embracing more expensive products, GM increased the average sale price of Cadillac CTS sedan by $8,000 and a price tag of $37,000 was set for the Buick Enclave, $14,000 more than Rendezvous, which it replaced (BusinessWeek 2008). Joel Ewanick, Hyundai director of marketing, explained that many car buyers do not believe the data indicating that Hyundai's quality is ahead of some Japanese automakers even when presented with the information from J.D. Powers. Therefore, they decided to change their ad agency and began to offer a 10-year and 100,000-mile warranty to move the brand to a whole new place in consumers' mind (BusinessWeek 2007). According to the results of this study, price and advertising information when provided with the objective quality information weakens the effect of objective quality on perceived quality. Regarding the main effects, it is seen that price and advertising signals have higher effect sizes than the objective quality in affecting the perceived quality. In other words, these signals are so dominant that they fade the role of objective quality ratings in influencing car buyers' perceptions about quality. The

findings support the substitutive role of price and advertising on objective quality since consumers demeans the objective quality information when provided with marketing-mix signals. These results also support the cognitive miser argument, which asserts that, even if other attributes are available to consumers, consumers find making quality judgments based on price and advertising more efficient since evaluating more direct information about quality across a variety of products is overwhelming (Rao 2005).

On the other hand, the finding for the interaction of warranty and objective quality emphasizes the complemetarity argument in the literature. It is found that objective quality has a significant and greater positive impact on perceived quality with warranty than without warranty information. In the main effects results of marketing signals, it is shown that consumers perceive above average warranty signal as deteriorating the brand image. However, when this information is provided by a brand having a high objective quality, there exists a positive interaction and warranty information helps boost the impact of objective quality on the perceived quality of the brand. This result also lends support to Balachander's (2001) and Cooper and Ross's (1985) arguments that a positive relationship of warranty and perceived quality occurs in product market if the brand's quality is already well-known by the consumers. Overall, the results suggest various implications for the use of various marketing-mix variables to signal the actual quality of the products. In employing a pricing and advertising strategy, the firm should pay attention to integrate the quality message in these signals to achieve a more complementary and synergistic relationship between marketing-mix signals and objective quality ratings. In employing a warranty strategy, the firms should take into account the current perceptions of their brands by the consumers. If the brand is recognized for its

high quality levels in the marketplace, the automaker can provide a better warranty to strengthen the relationship between objective quality and consumers' perception of quality. However, for a brand without an existing reputation for high quality, providing a higher than industry average warranty can decrease the consumers' perception of the brand.

Third, this study provides empirical testing of the interactions between various type marketing-mix signals with real industry data over time. The results answer the managerially relevant question of how managers should manage the mix of marketing-mix signals and validate the theoretical predictions for the signals' interactions. The findings are mostly contrary to theoretical predictions; yet, they offer some useful insights. As put forward in Kirmani and Rao (2000) and Basuroy et al. (2006), it is expected that the interaction between two dissimilar signals is positive and two similar signals is negative. According to Bhattacharya (1980), price and warranty are nondissipative signals since they do not involve up-front expenditures but place future profits/costs to risk whereas advertising expenditure is a dissipative signal. In an another typology, Kirmani and Rao (2000) categorize high prices and warranty as default-contingent signals and advertising as default-independent signal with a similar reasoning to Bhattacharya (1980).

According to the results, price and advertising have a negative interaction on perceived quality. Despite being contrary to the theoretical prediction, these results provide useful insights for managers and researchers. Regarding the main effects of price and advertising, it is seen that both signals have very significant positive impacts on consumers' perceptions. In other words, the high price tag and the intense advertising

amount of a car brand have very strong influences on the perceived quality by themselves, so when come together they steal the power from each other since consumers find the co-existence of these signals redundant. On the other hand, the other pair of dissimilar signals, advertising expenditure and warranty, has a positive but insignificant interaction effect on perceived quality. Considering the two similar type signals, the findings reveal that price and warranty have a positive but insignificant interaction. Although the result is insignificant, there is even a larger effect size in this interaction than the one between price and advertising; therefore the unexpected sign of this effect is worth more contemplation. With price and warranty signals, the firm delays the possible monetary loss should the quality of the product turn out to be lower than claimed. However, the future monetary loss occurs in two different routes; with high prices the firm puts the future revenues at risk and with better warranties it puts future costs at risk (Kirmani and Rao 2000). With a more in-depth examination of these two signals, it is seen that they present different roles to indicate unobserved product quality to the consumer. Moreover, from the main effects of these signals, it is also obvious that consumers perceive these two signals completely different. Therefore, specifically, in the automotive industry, managers can make use of these signals as complementary to each other. Similar to the warranty's accentuating role when provided with the objective quality information; when provided with the price information, warranty can signal better quality in high-priced cars than in low-priced cars.

Fourth, the interactions between signals also reveal the joint effects of brand reputation and individual marketing-mix signals. According to Kirmani and Rao's (2000) framework, the signaling role of brand reputation is consistent with its being both a

default-contingent and default-independent signal. Its credibility stems from the "bond" that is created between the firm and the consumer through the historical and current investments to build a brand reputation. Therefore, it is a cumulative and historical signal that puts this "bond" at risk whether the firms default on their signal or not. The results support this theoretical notion strongly since all three interactions of price, advertising, warranty and brand reputation are positive. Especially, with the interaction between warranty and reputation, it is seen that warranty has a higher effect on perceived quality when presented from a brand with higher reputation. This result has also a consistent rationale with the interaction results found between warranty and objective quality and warranty and price.

Finally, these results also indicate the importance of some control variables in changing the perceived quality of car brands. First, it is found out that the age of a brand is a significant and positive factor in affecting the perceived quality. Under asymmetric information, a firm's or brand's lifetime duration can convey some useful information to consumers and competitors. The longer a brand stays in the marketplace, the more target consumers are able to assess its quality and interpret the quality signals more confidently. In Spence's (1973) framework, time is considered as a screening device between high and low quality. This result supports the theoretical perspectives on the role of the age of a brand in the marketplace. It also agrees Narasimhan and Mendez's (2001) perspective that the durability of a product in the marketplace is a strategic aspect of quality and the longer the durability of a product, the longer it continues to influence the perceived quality of a product. Second, it is found that the size of the dealership network of a brand influences the perceived quality negatively. An empirical interpretation of this result

comes from the structure of the data. It is expected that US brands in the dataset have larger dealer networks compared to foreign brands and it is seen that U.S. cars negatively affect the perceived quality. Therefore, it is expected that the larger the dealership network of a brand, the lower its perceived quality through an indirect relationship. Another possible explanation for this negative relationship is consistent with the negative relationship found between market share and perceived quality in Helloffs and Jacobson (1999). They assert that having exclusivity rather than widespread existence can raise consumers' perceptions of product quality. This study also examines the country of origin effect on perceived quality. In Business Week's March 2008 issue, the importance of country of origin affecting the perceptions was emphasized in the Japanese automobile industry. The article discusses that although Lexus has been the top-selling luxury nameplate in U.S. since 2000, it did not arrive in Japan until 2005 while German brands have constituted an obsession in the high-end Japanese automobile industry. These results support a similar obsession in the U.S. automobile industry as well. German cars shift the perceived quality scores higher than any other brand nationality. It is also found that Korean brands cause the highest drop in the perceived quality and U.S. and Japanese brands follow Korea. The literature on the country of origin effects on product evaluations has been well-established (Bilkey and Nes 1982; Erickson et al. 1984; Elliott and Cameron 1994; Teas and Agarwal 2000), and this study contributes to it with real industry data.

2.5.1 Limitations and Future Research

As with any study, this study has some limitations, which provide opportunities for future research. First, in this study longitudinal, real industry data were collected for the empirical testing. However, as with any secondary data, the typical limitation is the issue of accurate representation and measurement of the conceptual variables. As much as the previous marketing literature was followed to identify the established and well-known measures, still several potential biases may exist in measuring concepts such as perceived and objective quality and brand reputation. So, testing these relationships with other available data sources will be a good validation of the current study.

Second, the U.S. automobile industry was chosen as a highly relevant context for this study. On contrary to previous research employing multiple industries, a single industry was considered due to certain difficulties of defining and measuring quality with various products (Zeithaml 1988). Extension of this research to other industries will help the external validity and generalizations of the results.

Third, brand-level data were used to test the relationships. However, increasing the depth of the analyses with model-level data in the U.S. automobile industry can help to discover more insights for managers and researchers. Some models under the same brand name have higher or lower objective and perceived qualities and reputations. Analyzing the relationships at the model level can also help to understand the more exact nature of pricing and advertising expenditures on the perceived quality. What can be even more interesting is to generate a hierarchical model of brands and models and understand the interactions between two levels.

Fourth, the impact of competitive intensity was not assessed in this framework. If a firm adopts a marketing strategy to increase its brand's overall perceived quality, against this competitive pressure, other brands should also learn to keep up with competitors' moves, otherwise, ceteris paribus, an increase in the perceived quality of a brand can indirectly deteriorate the perceived quality of other brands. The issue of how quality perceptions of a brand are influenced by the changes in the competitors' actual and perceived quality has not received much attention in the literature despite its importance.

CHAPTER 3: ANTECEDENTS AND CONSEQUENCES OF THE GAP BETWEEN PERCEIVED AND OBJECTIVE QUALITY OF BRANDS: LONGITUDINAL EVIDENCE FROM THE U.S. AUTOMOBILE INDUSTRY

3.1 INTRODUCTION

The critical role of perceived quality in determining consumer satisfaction and loyalty as well as firm sales and profitability has been well established in the marketing literature (e.g., Aaker and Jacobson 1994; Anderson and Sullivan 1993; Rust et al. 1999; Zeithaml 1988). However, it has been also addressed that perceived quality generally does not match with the actual quality of a product (Mitra and Golder 2006). Still, researchers have demonstrated that actual quality of a product or brand is one of the paramount drivers of its perceived quality (Boulding et al. 1993; Mitra and Golder 2006; Parasuraman et al. 1985). This relationship is argued to be one of complex and dynamic in nature since it takes time for consumers to adapt their perceptions to the changes in the true quality of a product (Bolton and Drew 1991a; Mitra and Golder 2006). This fundamental yet delayed relationship has been a major concern to managers, too:

"Volkswagen, whose well-crafted interiors and engines have attracted consumers despite several years of falling quality scores and difficulties in getting timely repairs. VW Chairman Bernd Pischetsrieder says, 'I'd rather have an actual quality problem than a perceptual one, because we can fix the actual problem faster than the perceptual one.'
(USA Today Jan 15, 2004)

"J.D. Power's 2008 Initial Quality Study finds Honda bested the Ford brand by a scant 2 problems per 100 cars (110 to 112), while Mercury actually bested Honda by two points. Ford's burden is to make the public aware of recent measured quality gains. Ford's president of Americas Mark Fields says, 'Our quality now matches Honda. For us to

change perceptions is more of a challenge than building great product." (Consumer

Guide Automotive 2009)

The reasons for the delay in consumer perceptions to reflect the changes in the

objective quality of a product include uncertainty about the product due to its experience-

related, complex, and credence nature; high cognitive efforts required for adjusting prior

beliefs while consumers are being cognitive misers or long intervals between purchases

(Mitra and Golder 2006). Among these reasons, information asymmetry has been

frequently addressed in the marketing literature. The asymmetric structure in a

marketplace arises from the disparate levels of information between firms and consumers,

and causes uncertainty and risk for the consumer about the true quality of a product

especially in complex and experience related products (Akerlof 1970; Erdem and Swait

1998). In this study, information asymmetry explains the discrepancy between the

perceived and objective quality of a product. In the previous literature, very scarce

research has examined the gap between a consumer-based and firm-based quality,

empirically. Previous research on the quality gaps has been either conceptual (e.g.,

Parasuraman et al. 1985) or obtained data from simulations or lab experiments (Kopalle

and Assuncao 2000; Kopalle and Lehmann 1995). One study has examined the product

quality divergence between the firm and the customer with cross-sectional field data

(Morgan and Vorhies 2001). Again, only one study has looked at the consequences of a

gap between the advertised and objective quality at two different time periods (Kopalle

and Lehmann 2006). Yet, there is no study that empirically examines the antecedents and

consequences of the gap between perceived and objective quality of a brand with real

industry data in a longitudinal sense.

In this study, the gap between perceived and objective quality of a brand is called quality perception gap (Zeithaml 1988). The main purpose of this study is two-fold. First, it examines the long-term brand performance implications of the quality perception gap. Second, it investigates how the marketing strategy of a firm affects the gap over time. These relationships are examined in a highly relevant context, the automotive industry. Quality is a vital attribute of cars; however the variation with respect to both types of quality is large among the car brands. Furthermore, cars are complex, experiential, and credence products, which cause the gap between the perceived and objective quality to be unequivocal. A brand-level panel dataset including performance, quality, and marketing-mix variables is compiled from a variety of secondary sources. Overall, it is comprised of annual observations of 33 automotive brands that have existed in the U.S. automobile industry between 1990 and 2007. The quality perception gap is calculated as perceived quality score minus objective quality score of a brand for a specific year. Therefore, in the dataset, there exist brands-years that have a positive and negative quality perception gap. In order to derive more intuitive and easy-to-interpret results, the dataset is partitioned into two parts. Brands that have a higher (lower) perceived quality than objective quality are named as over (under)-appreciated brands (USA Today 2004). A system of three market response equations and a gap equation are built to test the hypothesized relationships, and estimated via the two-stage least squares method to resolve endogeneity in the system.

Briefly, the findings reveal that the existence of a quality perception gap in either direction hampers the brand performance in the long term. The only exception is when there is a positive gap an increase in the gap has a positive impact on the residual value of

the brand. Furthermore, it is found that marketing-mix signals such as price, advertising, warranty, and brand reputation act as remedies to the information asymmetry between the brand's perceived and objective quality. In other words, the quality perception gap has a tendency to close unless firms have a contrary strategy. Especially, with over-appreciated brands, an increase in the value of these marketing-mix signals leads to a decrease in the quality perception gap. However, with under-appreciated brands, it is observed that marketing-mix signals are not very effective in manipulating the gap except the price.

There are specific contributions to the extant marketing literature. First, the discrepancy between the perceived and objective quality of a product or a brand is a relevant concern for both managers and researchers. In this study, this discrepancy is conceptualized and empirically examined along with its antecedents and consequences. Second, although there have been previous studies to model and analyze similar type of quality gaps (Kopalle and Assuncao 2000; Kopalle and Lehmann 2006), this is the first study that examines this issue longitudinally and with real industry data. Third, there has been limited empirical evidence on the comparison of the different marketing-mix signals as remedies of information asymmetry problem (Dewally and Ederington 2006). For example, Kopalle and Lehmann (2006) call for the impact of warranties as a firm decision making variable on the success of a firm's products. In this study, four different marketing-mix signals are examined with their impact on the quality perception gap and three different brand performance measures.

The organization of this study is as follows. First, the conceptual background is discussed and research hypotheses are developed. Second, the data, empirical model, and estimation method are explained. Third, the results of the analyses are presented. Fourth,

conclusions and the discussion of the study are provided. The current limitations and future research avenues end the study.

3.2 CONCEPTUAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

3.2.1 The Impact of Quality Perception Gap on Brand Performance

The extant marketing literature has argued that the perceived quality of a product or a brand is generally different from its objective quality (e.g., Mitra and Golder 2006; Morgan and Vorhies 2001), where objective quality refers to the actual superiority or excellence of a product and perceived quality refers to consumers' subjective assessments of the product's actual superiority or excellence. Previous research has explored and examined the discrepancy between perceived and objective quality from several perspectives (e.g., disconfirmation model, gap model). Parasuraman et al. (1985) propose different gaps in a service quality context emerging from the discrepancies between expectations of quality and its actual delivery to the consumers. Morgan and Vorhies (2001) address product quality alignment in a new product introduction context as the reduction of deviations of the firm's perspective of quality from the consumer's perspective of quality. Similarly, Zeithaml (1988) mentions that bridging the gap between objective and perceived quality requires that the firms view quality from the consumers' eye. Also, in a consumer behavior context, it is argued that (dis)confirmation between the expected and experienced quality plays a significant role in consumer satisfaction process (Boulding et al. 1993; Churchill and Suprenant 1982).

Various mechanisms have been proposed to explain the divergence between the two types of quality. This study, based on the economics of information paradigm, adopts

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information asymmetry phenomenon between the firms and the customers (Akerlof 1970; Bergen et al. 1992; Shapiro 1982) as potentially explaining the divergence between the perceived and objective quality of brands. Information asymmetry indicates that since consumers have lower levels of information about a product than the manufacturer of that product, it might be harder for them to assess the true product quality in pre-purchase evaluations (Erdem and Swait 1998). In the context of complex, experience, and credence products (i.e., the true quality of these products can be better evaluated with use and over time, or they require specialized expertise for a complete evaluation) since quality is not easily or readily available, information asymmetry becomes especially important (Nelson 1970). In the product categories, where quality is complex or not readily observable, consumers' decision-making process becomes a high-involvement and complicated one, where they seek to buy the product with the highest value for their budgets (Stigler 1961). In such situations, the existence of current uncertainty and future risk in evaluating the true quality of a product can lead some firms to claim a product quality different from the actual quality (Kopalle and Assuncao 2000). The manufacturer can either shirk complete effort in communicating product quality, understate the actual quality (Holmstrom 1979) or can make exaggerated claims to overstate it.

Prior research has emphasized that both cases, which lead to a gap between perceived and objective quality, can exist and be optimal under certain conditions. Kopalle and Lehmann (1995) define a disconfirmation between the advertised and observed quality and discuss that when quality is not fully observable, firms may have an incentive to overstate quality in their advertisements. Well before Kopalle and Lehmann (1995), Darby and Karni (1973) indicate that the largest gap between advertised and

actual quality as well as the largest "deception" should be expected when quality is not observable. Farrell and Gibbons (1989) assert that all firms have a tendency to stretch some hard-to-verify claims about their product quality. Kopalle and Assuncao (2000) examine the difference between advertised and actual quality similar to Marks and Kamins (1988) and find that quality might be overstated in markets characterized by high price sensitivity, low quality sensitivity, low brand loyalty, and high source credibility. They also indicate that understatement of quality generally aims to lower expectations and hence, increase future satisfaction of the consumers. Later, Kopalle and Lehmann (2006) conceptualize the difference between advertised and actual quality of a product as the quality claim differential. Their findings suggest that although overstating quality is generally desirable when customers rely relatively less on advertising to evaluate quality and when customers' satisfaction with the product is high, understating quality can be also optimal when 1) customers' sensitivity to the difference between actual and expected quality is high, 2) they do not discount the advertisements, 3) their satisfaction with the product is low, and 4) future rather than the current sales are the major source of profit. In a field study by Morgan and Vorhies (2001), the divergence between the firm's and the customer's perspective of quality is conceptualized as product quality alignment. In their framework, product quality alignment is defined as the degree to which a firm's product quality evaluations match those of their customers; in other words the smaller the divergence between the two parties' evaluations the better the alignment.

In this study, the difference between the perceived and objective quality of brands is defined as quality perception gap. The direction of the quality perception gap can be either positive or negative. If the manufacturer is able to communicate a higher than

actual product quality to its customers through various marketing-related mechanisms, then the product's perceived quality can exceed its objective quality. However, if the manufacturer chooses to make conservative claims about the actual product quality or is not effective in convincing the consumers on the true levels of quality due to unsuccessful marketing strategy, then the perceived quality of the product falls behind its objective quality. This study focuses on the automotive industry, which can provide several examples for the existence of a quality perception gap in either direction. Brands like Mercedes-Benz constantly receive higher scores in perceived quality rather than in objective quality. According to the Consumer Reports' 2008 Car Brand Perception Survey, the brand is placed in top five according to consumers' perception of the car quality while it ranks 33rd out of 36th in Consumer Reports' actual quality ratings. On the other hand, GM and Hyundai suffer from the under-appreciation of the vehicles' actual quality in the marketplace. GM spokesperson states that there is a perception gap between what they are actually doing in terms of vehicle quality and where the customer perceives them to be (Wall Street Journal 2004). Similar to this, Hyundai's director of marketing explains that although Hyundai's current quality is ahead of some Japanese automakers according to J.D. Powers, it is hard to convince customers and erase the memories of the Excel's earlier quality (BusinessWeek 2007). Although some brands try to increase their perceived quality to match or exceed the objective quality, brands like Toyota chooses to understate the quality when introducing the Lexus brand so that they lead customers to expect less and then pleasantly surprise them when their expectations are exceeded. Toyota brand itself also followed a similar strategy and therefore, it took a long time for consumers to recognize its quality advantage over the U.S. automakers (Mannering and

Winston 1991). In USA Today (Jan 15, 2004), David Kiley compares the car brands'

perceived quality scores from CNW Market Research and actual quality scores from J.D.

Power and Associates' Vehicle Dependability Study and find that four of the five under-

appreciated brands (i.e., actual quality is better than perceived quality) are from Big

Three in Detroit and European brands like Volkswagen dominate the list of over-

appreciated brands (i.e., perceived quality is better than actual quality).

In the marketing literature, although the impact of perceived quality on consumer

attitudes (e.g., customer satisfaction, loyalty, increase in willingness to pay) and firm

performance (customer lifetime value, firm profitability, stock returns) has been well-

established (e.g., Aaker and Jacobson 1994; Anderson and Sullivan 1993; Bolton and

Drew 1991; Rust et al. 1999; Rust et al. 1995), the possible impacts of the difference

between perceived and objective quality on brand performance measures have been

scarcely addressed. The few studies in this area are either conceptual or conducted in a

consumer behavior context with lab experiments or simulation data. Some of the earlier

findings are as follows. Anderson (1973) finds that consumers rate a product less

favorably when the discrepancy is high. Kopalle and Assuncao (2000) find that a firm's

need to overstate the quality decreases when actual quality of the product increases. Also,

communication effectiveness on the true product quality is contingent on the gap between

what is being communicated and what is delivered (Kopalle and Lehmann 1995). Kopalle

and Lehmann (2001) indicate that the difference between the observed and expected

quality has a positive effect on consumer's satisfaction. The disconfirmation model leads

to the strategic implication that firms should try to lower consumers' expectations to

maximize customer satisfaction. Kopalle and Lehmann (2006) discover that when quality

claim differential is positive (i.e., advertised quality is greater than actual quality), sales in the first-period increase; however when future sales are taken into account, it is seen that they begin to decrease. It is argued that the deviations of the actual quality of a product from its perceived quality can be indicative of either the firm's lack of understanding of the drivers of customer quality perceptions or the firm's over-representation of the actual quality, deceptively (i.e., 'puffery' as in Kopalle and Assuncao 2000). Morgan and Vorhies (2001) find that when the alignment between the firm's and the customer's perspective of quality decreases, the performance of the business unit decreases since the effectiveness and efficiency with which quality management is turned into customer-based quality perceptions will be hampered. On the other hand, when perceived and actual quality of a product or brand are more aligned, firms will be more successful in communicating the true quality via concentrating their quality improvement efforts into intrinsic product attributes and extrinsic marketing signals important to consumers.

Based on the prior literature, it is proposed that brand performance is a function of the discrepancy between the objective and perceived quality. It is expected that the increase in the discrepancy between the objective and perceived quality of a product or brand in either direction, will hurt the brand performance in the long term. Specifically, the perceived quality being above the objective quality might affect the performance positively in the short-term since customers have high expectations and better perceptions and are likely to purchase the brand. However, as the true quality of the product shows itself once the customer experiences it the repeat purchase likelihood is expected to decrease due to the disconfirmation between the perception and the realization. In the

long-term, if the company puts some effort to stretch the actual quality levels toward the perceived quality, the disconfirmation might decrease and consumers can be convinced to purchase the product. However, based on the high performance measures realized initially, if the firm continues to invest in the perceived quality rather than the actual quality, this will increase the disconfirmation and continue to hinder the brand performance. On the other hand, the objective quality being above the perceived quality might affect the performance negatively in the short-term since customers are not fully aware of the true quality of the product. In the long-term, this negative effect might decrease if the gap tends to become smaller when consumers purchase the product, become positively surprised with the higher than expected quality, and repeat the purchase or when firms invest to communicate the true quality and therefore, increase the perceived quality. However, if firms lack the communication and marketing skills to encourage the consumers to purchase the product and furthermore if they continue to invest in the actual quality rather than perceived quality, then brand performance will continue to decrease. In summary, the existence and increase in the gap between the perceived and objective quality in either direction is expected to have a negative impact on performance as long as the necessary actions are not taken to close the gap. Thus, it is hypothesized that:

H1: An increase in the quality perception gap of a brand is expected to result in inferior brand performance in the long-term.

3.2.2 The Impact of Marketing-Mix Signals on Quality Perception Gap

Market signaling has been proposed as a major remedy to information asymmetry (Holmstrom 1985). When a market is characterized by asymmetric information, delivering true information to the customers can serve as a competitive advantage for firms (Nayyar 1990). In this study, market signaling is employed as a remedy to reduce the gap between the perceived and objective quality of brands. Customers having uncertainty about the true product quality tend to rely on other sources of information such as marketing-mix variables to assess it. Customers' dependence on such information affects the marketing strategy of the firms, directly (Kirmani and Rao 2000). This study focuses on a firm's decision making on three aspects of the marketing strategy of brands; price, advertising expenditure, and warranty, and also brand reputation strategies as remedies for information asymmetry.

In the extant marketing literature, it has been discussed that the marketing and quality strategy of a firm should be in alignment in order for a product's quality improvement efforts to be righteously communicated to the customers (Kordupleski et al. 1993; Morgan and Vorhies 2001). Costly marketing signals assure potential customers that the firm is committed to high quality. One of the most frequently mentioned signal in prior research is price (Klein and Leffler, 1981; Rao and Monroe 1989; Shapiro 1983). In a competitive market, where quality is complex or not readily observable, consumers perceive high prices as indicating high quality. On the firm side, if firms lower price to the level of marginal cost, this will lead them to produce low rather than high quality products to be more profitable (Nayyar 1990).Therefore, high quality firms want to differentiate themselves from low quality firms by putting high price levels to indicate

high production costs associated with high quality (Erdem and Swait 1988). Dewally and Ederington (2006) also find that the prices realized by sellers who send credible signals of high quality are substantially higher than the prices realized by sellers who do not.

Similar to price, the amount of advertising expenditure can signal product quality. Consumers perceive high levels of advertising expenditures as the firm's confidence in and commitment to its product or brand quality (Erdem and Swait 1998; Nelson 1970; Tellis and Fornell 1988). It has been argued that firms of low quality products are not likely to invest in heavy advertising since they would not be able to recover the signaling costs as well as would risk repeat purchases once the true quality of their product is revealed (Kihlstrom and Riordan 1984; Milgrom and Roberts 1986). Another marketing-mix signal proposed as a remedy to information asymmetry is warranties or guarantees on the products. Signaling theory predicts that firms with low quality products have a higher chance of facing higher and more frequent repair costs for the same level of warranty than the sellers with high quality products (Boulding and Kirmani 1993; Grossman 1981). Therefore, consumers perceive better warranty as separating high quality products from low quality products in a competitive marketplace (Kirmani and Rao 2000).

As much as their signaling role has been demonstrated in the previous literature, it has been also suggested that the credibility of individual marketing-mix signals can be limited (Erdem and Swait 1998). Furthermore, firms may attempt to provide potential buyers with greater information in order to reduce information asymmetries between firms and customers. Under such conditions, brand reputation emerges as a quality signal apart from other individual marketing-mix signals since it embodies the cumulative effect

of all past marketing strategies and actions (Wernerfelt 1988). Reputation is the historical notion that credibility is based upon the sum of past behaviors of a firm or brand and it helps to prevent the problems of information asymmetry through discouraging moral hazard as a sanctioning device and adverse selection as a signaling device. Under the presence of difficulties in assessing quality, reputation of a brand related with the consistent quality of a product is one of the primary contributors to consumer's perception of quality (Shapiro 1983). When consumers trust the brand's reputation in high quality, it pays firms to cheat and provide poor quality (Allen and Faulhaber 1988). This suggests that well-established and high reputation companies have less incentive to overstate quality. Similarly, Kopalle and Lehmann (2006) have argued that when customers accept a company's word as a credible source, overstatement of the quality is likely to be reduced. Therefore, it is expected that when brand reputation is high, the difference between the perceived and objective quality of a brand is smaller.

Based on the signaling literature, marketing-mix signals are used to convey credible information to the consumers. When objective quality is higher than perceived quality, firms can make use of external cues such as price, advertising, warranty, and reputation to credibly communicate the true level of the product or brand quality. Similarly, when perceived quality is higher than objective quality, firms can use marketing signals to align the perceived quality with the objective quality in order to avoid a misperception. Even though it has been addressed that individual marketing signals can be used to increase perceived quality levels well above actual quality, this is not proven to be a sustainable strategy since the quality perception gap hampers brand performance in the long-term. As Nelson (1970, 1974) put, firms could advertise either to

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inform or to mislead consumers, but misleading advertising is not likely to be productive so long as consumers can verify quality either by inspecting the product or using it. Yet, . over time market-level perceptions of quality are likely to move toward objective quality along with experience, word-of-mouth, etc. (Camerer 1992). Therefore, based on the signaling roles of individual marketing-mix variables and brand reputation strategies, they are expected to perform as remedies to information asymmetry in the long term. Thus, it is hypothesized that:

H2: As the levels of marketing-mix signals increase, the quality perception gap is expected to decrease in the long-term.

3.3 DATA AND METHOD

3.3.1 Data

The dataset is comprised of yearly observations of the car brands in the U.S. automobile industry between 1990 and 2007. In this research, a specific industry is chosen as the research context to eliminate the variance in the conceptualization and operationalization of the objective and the perceived quality in across different product categories. Automobiles are highly relevant for the purposes of this study since quality is one of their indispensable attributes yet there is a large discrepancy in the objective and perceived quality among different brands.

The data were compiled from multiple secondary sources as depicted in Table 3.1. The performance of brands was measured via three dependent variables. They are sales, market share, and residual value. Annual unit sales (Sales) of auto brands were obtained from Automotive News Market Data Book. Annual market share (MShare) of each auto

brand was obtained from Market Share Reporter. Both sales and market share measure

were measured in terms of the unit sold, not the dollar value. The third performance

measure is the residual value (ResVal), which is the capital value remaining at the end of

an investment period. Since residual values can be of various forms, it has a much

broader meaning and operationalization then its associated phrase of salvage value

(Shillinglaw 1955). It is an important performance measure in the automotive industry

since cars are known to lose a considerable amount of value once the ownership is passed

from the automaker to the consumer. It also serves as an alternative measure for the

consumers' expectations of the vehicle performance in the marketplace. In this study, the

residual value of each brand in terms of the dollar amount was obtained for four different

investment periods as 24-month, 36-month, 48-month, and 60-month from Automotive

Leasing Guide (ALG). The residual values at different investment periods were averaged

to determine the approximate retained value of each brand.

Quality of brands was measured in three ways; perceived quality, objective

quality, and quality perception gap. Perceived quality scores were obtained from Harris

Interactive's Equitrend brand equity data. In the Equitrend study, Harris Interactive

conducts online surveys with 20,000 to 45,000 consumers aged 15 years or older to

determine their perceptions of over 1,000 brands across 35 product categories since 1989.

In this study, perceived quality of 33 auto brands were measured on a 0-10 scale, with 0

meaning poor and 10 meaning excellent quality. Objective quality ratings were obtained

from J.D. Power and Associates' Initial Quality Study (IQS).

Table 3.1: Measures and Sources of the Variables

Variable	Notation	Measure	Data Source
Performance Measures			
Sales	Sales	Number of units sold	Automotive News Market Data Book
Market Share	MShare	Number of units sold / market size	Market Share Reporter
Residual Value	ResVal	The average of the dollar value retained at 24-month; 36-month; 48-month; 60 month investment periods.	Automotive Leasing Guide
Quality Measures			
Perceived Quality	PQ	Scale of 0 - 10 (0: poor quality and 10: excellent quality)	Harris Interactive
Objective Quality	OQ	Number of defects per hundred cars in the first 90-day of ownership	J.D.Power and Associates
Quality Perception Gap	Gap	The difference between the "standardized PQ" and "standardized and reversed OQ" measures; (PQ-OQ)	Calculated
Marketing-mix Signals			
Retail Price	Price	The average of manufacturer suggested retail prices of all models under each brand.	Consumer Reports
Advertising Expenditures	AdvExp	Dollar amount (in millions) spent in all media	TNS Media Intelligence
Warranty	Warr	A composite index including basic, powertrain warranty, corrosion warranties, deductibles, and transfer fees (larger numbers indicate higher warranty)	The Car Book by Jack Gillis
Brand Reputation	Rep	Scale of 1 - 5 (1: low reputation and 5: high reputation)	Consumer Reports

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IQS surveys owners and lessees regarding the problems with their new vehicles, and provides in-depth information on vehicle quality after 90 days of ownership and results are presented as a "number of defects-per-100 vehicles" metric. The motivation is to capture the "out of box" quality of a car to understand the actual engineering excellence of a product. Therefore, objective quality of 33 auto brands were measured as the number of defects-per-100 vehicles in the first 90-day of ownership. In this rating, higher numbers mean worse quality, in other words, objective quality is reversely measured.

The quality perception gap (Gap) for each brand was calculated using the perceived and objective quality scores as follows. First, PQ and OQ values were standardized by subtracting the annual mean and dividing by the annual standard deviation. Second, the minimum value of the standardized PQ and OQ was found for each year. The minimum standardized PQ (i.e., - 0.987) value for a given year (i.e., 1990) of a specific brand (i.e., Dodge) was stretched to zero and the same amount was also added to the other PQ values of brands for the year 1990. For example, for the year 1990, the minimum standardized PQ value was "- 0.987" of a specific brand. Therefore, this number was carried to zero by adding "0.987" and the same amount was added to all brands for the year 1990. The same operation was done for all years and for the OQ measure as well. Therefore, the PQ value of zero denoted the poor quality. Next, based on the calculated values, the maximum PQ value was found for each year and the PQ values were divided by these maximum values and then multiplied by ten. Therefore, the maximum PQ value for each year was stretched to 10 denoting excellent quality. Therefore, both PQ and OQ scales were re-calculated having a minimum value of zero and a maximum value of 10. However, since in the original OQ scale, higher numbers

mean worse quality, the newly calculated OQ scale value was reversed to make it

compatible with the PQ scale. OQ values were subtracted from PQ values to find the

quality perception gap.

Marketing-mix signals such as retail price, advertising expenditures, warranty,

and brand reputation, constitute the independent variables. The manufacturer suggested

retail price (Price) data of the car brands were collected from Consumer Reports. Since

the annual price information is provided at the model level, the price for the make level

(i.e., brand level) was calculated by taking an average of the prices of different models

under the same brand name. The annual advertising expenditure (AdvExp) data in million

dollar amounts were obtained from TNS Media Intelligence through Ad$pender and

Advertising Age, which deliver advertising expenditure information on brands across all

media such as magazines, newspapers, network television, etc. The annual warranty

(Warr) data for car brands were obtained from the Car Book by Jack Gillis (Douglas et al.

1993). In this book, a warranty rating index, which is a compound assessment of the

basic, powertrain, corrosion warranties, deductibles, and transfer fees of each brand on a

yearly basis is provided. The index gives the most weight to the basic and powertrain

components of warranty and the higher numbers indicate better warranties. Finally, the

brand reputation (Rep) data were obtained from Consumer Reports. Although firm

reputation has a long history and been measured by various independent sources, it is not

as easy to find a reputation measure at the brand level as at the firm level. However,

Consumer Reports is a well established source in providing car reliability brand

reputations as independent third-party ratings. Dyer and Hatch (2006), Adler et al.

(1999), and Rhee and Haunschild (2006) use Consumer Reports' ratings to measure

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brand reputation at the make level in the automobile industry. In this research, reputation is measured on a 1-5 scale, 1 meaning low and 5 meaning high reputation. The annual reputation scores for each model under each brand name were averaged to find the overall brand reputation score.

3.3.2 Empirical Model and Estimation

The empirical model in this research consists of a system of four equations. Since there exist three brand performance measures, Equation 1, 2, and 3 are identified as market-response functions testing the effects of the marketing-mix signals and the gap on the sales, market share, and residual value, respectively. Market-response functions (Hanssens et al. 2001) have been very popular in the marketing models literature. They generally relate a series of marketing tools to purchasing behavior measures such as sales, market share, and brand choice in a regression or logit model framework. Equation 4 tests the effects of marketing-mix signals on the quality perception gap and examines whether price, advertising expenditures, warranty, and brand reputation can significantly alter the difference between the perceived and objective quality. The system of equations is defined as follows:

$$(1)\; Sales_{it} = \beta_0 + \beta_1 Gap_{it} + \beta_2 Price_{it} + \beta_3 AdvExp_{it} + \beta_4 Warr_{it} + \beta_5 Rep_{it} + \gamma dYear_t + u_{it}$$

$$(2)\; Mshare_{it} = \beta_0 + \beta_1 Gap_{it} + \beta_2 Price_{it} + \beta_3 AdvExp_{it} + \beta_4 Warr_{it} + \beta_5 Rep_{it} + \gamma dYear_t + u_{it}$$

$$(3) ResVal_{it} = \beta_0 + \beta_1 Gap_{it} + \beta_2 Price_{it} + \beta_3 AdvExp_{it} + \beta_4 Warr_{it} + \beta_5 Rep_{it} + \gamma dYear_t + u_{it}$$

(4) $Gap_{it} = \beta_0 + \beta_1 Price_{it} + \beta_2 AdvExp_{it} + \beta_3 Warr_{it} + \beta_4 Rep_{it} + \gamma dYear_t + u_{it}$

In the above equations, "i" and "t" denote the car brand and the observation year, respectively. So, for brand "i" and year "t", in Equation 1, Sales denotes the annual unit sales, Gap denotes the difference between perceived quality and objective quality, Price denotes the average manufacturer suggested retail price, AdvExp denotes the annual advertising expenditures in million dollars, Warr denotes the warranty index, and Rep denotes the brand reputation score. In Equation 2, MShare denotes the annual market share as a percentage value, and in Equation 3, ResVal denotes the average dollar value retained based on four different investment periods. Finally, Year represents the dummy variable for each year and "u" is the idiosyncratic error term. Sales, ResVal, Price, AdvExp, and Warr enter into the equations in natural log forms. In other words, the coefficients of Price, AdvExp, and Warr in Equation 1 and 3 can be interpreted as elasticities, whereas the coefficient of Rep in the same equations can be interpreted as semi-elasticity (Wooldridge 2003).

Prior to the estimation, the dataset is divided into two parts to identify the over-appreciated and under-appreciated brands. Over-appreciated brands have a positive gap value, whereas under-appreciated brands have a negative gap value (i.e., Gap = PQ-OQ). First, each equation is estimated via pooled OLS (POLS). Table 3.3 and 3.4 demonstrate the OLS estimates for both categories. In the system of equations the correlated error structures across equations can provide links that can be exploited in the estimation (Wooldridge 2002). However, if the error terms are allowed to be correlated since the dependent variable in Equation 4 enters as an independent variable into Equation 1, 2, and 3, this introduces endogeneity to the system. More specifically, in the first three

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equations, corr (Gap, u_{it}) will be different from zero, since the error term in the gap

equation is correlated with the error terms in the brand performance equations. Under

OLS estimation process, the non-zero correlation between independent variables and the

error term results in biased and inconsistent estimators. A frequently used technique in

such situations is estimation via instrumental variable (IV) approach for the endogenous

variable. Since one period lagged Gap variable (Gap_1) does not exist in Equation 1, 2,

and 3, it is treated as an IV for the Gap variable. The correlation between Gap_1 and Gap

for the over-appreciated group of brands is 0.16 and for the under-appreciated group of

brands is 0.25. Therefore, a two-stage least squares (2SLS) estimation procedure is

adopted, the reduced form equation below is estimated, initially:

$$(5)\ Gap_{it} = \pi_0 + \pi_1 Price_{it} + \pi_2 AdvExp_{it} + \pi_3 Warr_{it} + \pi_4 Rep_{it} + \pi_5 Gap_{i,t-1} + \delta dYear_t + \vartheta_{it}$$

Then, Equation 1, 2, and 3 are estimated via IV. Table 3.3 and 3.4 demonstrate the 2SLS

parameters next to the OLS parameters. Normally, 3SLS could provide efficiency gains

over 2SLS, however there is no system efficiency gain from 3SLS in this context.

3.4   RESULTS

The Pearson pairwise correlations with significance levels and the descriptive statistics of

the variables are presented in Table 3.2a and 3.2b. Table 3.3 and 3.4 present the OLS and

2SLS parameter estimates for the over- and under-appreciated brands, respectively. Chow

tests reveal that coefficients in regression models differ significantly across the two

groups. It is also observed that, the standard errors significantly inflate in 2SLS estimates

depending on the correlation between the Gap and Gap_1 (i.e., the quality of the IV

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estimator). As the quality of the IV estimator decreases, it is seen that the 2SLS estimates become less efficient. Furthermore, it is observed that the overall adjusted R-squared of the model generally decreased in 2SLS estimation and this is somewhat an expected result since by definition OLS minimizes the sum of squared residuals. However, 2SLS provide consistent estimates of the ceteris paribus effect of quality perception gap on sales, market share, and residual value when Gap and the error term are correlated (Wooldridge 2003).

In Table 3.3, Model 1 includes the effects of the gap and marketing-mix signals on the unit sales of a brand. Although the relationships between marketing-mix variables and the performance measures are not the major focus of this study, those parameters are estimated to test dataset validity. 2SLS results show that, price elasticity of demand is negative and significant ($\beta = -0.844$, $\rho < 0.01$) whereas advertising elasticity is positive and significant ($\beta = 0.672$, $\rho < 0.01$). It is also observed that an increase in warranty leads to a significant decrease in sales ($\beta = -1.063$, $\rho < 0.05$) and an increase in brand reputation leads to an increase in sales but its effect is not significant ($\beta = 0.141$, $\rho > 0.10$). Regarding the impact of quality perception gap on brand sales, gap has a negative and significant impact on sales. For the brands, whose perceived quality is higher than its objective quality, an increase in the gap leads to a decrease in the unit sales. This result is consistent with the direction of the relationship in H1.

Model 2 tests similar relationships for the market share of a brand. As expected, marketing-mix variables have very similar effects on the market share of a brand.

Table 3.2a: Descriptive Statistics and Correlations for the Over-appreciated Brands (Gap > 0)

Variable	Sales	MShare	ResVal	Gap	Price	AdvExp (mln)	Warranty	Reputation
Sales	1.000							
MShare	0.897***	1.000						
ResVal	-0.326***	-0.327***	1.000					
Gap	-0.141*	-0.131*	0.221***	1.000				
Price	-0.345***	-0.347***	0.874***	0.243***	1.000			
AdvExp	0.843***	0.835***	-0.436***	-0.125	-0.455***	1.000		
Warranty	-0.351***	-0.352***	0.045	0.003	0.059	-0.285***	1.000	
Reputation	0.095	0.086	-0.117	-0.246***	-0.147*	0.164**	0.017	1.000
Number of obs.	165	165	161	165	161	161	163	162
Mean	545,296.7	3.29	18,360.8	2.29	40,208.3	282.7	1165.9	3.69
Std. Dev.	741,545.9	4.48	10,474.9	1.63	18,708.9	245.0	240.2	0.69
Minimum	8,614	0.1	5,458.7	0.002	13,726	9	648	2.05
Maximum	3,457,996	21.5	59,688.7	9.19	108,862	984.6	2154	4.91

*, **, *** indicate a significance level of < 0.10, < 0.05, and < 0.01, respectively.

Table 3.2b: Descriptive Statistics and Correlations for the Under-appreciated Brands (Gap < 0)

Variable	Sales	MShare	ResVal	Gap	Price	AdvExp (mln)	Warranty	Reputation
Sales	1.000							
MShare	0.896***	1.000						
ResVal	-0.234***	-0.238***	1.000					
Gap	-0.075	-0.113	0.379***	1.000				
Price	-0.273***	-0.281***	0.965***	0.433***	1.000			
AdvExp	0.790***	0.771***	-0.275***	0.006	-0.293***	1.000		
Warranty	-0.344***	-0.350***	0.170**	0.125	0.183**	-0.254***	1.000	
Reputation	-0.122	-0.134	0.191**	0.203***	0.151*	0.037	0.166**	1.000
Number of obs.	140	140	139	140	139	138	139	137
Mean	548,334.8	3.39	13,866.6	-1.85	32,375.1	262.0	1186.4	3.70
Std. Dev.	754,426.8	4.68	6,675.8	1.98	13,344.5	205.5	289.5	0.69
Minimum	7,098	0.1	4,047.7	-0.005	10,643	15.3	824	2.20
Maximum	3,414,169	21.8	44,495.7	-9.45	91,205	1,022.2	2068	4.87

*, **, *** indicate a significance level of < 0.10, < 0.05, and < 0.01, respectively.

Accordingly, price and warranty have a negative impact on market share ($\beta = -2.929$, $p < 0.05$; $\beta = -4.433$, $p < 0.10$, respectively); whereas the amount of advertising expenditures has a positive and significant impact on the market share ($\beta = 1.883$, $p < 0.01$), and reputation does not affect market share, significantly ($\beta = 0.912$, $p < 0.10$). Again consistent with the sales equation and H1, an increase in the quality perception gap has a detrimental impact on the market share of a brand ($\beta = -1.094$, $p < 0.10$) as well. Model 3 includes the effects of the same variables on the residual value of a brand. Compared to sales and market share, residual value measures brand performance from a different perspective. Regarding the effects of marketing-mix variables, it is found that an increase in the price, advertising expenditures, and reputation of a brand positively and significantly influences the retained value of a brand after an investment period ($\beta = 1.217$, $p < 0.01$; $\beta = 0.151$, $p < 0.01$; $\beta = 0.125$, $p < 0.10$, respectively). Moreover, it is not surprising that among the various marketing-mix signals, price has the highest impact on the residual value of a brand. However, it is seen that an increase in the warranty offer of a brand negatively impacts its residual value and this effect is not significant ($\beta = -0.111$, $p > 0.10$). Furthermore, on contrary to the findings in sales and market share equations, it is found that an increase in the quality perception gap of a brand has a positive influence on its residual value ($\beta = 0.179$, $p < 0.01$). This finding is not consistent with H1.

In Model 4, the relationship between marketing-mix variables and the quality perception gap are tested. It is found that when the quality perception gap of a brand is positive, all the proposed marketing-mix variables have a negative influence on the gap in the long-term. Specifically, an increase in price, the amount of advertising expenditures, warranty offer, and brand reputation lead to a decrease in the gap ($\beta = -0.513$, $p < 0.01$; β

= - 0.620, $\rho < 0.01$; β = - 1.889, $\rho < 0.05$; β = - 0.698, $\rho < 0.01$, respectively). Consistent with H2, for the over-appreciated brands, it is shown that marketing-mix signals can be credible tools to ease the discrepancy between the perceived and objective quality of a brand in the long-term.

Table 3.4 denotes the same relationships for the brands with a negative quality perception gap. Model 1 indicates that an increase in price leads to a decrease in sales (β = - 0.935, $\rho < 0.01$); an increase in advertising expenditures leads to an increase in sales (β = 0.687, $\rho < 0.01$), an increase in warranty offer has a negative but insignificant effect on sales (β = - 0.331, $\rho > 0.10$), and finally brand reputation has a positive and significant impact on sales (β = 0.144, $\rho < 0.10$). When it comes to gap, it is observed that for the brands whose perceived quality is lower than its objective quality, an increase in the gap leads to an increase in sales (β = 0.060, $\rho < 0.05$). This and other findings including the gap variable should be interpreted with caution since in this group of brands, gap has a negative value. In fact, an increase in gap means that gap is getting closer to zero. Therefore, the positive sign in front of the parameter estimate indicates a negative relationship between the absolute value of gap and brand sales, which is consistent with H1.

Model 2 looks at the market share performance. Similar relationships are found with respect to the impact of price, advertising, and warranty. Price has a negative and advertising expenditures have a positive relationship with market share (β = - 1.940, $\rho < 0.10$; β = 3.743, $\rho < 0.01$). In the market share equation, warranty is found to have a negative and significant impact (β = - 2.644, $\rho < 0.10$) different from the sales equation.

Table 3.3: Parameter Estimates when Gap > 0

	Model 1		Model 2		Model 3		Model 4	Model 5
	Log (Sales)		MShare		Log (ResVal)		Gap	Gap
	POLS	2SLS	POLS	2SLS	POLS	2SLS	POLS	Reduced Form
Log (Price)	-0.736***	-0.844***	-2.394***	-2.929**	1.217***	1.217***	-0.593***	-0.513***
	(.148)	(.215)	(.792)	(1.185)	(.079)	(.082)	(.176)	(.178)
Log (Adv)	0.723***	0.672***	2.162***	1.883***	0.132***	0.151***	-0.688***	-0.620***
	(.069)	(.098)	(.353)	(.558)	(.034)	(.045)	(.152)	(.154)
Log (Warr)	-0.687***	-1.063**	-3.023**	-4.433**	-0.143	-0.111	-2.036***	-1.889**
	(.207)	(.465)	(1.172)	(2.369)	(.111)	(.128)	(.733)	(.728)
Reput	0.266***	0.141	1.437***	0.912	0.101**	0.125*	-0.845***	-0.698***
	(.095)	(.184)	(.530)	(1.024)	(.041)	(.068)	(.229)	(.238)
Gap	-0.056**	-0.466**	-0.369**	-1.094*	0.040***	0.179***		
	(.026)	(.211)	(.183)	(.643)	(.013)	(.063)		
Gap_{t-1}								0.217***
								(.081)
Number of obs.	153	152	153	152	153	152	153	152
Adjusted R-squared	0.86	0.78	0.66	0.57	0.77	0.76	0.34	0.37

*, **, *** indicate a significance level of < 0.10, < 0.05, and < 0.01, respectively. Standard errors in parentheses.

Table 3.4: Parameter Estimates when Gap < 0

	Model 1		Model 2		Model 3		Model 4	Model 5
	Log (Sales)		MShare		Log (ResVal)		Gap	
	POLS	2SLS	POLS	2SLS	POLS	2SLS	POLS	Reduced Form
Log (Price)	-0.900*** (.143)	-0.935*** (.132)	-1.952* (1.170)	-1.940* (1.195)	0.904*** (.072)	0.834*** (.386)	1.187*** (.322)	1.142*** (.326)
Log (Adv)	0.917*** (.069)	0.687*** (.067)	3.740*** (.565)	3.743*** (.566)	0.126*** (.039)	0.125** (.062)	0.336* (.182)	0.270 (.187)
Log (Warr)	-0.938*** (.185)	-0.331 (.226)	-2.638* (1.513)	-2.644* (1.514)	-0.061 (.109)	-0.028 (.176)	0.898 (.605)	0.823 (.602)
Reput	0.123 (.077)	0.144* (.085)	-1.150** (.604)	-1.149* (.634)	0.073 (.045)	0.062 (.046)	0.172 (.255)	0.177 (.256)
Gap	0.066** (.030)	0.060** (.025)	0.445* (.248)	0.435 (.270)	0.030** (.014)	0.049 (.164)		
Gap$_{t-1}$								0.158** (.076)
Number of obs.	134	133	134	133	134	133	134	133
Adjusted R-squared	0.87	0.86	0.56	0.56	0.80	0.78	0.59	0.60

*, **, *** indicate a significance level of < 0.10, < 0.05, and < 0.01, respectively.
Standard errors in parentheses.

Interestingly, reputation has a negative and significant effect on market share (β = -1.149, ρ < 0.10). Furthermore, it is found that gap has a positive but insignificant effect (β = 0.435, ρ > 0.10), which partly supports H1.

Finally, Model 3 examines the same relationships with the residual value of a brand. The results are quite similar to Model 3 results in Table 3.3. It is seen that of all the marketing signals, price has the highest impact on the residual value of a brand (β = 0.834, ρ < 0.05). The amount of advertising expenditures of a brand has also a positive and significant impact on the retained dollar amount of the brand (β = 0.125, ρ < 0.05). It is found that warranty and reputation do not have significant effects while the parameter sign for warranty is negative and for reputation it is negative (β = -0.028; β = 0.062, ρ > 0.10). It is also found that gap does not have a significant impact on the residual value (β = 0.049, ρ > 0.10); however the effect is found to be positive, which still partly supports H1.

When the effects of marketing-mix variables on the gap measure are considered, it is found that only price has a significant effect (β = 1.142, ρ < 0.01) ; β = 0.336, ρ < 0.10) on the gap measure. The positive and significant effect of price on the quality perception gap indicates that of all the marketing-mix signals, price is the most effective to stretch the perceived quality to the objective quality of a brand. The signs of the advertising, warranty and reputation estimates are also positive but their effects are insignificant (β = 0.270; β = 0.823; β = 0.177, ρ > 0.10). Resulting in positive parameters is consistent with the direction of the relationships in H2; however the insignificant results lend only partial support to H2 for the under-appreciated brand group. Overall, it is observed that the hypothesized relationships receive considerable support from the

analyses. However, the results in the over-appreciated brand group are more consistent with the hypothesized relationships compared to those in the under-appreciated brand group.

3.5 CONCLUSIONS AND DISCUSSION

A firm's decisions with regard to the price, advertising expenditures, warranty, quality as well as the overall brand reputation are critical for the long-run success of brands. The motivation of this study was two-fold: 1) to understand the impact of the discrepancy between perceived and objective quality of a brand in terms its magnitude and direction on brand performance and 2) to understand the impact of marketing-mix signals on the discrepancy between perceived and objective quality of a brand.

For the purposes of this study, first, a new variable called quality perception gap is conceptually defined and calculated. Then, three brand performance measures are introduced as sales, market share, and residual value to understand whether the effects of quality perception gap on brand performance is consistent across these measures in a series of aggregate-level market response functions. Finally, four marketing-mix variables from signaling literature are proposed as remedies to the information asymmetry between the perceived and objective quality of brands. Three of these marketing signals are firm's decision making tools such as price, advertising expenditures, and warranty, which are relatively easier to manipulate. The fourth signal is brand reputation, which is a historical signal that constitutes all the past marketing activities of a brand (Herbig and Milewicz 1993). Longitudinal, brand-level data on 33 automotive brands that have existed in the U.S. automobile industry between 1990 and

2007 are obtained. For a depiction of the standardized perceived and objective quality scores of the brands over time please refer to the Appendix at the end. In order to have a more precise interpretation of the parameter estimates, the dataset is divided into two subsets, where the first set (second set) includes brands-years with positive (negative) quality perception gap value indicating the difference between perceived and objective quality. The brands with positive (negative) quality perception gap are referred to as over (under)-appreciated brands in this study.

Regarding the relationships between the marketing variables and the performance measures it is found that, the price elasticity of demand is negative and advertising elasticity of demand is positive for both over- and under-appreciated brands. These results are mainly consistent with previous research findings indicating that price (advertising) elasticity is significantly positive (negative) and price elasticity is higher than advertising elasticity (Tellis 1988). Previous research finds that the absolute amount of average price elasticity is around 1.70 (Tellis 1988) and almost eight times larger than the advertising elasticity values of around 0.22 (Assmus, Farley, and Lehmann 1984; Lodish et al. 1995a). In this context, price is found to be relatively inelastic and advertising relatively more elastic and the difference between two is not as large as what prior work has concluded. The characteristics of the automobile industry as well as the aggregated data at the brand level might have played significant role in these findings. As prior research suggests price elasticity is found to be more negative in emerging product categories compared to mature markets. Also in this study, there is limited opportunity to differentiate among various car segments such as luxury, entry level, etc., which can significantly influence the elasticity values.

Relatively less research has focused on the effects of warranty and brand reputation on the brand performance. However, product warranty has a growing prominence in the marketing mix (Padmanabhan and Rao 1993). Chu and Chintagunta (2009) discuss that based on insurance and screening mechanisms the economic value of warranties is estimated to be positive in the U.S. server market. In this context, warranties have a fairly strong and negative elasticity on the brand sales in the group of over-appreciated brands. A 2007 survey of 8,000 customers by Consumer Reports indicated that only around 38 percent of customers are highly satisfied with the better and longer warranties sold along with the car. The rest perceives it as a costly "peace of mind." The reputation semi-elasticity of sales is found to be positive in both group of brands, which supports the prior literature. It has been discussed that brand reputation is difficult to build, helps create defensible competitive positions, and cannot be easily transferred to other brands or organizations; therefore as the firm invests more in its reputation, the higher its sales will be (e.g., Kotha et al. 2001). When it comes to market share response functions, in line with the expectations, the results are almost the same as in the sales response function in terms of their directions; however their interpretations will be different since market share is entered as a level variable into the equation (i.e., ΔMShare = (β/100)% Δx) (Wooldridge 2003).

Residual value of a car brand is a qualitatively different performance measure than sales and market share. Accordingly, the results show that the relationships between the marketing variables and residual value turn out to be different from what is discovered in sales and market share response functions. Residual value is the capital value in dollar amount remaining at the end of an investment period (i.e., leasing). It is

observed that both for the over- and under-appreciated brands, the marketing-mix signal that has the highest impact on the residual value of a car brand is the average sale price of the car brand. As the price level increases, the residual value of a car at the end of an investment period increases as well. For the over-appreciated brands, price elasticity of residual value is relatively more elastic compared to the under-appreciated brands. In other words, the value of the cars whose perceived quality is higher than its objective quality is more responsive to the original sale price level in the long-term. It is also found that advertising elasticity of the residual value is positive but much lower compared to that of price. This is an expected result since residual value will be highly biased toward to the selling price compared to any other marketing tool. Accordingly, it is also found that warranty and reputation mechanisms do not affect the residual value of a brand to a significant extent.

Regarding the relationships between quality perception gap and brand performance, the results provide interesting conclusions for both theory and practice. For both over-appreciated and under-appreciated brands, it is observed that an increase in the difference between perceived and objective quality of a brand in either direction generally leads to a decrease in the sales and market share of the brand in the long term. This result lends support to the disconfirmation and gap models in the literature. If consumers perceive quality higher than the true quality, this may result in favorable performance measures for the firm in the short-run. However, as the consumer experiences the product and is dissatisfied with its actual performance repeat purchase will be forfeited and negative word-of-mouth will be in effect in the long-term. On the other hand, having true quality of a product higher than its perceived quality has

detrimental effects on the brand performance as well since product quality improvements are ineffectively communicated to the consumers via the marketing-strategy. In sum, having a difference between the manufacturing quality and marketing quality hampers the sales and market share over time. This result is reversed with respect to the relationship between quality perception gap and residual value of a brand. It shows that when brands have a higher perceived quality over objective quality, an increase in the quality perception gap leads to a higher retained value on the car after a specific investment period. However, it is observed that this is not true for the under-appreciated brands. Therefore, it can be concluded that holding everything else constant, having a higher perceived image significantly increases the second hand value of the brand as well.

As a further analysis, this study examined whether the squared of the gap variable has a significant impact on the brand performance. For the over-appreciated brands, in their market share response function, it is found that while gap has a negative impact, the squared of the gap variable has a positive and significant impact on market share. However, no significant impact or sign change in the squared gap variable for the under-appreciated brands is found for any of the performance variables. This finding can have a critical implication on the role of marketing strategy on the brand performance. It suggests that although the difference between perceived and objective quality is detrimental to performance in the long run, after a certain point (i.e., turning point in the U-shaped curve) the increase in perceived quality above the objective quality produces some increasing returns for the brands. From the data set, it is found that this specific result covers the high-end brands such as BMW, Porsche, Mercedes-Benz, and Volvo.

This result implies that rather than reducing the information asymmetry, holding it consistently at high levels favoring the high perceived quality over the actual quality can serve as a competitive advantage for certain brands.

Moreover, the results of this study support the role of marketing-mix signals in a firm's quality improvement communication efforts as enhancing the alignment between the perceived and objective quality of a product (e.g., Morgan and Vorhies 2001). This study empirically analyzes the effect of multiple marketing signals as remedies for information asymmetry. Overall, findings suggest that marketing signaling and brand reputation strategies are more credible for the group of brands, which have a higher perceived quality than objective quality. They are effective as information remedy tools to converge perceived quality to the objective quality in the long term. They also imply that although individual marketing variables can be used for an over claim of the true quality in the short-term, in the long term, especially for the increasing levels of price, advertising, warranty, and reputation firms are less likely to risk the signaling costs as well as its reputation as a bonding mechanism with the customers (Boulding and Kirmani 1993) should the actual quality turn out to be lower than claimed. Because consumers punish the brands with deceptive behaviors and if the present value of punishment exceeds the gains from cheating, then the consumers' threat on the firm's behaviors provides rational sellers with sufficient incentives to cooperate (Herbig and Milewicz 1995; Herbig et al. 1994). Therefore, at higher levels of marketing signals, where the present values of punishment are more likely to exceed the costs, a lower discrepancy between perceived and objective quality is more attainable for the over-appreciated brands. This suggests that for the brands, which have higher perceived quality than

objective quality, a viable strategy can be firms' continuous investment in actual quality in alignment with its marketing strategy so that while consumers are being satisfied with the actual quality of the product and firms can benefit from the unique competitive advantage emerging from consumers' high perceptions. Therefore, the sustainable information asymmetry, which is mutually beneficial for the firms and the consumers, can turn into a competitive advantage for over-appreciated brands.

For the under-appreciated brands, the implications are different. The only effective signal is found to be price indicating that an increase in the price level can communicate the true quality of the product better than the advertising, warranty, and brand reputation. For the brands having a lower perceived quality than objective quality, the results imply that manipulating marketing-related cues are not effective to close the quality perception gap. Because if they were effective to increase the perceived quality, they would have been already successful and make the perceived quality at least meet the objective quality or exceed it. The results suggest that for the brands that have low consumer perceptions, even if the actual quality is at a high level, it is difficult to reverse this situation solely with changes in the levels of marketing-mix variables. This finding explains why American auto manufacturers are continuously being challenged with convincing their customers about the high manufacturing quality of their cars even in the presence of actual quality scores from reputable third-party agencies.

3.5.1 Limitations and Future Research

As with any study, this study has also some limitations, which provide further research avenues. First, this study investigated the longitudinal effects with industry archival data.

One general problem with the use of secondary data is the fit of the measures with the concepts. Although, this research followed previous literature in obtaining measures for the dataset; still, there can be still potential biases in measuring concepts such as perceived and objective quality as well as brand reputation. Second, this study employed multiple performance measures to achieve a more comprehensive picture; however other performance measures such as profitability, brand choice, etc. can provide more intriguing results, too. Third, it concentrated on one specific industry in examining the quality perception gap along with its antecedents and consequences. Application in other industries can contribute to the generalization of the findings. Fourth, the effects of interactions between marketing-mix signals on the quality perception gap were not considered. Investigating the interaction as well as quadratic effects of marketing signals on the quality perception gap can be a valuable next step. Fifth, a 2SLS estimation method was employed versus OLS, however future research can build a simultaneous equation systems accounting for other possible endogeneities such as the effects of objective quality improvements on the pricing and advertising strategy of firms or the effect of performance measures on the quality perception gap. Marketing literature has discussed issues such as the feedback mechanism from performance to the quality perception gap such that as sales or market share increase, consumers' experience with the product increases, and therefore consumers' perception of quality approach to the actual quality (Kopalle and Lehmann 2006).

Related with the methodology, it employed one period-lagged gap measure as a potential instrumental variable for the quality perception gap. However, it is seen that the low correlation between the IV and the independent variables caused a significant

inflation in the standard errors and therefore a loss in efficiency. In future studies, either another method of calculating the gap or a more viable IV can be employed for possible efficiency gains. Sixth, this study did not account for any competition or brand segment effects on these relationships. Especially, the segment of the car brand can be an important determinant on the quality perception gap as well as the decision on marketing strategy tools and brand performance. Competition intensity can also provide a contingency for the impact of quality gaps on performance. Regarding the levels of perceived and objective quality of a specific brand in the marketplace, competitors' quality or marketing strategy efforts are expected to affect focal brand's perceptions in the marketplace. Finally, besides the marketing strategy implications for managers and theoretical implications for the researchers, the gap between the perceived and objective quality of a product can have some possible marketing policy implications regarding deceptive pricing, advertising or assurance policies offered to the customers.

CHAPTER 4: THE EFFECTS OF QUALITY RATINGS AND MARKETING-MIX SIGNALS ON CONSUMER'S PERCEPTION OF QUALITY: A CUE UTILIZATION - DIAGNOSTICITY EXAMINATION

4.1 INTRODUCTION

In complex and experience product markets, consumers are generally uncertain about the true quality of competing products or brands (Nelson 1970; Erdem and Swait 1998). Previous research has proposed that in such markets, consumers are likely to depend on cues in assessing product quality (Rao and Monroe 1989; Monroe 2003). Several quality cues have received attention in the marketing literature such as price (Olson 1977; Rao and Monroe 1989), warranty (Boulding and Kirmani 1993; Shimp and Bearden 1982), advertising (Kihlstrom and Riordan 1984; Kirmani and Wright 1989), brand name (Wernerfelt 1988; Erdem and Swait 1998), and store name (Dodds et al. 1991; Purohit and Srivastava 2001). When product related information is scarce, ambiguous or difficult to evaluate, market-related cues affect consumers' perceptions of quality resulting in a more heuristic evaluation (Suri and Monroe 2003). Another mechanism to attenuate the pre-purchase evaluation uncertainty is third party product quality ratings (Archibald et al. 1983; Chen and Xie 2005). Recently, these ratings have become of growing interest to marketing literature in understanding consumers' information integration and quality assessment processes.

Notwithstanding the popularity of the impact of marketing cues and third party information on quality perceptions, the effect of multiple quality signals on consumers' evaluations is rather under-explored. In the marketing literature, the evidence is scarce in terms of the relationships between marketing-related cues as well as between the third party information and marketing-related cues. However, this is a highly relevant topic for

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both researchers and managers since quality signals usually exist and operate simultaneously. Therefore, unless multiple sources of information are presented separately, it is hard to overlook the relationships among them. Previous work that examines such relationships has been limited (e.g., Dawar and Parker 1994; Dodds et al. 1991; Miyazaki et al. 2005; Purohit and Srivastava 2001; Richardson et al. 1994) and resulted in equivocal conclusions. Furthermore, the disparate information integration approaches employed in the previous research calls for a parsimonious conceptual framework to examine the simultaneous effects of multiple information sources.

The purpose of this study is two-fold. First, given certain marketing-related cues, it examines how the existence of a cue strengthens or weakens the diagnosticity of another cue in a consumer's quality judgment. Second, given third party quality ratings and marketing-related cues, how these ratings interact with marketing-related cues in affecting consumer's quality inferences. Imagine a consumer intending to buy a car and evaluating several brands in his/her consideration set. Although the consumer is provided with specific intrinsic cues (e.g., engine size, mpg), there may be uncertainty about the quality of a specific part, its performance in the long run or difficulty in evaluating technical specifications. Therefore, the consumer tends to rely on some marketing related attributes such as brand name, reputation, price, warranties, assurance policy or third party quality ratings such as Consumer Reports or expert opinions. In such a scenario, this study asks the following the research questions: 1) How do consumers combine and assess multiple marketing-related cues in their product or brand quality evaluations? 2) How do consumers integrate third party quality ratings with the marketing-related cues in their product or brand quality evaluations?

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In this study, two different categorizations are used to understand the nature of multiple sources information. First, it differentiates between high-scope and low-scope cues (Gidron et al. 1993) to examine the marketing-related cues. High-scope cues are stable so that their value cannot be changed easily and quickly (e.g., brand reputation) whereas low-scope cues are temporary and they can be changed with relative ease and lower costs (e.g., price, warranty). Second, there is a differentiation between intrinsic and extrinsic cues (Cox 1967) to examine third party information and marketing-related cues. Intrinsic cues represent the integral parts of a product and extrinsic cues represent external information related with the product. All the marketing-related attributes can be categorized as extrinsic cues since altering them do not necessarily change the physical product. This study examines third party rating as a substitute to intrinsic cues wherever they are scarce or ambiguous. Specifically, third party product quality ratings are based on independent laboratory tests, expert evaluations, etc. to reduce the information asymmetry between the manufacturer and the consumer when the true quality is not easily observable. Movie critics (Eliashberg and Shugan 1997), consumer magazines (PC Magazine, Consumer Reports, Runner's World), websites (golfdigest.com) are examples of third party information. This study, drawing on cue diagnosticity (e.g., Skowronski and Carlston 1987) and cue utilization (Cox 1967) frameworks, develops and tests a conceptual framework that examines the simultaneous effects of multiple quality information on consumer's quality perceptions.

A series of general linear models (GLMs) and planned contrasts reveal that not only directly, but also indirectly brand reputation and quality ratings are used in evaluating price and warranty signals. It is found that warranty and price are more

diagnostic in product quality judgments when the valence of the brand reputation and quality ratings is high. This, however, does not occur in low reputation and low quality rating conditions. The results provide strong support not only to cue diagnosticity and cue utilization frameworks but also have implications for consumer-side signaling and the negativity bias.

This study has key contributions to the marketing literature. First, it provides a parsimonious conceptual framework to examine the simultaneous impacts of multiple quality signals. Second, it provides clear empirical evidence for the credibility and diagnosticity of brand reputation when presented with other marketing signals. Third, it empirically examines the interaction between third party quality ratings and marketing strategy of a manufacturer.

The organization of this study is as follows. First, it presents the conceptual background and then develops hypotheses regarding relationships among brand reputation, quality ratings, price, and warranty. Then, it describes and reports the findings of two experiments, which test the hypothesized relationships. Finally, it provides a general discussion of the findings with their theoretical and managerial implications. The discussion of limitations and directions for future research concludes the study.

4.2   CONCEPTUAL BACKGROUND AND HYPOTHESES DEVELOPMENT

4.2.1   Cue Utilization and Cue Diagnosticity

Information search behavior of consumers is an important determinant of the competitiveness of markets (Stigler 1961). The main premise is that not all consumers have perfect information about the products in the marketplace and therefore they place

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different values on products from the costs and returns of their own information search processes. This is especially true for the markets where the product quality is not easily or readily observable by the consumers due to the products' complex and experience based natures (e.g., Nelson 1970; Rindova et al. 2005). In the extant marketing literature, it has been shown that in such markets, consumers tend to rely on several cues to assess product quality (e.g., Rao and Monroe 1989).

Cue utilization theory states that most of the evaluations and choices regarding products are based on multiple cues. Drawing on this theory, products are conceptualized to consist of an array of intrinsic and extrinsic cues that serve as surrogate indicators of quality to consumers (Cox 1967; Olson 1972). Intrinsic cues are the inseparable parts of the physical product such as color or ingredients, whereas extrinsic cues are not an integral part of the product but often serve as signals to affect consumers' quality perceptions like price or brand name (Olson and Jacoby 1973). A review of literature suggests that consumers generally make evaluations via both intrinsic and extrinsic cues (Alba et al. 1999; Jacoby et al. 1971; Simonson 1989). Research shows that intrinsic cues generally dominate extrinsic cues in consumers' evaluations because they explain more about the product (Rao and Monroe 1988). However, when intrinsic attributes are missing, ambiguous or complex consumers use extrinsic cues to evaluate the product quality (Suri and Monroe 2003). A stream of behavioral research addresses those extrinsic cues affecting consumers' choice as "shortcuts" to assess product quality (e.g., Rao 2005).

Purohit and Srivastava (2001), drawing on Slovic and Lichtenstein's (1971) approach, indicates that the use of a specific cue in evaluating quality is contingent on the

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other cues' value or diagnosticity. The cue diagnosticity framework, building on cue

utilization, views product quality perception as a process, where individual cues

contribute to the categorization of the product quality (i.e., high versus low quality)

(Feldman and Lynch 1988; Skowronski and Carlston 1987). Cues that strongly suggest

one category over alternative categories are considered as diagnostic cues; and the more

diagnostic the cue is the more it is used. Cue diagnosticity is similar to the concept of

signal credibility, which is the main mechanism of the separating equilibrium in signaling

theory (Spence 1974; Kirmani and Rao 2000). Credible signals have a "bonding"

component indicating that firms incur loss if the signal is false (Ippolito 1990). Therefore,

consumers have confidence in the credible signals to distinguish high quality products

from low quality ones (Boulding and Kirmani 1993).

Since multiple cues exist simultaneously for a product in the marketplace, it is

important to understand how they affect product quality perceptions together, where the

effectiveness of a cue can be contingent on the existence and/or the value of another cue

(Maheswaran and Chaiken 1991; Miyazaki et al. 2005). Cue diagnosticity theory predicts

that when multiple cues are present, consumers will choose the more diagnostic ones to

determine the product quality category. To determine which cues are more diagnostic,

Gidron et al. (1993) develop a typology to classify the cues. They categorize cues into

two types as high-scope and low-scope. In an analogy of personality traits, they refer to

the frequency of a trait as its scope and assert that traits with high-scope require a higher

relative frequency of manifestation. Purohit and Srivastava (2001) extend this

classification in a quality assessment context and characterize high-scope cues as

evolving over time and stable so that their value cannot be changed easily and quickly

(i.e., brand reputation); and low-scope cues as temporary so that their value can be changed with relative ease and lower costs (i.e., price, warranty, free trial). Based on this categorization, high-scope cues are more diagnostic and credible signals of quality than low-scope cues. While the relative diagnosticity and credibility of low-scope cues can change with either the presence or value of high-scope cues, high-scope cues are less dependent on other cues existing in the environment. For example, a brand with a high (low) reputation can make the related low-scope cues more (less) diagnostic since the consumers perceive the brand as less (more) likely to send a false signal. This relationship between high- versus low-scope cues is also discussed in Boulding and Kirmani's (1993) consumer-side signaling framework, where high (low) quality firms have an incentive (disincentive) to choose a high warranty, allowing customers to distinguish high quality from low quality firms. Recently, in a similar manner, Miyazaki et al. (2005) suggest that cue consistency theory predicts the positive interaction between multiple sources of information when they provide supporting rather than contradictory information.

4.2.2 Hypotheses Development

Using cue utilization and cue diagnosticity theory, this study examines the impact of warranty and price on the perceived quality of a brand along with the existence of brand reputation and quality ratings. The main purpose is to understand whether brand reputation and quality ratings have an indirect effect on perceived quality through manipulating the diagnosticity of price and warranty.

4.2.2.1 Effects of Brand Reputation, Warranty, and Price on Perceived Quality

Several studies have examined the role of warranty on consumers' quality perceptions (Boulding and Kirmani 1993; Purohit and Srivastava 2001; Miyazaki et al. 2005). Warranties mainly serve to signal the manufacturer's confidence in the quality of a product and also provide consumers with an assurance of quality to increase their confidence (Erevelles 1993; Kirmani and Rao 2000; Shimp and Bearden 1982). Signaling theory predicts that since manufacturers with a low quality product are more frequently faced with higher repair costs than the manufacturers with a low quality product for the same level of warranty, low-quality manufacturers are discouraged to select longer period and higher coverage warranties (Spence 1974). However, warranty as a credible signal works only when the provision of a high warranty by a low quality manufacturer raises its costs to a higher level than that of a high quality firm. Conversely, if the low quality manufacturer can offer a high warranty and at the same time absorbs the higher costs of warranty fulfillment through charging a higher price, which is still lower than that of the high quality manufacturer, warranties will not be a credible signal to distinguish the high quality product from the low quality product. Erdem and Swait (1998) also discuss the limited credibility of a warranty signal in adverse selection and moral hazard situations. Moreover, Purohit and Srivastava (2001) categorize warranty coverage as a low-scope cue since it can be changed relatively easily and inexpensively. They propose that low-scope cues can be potentially used by firms to send false signals since they are less diagnostic and more ambiguous in assigning a product to a specific quality category. Therefore, warranty by itself may not be enough to credibly signal product quality but needs the existence and positive value of a higher-scope cue to increase its diagnosticity.

In considering high-scope cues, brand reputation is the one that is directly linked to the product. Brand reputation cue has taken the forms of bond credibility, brand name, manufacturer reputation, etc. in the marketing literature to indicate its credible role as a product quality signal (e.g., Boulding and Kirmani 1993; Erdem and Swait 1998; Purohit and Srivastava 2001; Rao et al. 1999). Wernerfelt (1988) sets the brand name apart from individual marketing-mix signals since it embodies the cumulative effect of all past marketing strategies. The ability of a brand name to signal the unobservable quality is based on the potential loss of brand equity, which can result in consumers' punishing the firms by withholding future purchases (Rao et al. 1999). A dominant view in the literature posits brand reputation as a high level signal affecting the interpretations of the other low level signals sent by the same manufacturer (Shapiro 1983). Similarly, Boulding and Kirmani (1993) define the reputation of a manufacturer both as a high level signal and as the "bond" component of other low level signals. They indicate that when a manufacturer fails to fulfill the obligations of a low level signal (e.g., warranty obligation), it not only forfeits its reputation with current customers but also eliminates the possibility of repeat purchase. Therefore, when reputation costs are important to a manufacturer, consumers perceive a good warranty offer by the manufacturer as a high quality signal. Purohit and Srivastava (2001) support and extend this view by proposing that not only a good (bad) reputation has a direct effect on product quality perception but also has an indirect effect through the increase (decrease) in the diagnosticity of the low-scope cue like warranty. A low-scope cue needs the existence of a positive high-scope cue to be evaluated as a diagnostic cue. Therefore, a better warranty does not influence the quality perceptions positively when sent by a low reputation manufacturer because

consumers are likely to perceive the better warranty as a compensation mechanism of the manufacturer for its poor reputation in the marketplace. Thus, it is hypothesized that:

H1a: When brand reputation is high, consumers are likely to perceive a higher quality with a better warranty than a poorer warranty.

H1b: When brand reputation is low, consumers are not likely to perceive a higher quality with a better warranty than a poorer warranty.

Another frequently cited product quality signal is price. It is indeed the most commonly referred extrinsic cue (Brucks et al. 2000). Especially, when intrinsic product information or other types of signals are missing in the environment, price appears to function as a proxy to quality (Zeithaml 1988). A high price implies a high demand for superior quality on the consumer's side or high production costs on the manufacturer's side. According to signaling theory, charging a high price puts the future revenues of the seller at risk because if the product's true quality is discovered to be lower than claimed, low quality sellers may not recover the signaling costs. However, price is a credible signal as long as firms do not find it economically profitable to deceive the customer by delivering a false quality claim with a high price. Price can lose its credibility when low quality firms mimic the high quality firms' actions until the signaling costs reach a level that low quality firms cannot mimic any more or when they misinform the customers about their true quality to capture some undeserved returns in the marketplace. Moreover, it is categorized as a low-scope cue. Since price levels are transient in nature, they can be changed quickly, and firms can use price to make false quality claims to the consumer. Therefore, similar to warranty coverage, price needs the existence and positive value of a high-scope cue like brand reputation to validate its diagnosticity. Shapiro (1983)

discusses that the price premium that high reputation brands have can be evaluated either as a return on reputation or as an incentive payment to induce quality maintenance. Dawar and Parker (1994) observe that brand name and price are most useful in quality determinations when presented together. Similarly, Brucks et al. (2000) find that when price is used more frequently when presented with a consistent brand cue than when brand cue is absent. Price is more diagnostic when the brand reputation is high but not when it is low. Consistent with the previous literature, a higher price is more likely to influence product quality perceptions positively when presented by a high reputation brand. Thus it is hypothesized that:

H2a: When brand reputation is high, consumers are likely to perceive a higher quality with a higher price level than a lower price level.

H2b: When brand reputation is low, consumers are not likely to perceive a higher quality with a higher price level than a lower price level.

The hypotheses above propose the effect of brand reputation on the individual impact of warranty and price on perceived quality. Extending the previous literature, it is argued that price and warranty will have a significant interaction effect on product quality perceptions when offered by a high reputation brand. According to Kirmani and Rao's (2000) categorization of signals, price and warranty are both default-contingent signal; and therefore they have a negative interaction since they provide the same type of information. However, according to the results of first study in this dissertation, price and warranty have a positive interaction effect on perceived quality. Although this result seems counterintuitive, when examined deeper, it is realized that price is a revenue-risking whereas warranty is a cost-risking signal and it is highly likely that they present

complementary rather than substitute information to the consumers. Based on these results, it is expected that the interaction between price and warranty is positive and significant on perceived quality and this effect is diagnostic when presented by a high reputation brand but not by a low reputation brand. Thus, it is hypothesized that:

H3: When brand reputation is high, the interaction of price and warranty leads to a higher perceived quality than when brand reputation is low.

4.2.2.2 Effects of Quality Ratings, Warranty, and Price on Perceived Quality

Cue diagnosticity theory builds on cue utilization theory, which suggests that products consist of an array of intrinsic and extrinsic cues and intrinsic attribute information usually dominates extrinsic cues in consumers' information integration (e.g., Miyazaki et al. 2005; Rao and Monroe 1988; Zeithaml 1988). The categorization of intrinsic versus extrinsic cues is different from the high-scope versus low-scope cues. Intrinsic cues represent the integral parts of a product and extrinsic cues represent external information related with the product (Cox 1967). All the marketing-related attributes can be categorized as extrinsic cues since altering them do not necessarily change the physical product.

In many situations, consumers are uncertain about the true quality of products especially when the intrinsic information is scarce and product is complex or experiential in nature (Nelson 1970). Previous research has examined how consumers tend to rely on marketing-related attributes (i.e., external cues) and make quality evaluations based on simple heuristics (Rao and Monroe 1989; Suri and Monroe 2003; Zeithaml 1988). Another mechanism to reduce the pre-purchase evaluation uncertainty is the third party

product quality ratings (Archibald et al. 1983; Chen and Xie 2005). The emergence of third party reviews (e.g., quality ratings) is related to the scarcity of intrinsic cues and uncertainty about the true quality of products or brands (Akerlof 1970). Movie critics (Eliashberg and Shugan 1997), consumer magazines (PC Magazine, Consumer Reports, Runner's World), websites (golfdigest.com) are examples of third party information. These ratings have become of growing interest in marketing literature in understanding consumers' information integration and quality assessment processes.

Previous research has examined how the information presented by the independent third parties via ratings and reviews affects the product performance (Eliashberg and Shugan 1997; Shaffer and Zettelmeyer 2002). However, the indirect relationship of third party reviews on product performance via other marketing-related cues has been relatively less examined. Regarding this indirect role, Archibald et al. (1983) propose a hedonic assumption, which suggests that the correlation between marketing signals and perceived quality increases with the introduction of third party product quality ratings. They analyze the interaction between quality ratings and marketing signals and find that in the presence of third party information, the impact of marketing-related cues on consumers' perception of product quality increases. Recently, Chen and Xie (2005) provide both a complementary and substitutive perspective of third party product reviews on firm's marketing strategy.

This study examines third party ratings as a substitute to the scarce and ambiguous intrinsic cues of the product quality. Specifically, third party product quality ratings are based on independent laboratory tests, expert evaluations, etc. to reduce the information asymmetry between the manufacturer and the consumer when the true

quality is not easily observable. Drawing on cue utilization theory, it is posited that due to their substitutive role to intrinsic product information, third party quality ratings dominate consumers' evaluation of product quality. Therefore, when other marketing-related attributes are presented together with third party information, their credibility will be contingent on the valence of the ratings. When a positive quality rating is made publicly available, consumers are willing to process it and also evaluate other marketing related attributes with it. According to the cue utilization theory, the substitute role of third party quality ratings predicts that they not only have a direct impact on consumers' perception of product quality but also have indirect impacts through extrinsic cues such as price and warranty. Moreover, cue consistency theory (Maheswaran and Chaiken 1991) predicts that if various sources of information are available, they are more likely to have a positive impact on quality perceptions when they confirm each other rather than conflict with each other. Based on the cue utilization theory, it s expected that consumers will perceive product quality to be higher with better warranty and higher price under the presence of high third party quality ratings. Thus, it is hypothesized that:

H4a: In the presence of high third party quality ratings, consumers are likely to perceive a higher quality with a better warranty than a poorer warranty.

H4b: In the presence of low third party quality ratings, consumers are not likely to perceive a higher quality with a better warranty than a poorer warranty.

H5a: In the presence of high third party quality ratings, consumers are likely to perceive a higher quality with a higher price level than a lower price level.

H5b: In the presence of high third party quality ratings, consumers are not likely to perceive a higher quality with a higher price level than a lower price level.

The hypotheses above propose the effect of third party quality ratings on the individual impacts of warranty and price on perceived quality. Extending the previous literature, it is hypothesized that an interaction effect exists between warranty and price under the given quality ratings. It is expected that price and warranty will have a significant and positive interaction effect on product quality perceptions when presented with high third party quality ratings.

H6: In the presence of high third party quality ratings, the interaction of price and warranty leads to a higher perceived quality than in the presence of low third party quality ratings.

4.3   METHODOLOGY

The hypotheses are examined in two studies that establish the main and interaction effects of various types of cues on the perceived quality. First, a pretest study is conducted to test the relationships between marketing and quality signals on perceived quality using the product categories of laptop and backpack. Next, in Study 1, the interaction effects are examined between brand reputation, price, and warranty on the perceived quality of cars to test H1a,b; H2a,b; and H3. Finally, in Study 2, the interaction effects are examined between quality ratings, price, and warranty on the perceived quality to test H4a,b; H5a,b; and H6.

4.3.1   Pretest

Relationships between marketing signals, quality ratings, and perceived quality were tested in a 3x2x2x2 mixed design experiment. Price (high/medium/low), warranty

(long/short), and product quality (excellent/poor) were manipulated between subjects, and the level of product involvement (high/low) was manipulated within subjects. A total of 134 undergraduate students (juniors and seniors only) enrolled in marketing courses participated for extra credit and were randomly assigned to 12 different purchase scenarios (cell sizes = 10 or 11). In each scenario, the participants were described a high and low involvement product purchase, where the order of the scenarios were randomized to eliminate the ordering effects. Laptop was chosen as a high involvement product and backpack was chosen as a low involvement product since both products are relevant to college students. However, laptops are more complicated and expensive products. They are used for a greater variety of activities and require more time and effort in pre-purchase evaluations compared to backpacks.

Subjects completed the online survey in a computer lab. They read two hypothetical purchase scenarios for a laptop and a backpack where they were asked to imagine themselves as a person who is planning to purchase the described product in the scenario. The manipulations were presented at the end of the scenarios. All the manipulations were determined based on a market scan of the products and chosen at the extreme within the feasible range of values for the product classes (Boulding and Kirmani 1993). Price had three levels for both the laptop (high price: $1,900, medium price: $ 900; low price: $350) and the backpack (high price: $99, medium price: $ 49; low price: $15). Warranty length was 30 days for the short condition and three years for the long condition. Quality of the product was based on fictitious Consumer Reports ratings (Alba et al. 1999), according to which the value of "one" represents the poor

condition and "seven" the excellent condition. Then, subjects completed the survey

questions, which took about 15 minutes.

A focal issue in the pretest and the following studies was the assumption of

signaling theory that consumers have imperfect information about product quality. The

limited scenario of this and the following experiments was consistent with this

assumption since consumers do not actually know the brand explained in the scenario and

are in need of extra information to assess its true quality (Boulding and Kirmani 1993).

In terms of dependent measures, a three-item *perceived quality* scale (Cronbach's

alpha = .96) was adopted from Swait and Erdem (2007): "the quality of the laptop

(backpack) is" (1=poor, 4= average, 7=excellent), "in terms of the overall quality, I

would rate the laptop (backpack) as:" (1=inferior; 7=superior), and "compared to other

brands, this laptop (backpack) brand is:" (1=one of the worst; 7=one of the best). The

scale items were averaged to measure the intended construct.

Regarding the manipulation checks, a 3 x 2 x 2 ANOVA on perceptions of price,

warranty, and quality showed that manipulations were viewed as intended in both

products. However, post-hoc tests (i.e., Scheffe and Bonferroni) showed that the

difference between high and low price; and medium and low price were significant but

the difference between high and medium price was not significant for both product

categories. The means for the level of involvement with laptops and backpacks were also

compared and the difference was significant.

In Table 4.1, the univariate GLM model results show that price and warranty do

not cause a significant difference on the perceived quality for both high- and low-

involvement product categories. However, quality rating has a highly significant impact

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in changing consumers' perceptions. It is also found that price and warranty signals significantly interact with the quality rating information for the high-involvement scenario but not for the low-involvement scenario. The two-way interaction between price and warranty is only significant for the high-involvement product. Finally, from the adjusted R-squared values, it is observed that the high-involvement product scenario has a higher explanatory power.

Table 4.1: Pilot Study - F-Values on Perceived Quality for the High and Low Involvement Purchase

Source	High-Involvement	Low-Involvement
Quality (Q)	214.06 ***	157.91 ***
Warranty (W)	0.82	0.05
Price (P)	0.03	1.36
W x Q	10.06 ***	1.23
P x Q	9.75 ***	1.03
P x W	4.45 *	0.70
P x W x Q	0.57	0.03
Overall Model	20.38 ***	15.34 ***
Adj. R-squared	*0.65*	*0.54*

*, **, *** indicate a significance level of $< .10$, $< .05$, and $< .01$, respectively.

4.3.2 Study 1

4.3.2.1 Participants, Design, and Procedure

Participants included a total of 182 undergraduates (juniors and seniors only) who participated in the experiment for course credit. Participants were randomly assigned to one of the eight cells in the 2 (brand reputation: higher than industry average and lower than industry average) x 2 (warranty: better than industry average and worse than industry average) x 2 (price: above industry average and below industry average) between subjects design. The number of participants in each cell ranged from 21 to 24.

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In the experimental task, the participants were asked to evaluate and provide their thoughts and feelings of a hypothetical car brand (Brand XYZ) with certain brand reputation, price, and warranty features with respect to the industry average values explained in a car purchase scenario. Before reading the scenario, the respondents were asked a few questions to understand their self-efficacy in purchasing a car and they were asked to write down the number of cars (including their current car) they have owned or used as their own cars in the past. Next, the scenario titled "Decision Making Scenario for a Car Purchase" was introduced with the following instructions: "On the next page, you will be presented with a car purchase scenario. As you read the scenario and answer the questions following the scenario, please imagine that you really come across a car brand as described. Please read the scenario carefully and then answer the following survey questions based only on the scenario." In the imaginary scenario, the participants were asked to imagine that they just graduated from college, found a good job, and decided to purchase a compact sedan car; and in their search process they came across several brands with compact sedan cars, some of which they took into their consideration set. They were told to assume that the brands in the consideration set have almost identical technical specifications and so, they are not very likely to affect their decision in favor of one brand over another. Therefore, it was explained that they decide to focus on the market-related attributes rather than the technical ones and then the participants read "As you browse through the brands in your set, you come across Brand XYZ with the following attributes."

The description of the Brand XYZ's attributes included the reputation, warranty, and price manipulations. The manipulations were presented with respect to the industry

average values to eliminate the possibility that participants may not be aware of whether the manipulated values are in the low or high range. To emphasize the manipulations with respect to their industry average values, they were also depicted in a simple table following the description in the scenario. Brand reputation was manipulated by telling participants the reputation rating of the Brand XYZ with respect to the industry average rating from Consumer Reports. Similar to Boulding and Kirmani (1993), participants in the higher than industry average (lower than industry average) reputation condition were told that, "Brand XYZ has been rated by Consumer Reports with a value of 4.8 (1.5), which is higher (lower) than the industry average value of 3.3." They were also told that "brand reputation is measured on a scale of 1 to 5 where 1 = low reputation and 5 = high reputation." Similar to Purohit and Srivastava (2001), warranty was manipulated relative to the average industry coverage in terms of the number of years and mileage. Participants in the better (worse) than industry average condition were told that, "Brand XYZ offers a warranty of 10 years/100,000 (3 years/36,000) miles, which is better (worse) than the industry average of 6 years/60,000 miles." Finally, price was also manipulated relative to the industry average value. For the above industry average (below industry average) condition, participants were told that, "Brand XYZ has a price tag of $30,000 ($9,900), which is above (below) the industry average of 20,000." All the manipulation levels were chosen at extreme, yet within the feasible range of real industry values (Boulding and Kirmani 1993). After reading the scenario, participants were asked to type their thoughts and feelings about Brand XYZ and complete a questionnaire that collected information on the dependent measure, manipulation checks, and standard demographics. The entire task took about 20 minutes to complete.

4.3.2.2 Dependent Measure

Participants' perception of product quality was measured by averaging five 7-point items (Cronbach's alpha = .97). Adopted from Purohit and Srivastava (2001), the five items were: "my overall impressions of Brand XYZ's quality is," ranging from 1 (very bad) to 7 (very good); "brand XYZ is most likely going to be of high quality," ranging from 1 (strongly disagree) to 7 (strongly agree); "brand XYZ is likely to be reliable," ranging from 1 (not very likely) to 7 (very likely); "compared to the other car brands, the quality of Brand XYZ is," ranging from 1 (much lower than average) to 7 (much higher than average); and a reverse coded item "I would worry about the quality of Brand XYZ," ranging from 1 (strongly disagree) to 7 (strongly agree). A factor analysis confirmed that the five items loaded on a single factor.

4.3.2.3 Results

Regarding manipulation checks, participants' perceptions about brand reputation, warranty, and price of the Brand XYZ were measured by a single item (i.e., "Please rate the brand reputation, warranty, and price of the Brand XYZ as described in the scenario.") measured on a 3-point scale (i.e., low – average - high). Participants were also asked to write down the reputation, warranty, and price attributes of Brand XYZ as they recalled from the scenario. A 2 x 2 x 2 analysis of variance (ANOVA) showed that perceptions of brand reputation, warranty, and price were significantly affected by the manipulations. Subjects in the "higher than industry average" brand reputation condition recalled the brand with higher reputation compared to the "lower than industry average" brand reputation condition (M = 2.71 vs. M = 1.27; F (1, 180) = 289.23, p < .001).

Subjects in the "better than industry average" condition recalled the brand as with higher warranty than the "worse than industry average" warranty condition, (M = 2.79 vs. M = 1.27; F (1, 176) = 383.07, p < .001). Finally, subjects in the "above industry average" condition recalled the brand as having higher price compared to the "below industry average" price condition (M = 2.69 vs. M = 1.50; F (1, 176) = 124.98, p < .001). It is observed that in the recall questions, approximately 85 percent of the participants recalled the manipulations correctly.

Table 4.2 reports the F-values from a univariate GLM model on the dependent measure, perceived quality. It is observed that among all three manipulated factors, reputation affects the perceived quality more than warranty and price (F(1, 174) = 714.12, p < .01). Furthermore, it is observed that all two-way interactions among the manipulations are significant whereas the three-way interaction, reputation x warranty x price, does not affect the perceived quality measure, significantly. The overall model has an adjusted R-squared value of 0.81. Table 4.3 displays the means and standard deviations of the perceived quality as a function of the manipulated variables. A series of planned contrasts depicted in Table 4.3 were used to test the hypothesized relationships. In the extant literature, it is discussed that planned contrasts are more efficient than F-tests in testing hypotheses that predict differences in specific cell means (Kirk 1995; Rosenthal and Rosnow 1985). Most of the studies in consumer behavior literature have used planned contrasts to test the hypotheses with respect to particular differences between treatment cells (e.g., Boulding and Kirmani 1993; Miyazaki et al. 2005; Purohit and Srivastava 2001).

Table 4.2: Study 1 - F-values on Perceived Quality

Source	F-value	Power
Reputation (R)	714.12 ***	1.00
Warranty (W)	31.27 ***	1.00
Price (P)	15.87 ***	0.98
R x W	9.24 ***	0.86
R x P	3.70 **	0.48
W x P	4.45 **	0.55
R x W x P	1.24	0.20
Overall Model	112.19 ***	1.00
Number of obs.	*182*	

*, **, *** indicate a significance level of < .10, < .05, and < .01, respectively.
Adjusted R-squared for the overall model = 0.81.

H1a states that when a brand has high reputation, then an increase in warranty results in higher perceptions of quality by the consumers. As Table 4.3 shows and planned contrasts test reveals, participants in the higher than average reputation cells perceive brand quality to be significantly higher with better than average product warranty offers relative to worse than average offers (M = 5.89 vs. M = 4.97; $F(1,174)$ = 36.53, p < .01).

H1b states that when a brand has low brand reputation, then an increase in warranty does not imply higher perceptions of quality. Consistent with this hypothesis, it is found that participants do not perceive quality significantly higher when it is sold via a better warranty under low reputation condition (M = 2.70 vs. M = 2.43; $F(1,174)$ = 0.48, ns). These results are in line with the previous literature (Boulding and Kirmani 1993; Purohit and Srivastava 2001). H2a and H2b test similar relationships between reputation and price. H2a indicates that if the brand has high reputation, consumers are more likely to perceive higher quality with above average industry prices. As predicted, Table 4.3 shows that consumers' perception of brand quality is higher when the high reputation

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brand sells the product with a higher price (M = 5.75 vs. M = 5.12; $F(1,174) = 17.89$, p < .01). H2b states that when a brand has low reputation, then an increase in price does not imply higher perceptions of quality. Planned contrasts show that when Brand XYZ has lower than industry average brand reputation, perceptions of quality are not necessarily higher with above average prices (M = 2.68 vs. M = 2.46; $F(1,174) = 2.56$, ns).

Finally, H3 tests for a three-way interaction among brand reputation, warranty, and price. H3 states that under high brand reputation, better warranty has a higher effect on perceived quality when presented with above average industry price relative to a worse warranty (no effect is expected with below industry price). H3 also states that when the brand has high brand reputation, above average prices have a higher effect on perceived quality when presented with better warranty conditions (no effect is expected with worse warranty). ANOVA results in Table 4.2 do not indicate a significant three-way interaction among the manipulated factors. By analyzing the nature of interaction using planned contrasts, it is found that when brand reputation is high, better warranty has a higher impact on perceived quality not only with above average prices but also with below average prices (Above average price: M = 6.04 vs. M = 5.46; $F(1,174) = 25.58$, p < .01. Below average price: M = 5.75 vs. M = 4.48; $F(1, 174) = 10.98$, p < .01). Moreover, it is observed that when reputation is high, above average prices do not necessarily have a higher impact on perceived quality with better warranty but indeed have higher impact with worse than industry average warranty condition (Better warranty: M = 6.04 vs. M = 5.75; $F(1,174) = 2.9$, ns. Worse warranty: M = 5.46 vs. M = 4.48; $F(1, 174) = 13.28$, p < .01). Therefore, planned contrasts do not support a significant three-way interaction under high brand reputation as well.

Table 4.3: Study 1 - Mean Perceived Quality and Planned Contrasts

	Higher than Average Reputation				Lower than Average Reputation			
	Product Warranty							
	Better		Worse		Better		Worse	
Price	M	SD	M	SD	M	SD	M	SD
Above Average	6.04 [1]	0.44	5.46 [2]	0.72	2.76 [3]	0.59	2.60 [4]	0.93
Below Average	5.75 [5]	0.53	4.48 [6]	1.08	2.65 [7]	0.55	2.27 [8]	0.59

Contrasts for testing hypotheses

H1a: [1] + [5] > [2] + [6]

H1b: [3] + [7] = [4] + [8]

H2a: [1] + [2] > [5] + [6]

H2b: [3] + [4] = [7] + [8]

H3: [1] > [2] & [5] = [6]; [1] > [5] & [2] = [6]

M = mean; SD = Standard deviation

Numbers in brackets denote the treatment cells.

4.3.3 Study 2

4.3.3.1 Participants, Design, and Procedure

Participants included a total of 178 undergraduates (juniors and seniors only) who participated in the experiment for course credit. Participants were randomly assigned to one of the eight cells in the 2 (quality rating: higher than industry average and lower than industry average) x 2 (warranty: better than industry average and worse than industry average) x 2 (price: above industry average and below industry average) between subjects design. The number of participants in each cell ranged from 20 to 25.

In this study rather than the brand reputation, third party quality rating of the car (Brand XYZ) was manipulated along with warranty and price. The experimental task was the same as in Study 1, where participants were asked to evaluate and provide their thoughts and feelings of the hypothetical car brand with some third party quality rating,

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price, and warranty features with respect to the industry average values explained in a car

purchase scenario. In the scenario, the description of the Brand XYZ's attributes included

the Consumer Reports' quality rating, warranty, and price manipulations. The

manipulations were presented with respect to the industry average values to eliminate the

possibility that participants may not be aware of whether the manipulated values are in

the low or high range. Participants in the higher (lower) than industry average quality

condition were told that, "Brand XYZ has been rated by Consumer Reports with a value

of 6 (2), which is higher (lower) than the industry average value of 4." They were also

told that "quality is measured on a scale of 1 to 7 where 1 = poor and 7 = excellent

quality." Warranty and price manipulations were kept the same. Similar to Study 1, after

reading the scenario, participants were asked to type their thoughts and feelings about

Brand XYZ and complete a questionnaire that collected information on the dependent

measure, manipulation checks, and standard demographics. The entire task took about 20

minutes to complete. In order to ensure the independence of the samples across two

studies, the students who already completed Study 1 were not allowed to participate in

Study 2 and were provided with an alternative extra credit study.

4.3.3.2 Dependent Measure

Similar to Study 1, the dependent variable in this study was perceived quality and

measured by averaging the five items (Cronbach's alpha = .97) adopted from Purohit and

Srivastava (2001). Again, a factor analysis confirmed that the five items loaded on a

single factor.

4.3.3.3 Results

Regarding manipulation checks, participants' perceptions about quality, warranty, and price of the Brand XYZ were measured by a single item (i.e., "Please rate the actual quality, warranty, and price of the Brand XYZ as described in the scenario.") measured on a 3-point scale (i.e., low - average - high). Participants were also asked to write down the quality, warranty, and price attributes of Brand XYZ as they recalled from the scenario. A 2 x 2 x 2 ANOVA showed that perceptions of quality rating, warranty, and price were significantly affected by the manipulations. Compared to the "lower than industry average" quality condition, subjects in the "higher than industry average" quality condition recalled the brand as higher quality ($M = 1.04$ vs. $M = 2.88$; $F(1, 176) = 2087.64$, $p < .001$). Compared to the "worse than industry average" warranty condition, subjects in the "better than industry average" condition recalled the brand as with higher warranty ($M = 1.16$ vs. $M = 2.93$; $F(1, 176) = 1272.48$, $p < .001$). Finally, compared to the "below industry average" price condition, subjects in the "above industry average" condition recalled the brand as having higher price ($M = 1.22$ vs. $M = 2.86$; $F(1, 176) = 398.77$, $p < .001$). It is observed that in the recall questions, over 90 percent of the participants recalled the manipulations correctly.

Table 4.4 reports the F-values from a univariate GLM model on the dependent measure, perceived quality. Three important results are observed. First, among three different manipulations, third party quality ratings affect the perceived quality ($F(1, 170) = 457.18$, $p < .01$) to a greater extent than price and warranty. Second, although warranty does not affect the perceived quality significantly, there is a significant interaction between quality and warranty ($F(1, 170) = 3.80$, $p < .05$). Third, neither the two-way

interaction between warranty and price ($F(1, 170) = 2.05$, $p > .10$) nor the three-way interaction, quality x warranty x price, ($F(1, 170) = 1.14$, $p > .10$) is significant on perceived quality. The overall model has an adjusted R-squared value of 0.74. Table 4.5 displays the means and standard deviations of the perceived quality as a function of the manipulated variables. Similar to Study 1, a series of planned contrasts, as depicted in Table 4.5, were used to test the hypotheses.

H4a states that when a brand has high third party quality ratings, then an increase in warranty results in higher perceptions of quality by the consumers. As Table 4.5 shows and planned contrasts reveal, participants in the higher than average quality cells perceive brand quality to be significantly higher with better than average product warranty offers relative to worse than average offers ($M = 5.51$ vs. $M = 5.03$; $F(1,170) = 5.95$, $p < .05$). H4b states that when a brand has low third party quality ratings, then an increase in warranty does not imply higher perceptions of quality. Consistent with this hypothesis, it is found that participants do not perceive quality significantly higher when it is sold via a better than average warranty under low quality ratings ($M = 2.30$ vs. $M = 2.34$; $F(1,170) = 0.06$, ns). H5a and H5b test similar relationships between quality rating and price. H5a indicates that if the brand has higher than average quality ratings, consumers are more likely to perceive higher quality with above industry average prices. As predicted, Table 4.5 shows that consumers' perception of brand quality is higher when the high quality brand sells the product with a high price ($M = 5.72$ vs. $M = 4.82$; $F(1,170) = 19.5$, $p < .01$). H5b states that when a brand has low quality ratings, then an increase in price does not imply higher perceptions of quality.

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Table 4.4: Study 2 - F-values on Perceived Quality

Source	F-value		Power
Quality (Q)	457.18	***	1.00
Warranty (W)	2.61		0.36
Price (P)	11.72	***	0.93
Q x W	3.80	**	0.50
Q x P	9.18	***	0.85
W x P	2.05		0.29
Q x W x P	1.14		0.18
Overall Model	72.97	***	1.00
Number of obs.	*178*		

*, **, *** denote significance levels of < .10, < .05, and < .01, respectively.
Adjusted R-squared for the overall model = 0.74.

As Table 4.5 and planned contrasts show, when Brand XYZ has lower than industry average quality ratings, perceptions of quality are not necessarily higher with above average prices (M = 2.35 vs. M = 2.29; F(1,170) = 0.08, ns).

Finally, H6 tests for a three-way interaction among quality rating, warranty, and price. H6 states that under high quality ratings, better warranty has a higher effect on perceived quality when presented with above industry price relative to a worse warranty (no effect is expected with below industry price). H6 also states that under high quality ratings, above average prices have a higher effect on perceived quality when presented with better warranty conditions (no effect is expected with worse warranty). ANOVA results in Table 4.4 do not indicate a significant three-way interaction among the manipulated factors. By analyzing the nature of interaction using planned contrasts, it is observed that when quality rating is high, better warranty has a higher impact on perceived quality in the presence of both above and below industry price conditions

(Above average price: M = 5.79 vs. M = 5.65; F(1,170) = 7.55, p < .01. Below average

price: M = 5.24 vs. M = 4.41; F(1, 170) = 11.2, p < .01).

Table 4.5: Study 2 - Mean Perceived Quality and Planned Contrasts

	Higher than Average Quality				Lower than Average Quality			
	Product Warranty							
	Better		Worse		Better		Worse	
Price	M	SD	M	SD	M	SD	M	SD
Above Average	5.79 [1]	0.73	5.65 [2]	0.45	2.31 [3]	0.82	2.40 [4]	1.07
Below Average	5.24 [5]	0.94	4.41 [6]	1.33	2.30 [7]	0.85	2.29 [8]	0.95

Contrasts for testing hypotheses
H4a: [1] + [5] > [2] + [6]
H4b: [3] + [7] = [4] + [8]
H5a: [1] + [2] > [5] + [6]
H5b: [3] + [4] = [7] + [8]
H6: [1] > [2] & [5] = [6]; [1] > [5] & [2] = [6]

M = mean; SD = Standard deviation
Numbers in brackets denote the treatment cells.

Moreover, it is find that when quality rating is high, above average prices have a higher

impact on perceived quality in the presence of both better and worse than industry

average warranty (Better warranty: M = 5.79 vs. M = 5.24; F(1,170) = 4.1, p < .05 .

Worse warranty: M = 5.65 vs. M = 4.41; F(1, 170) = 18.40, p < .01) Therefore, planned

contrasts do not support a three-way interaction under high quality ratings, although it is

observed that the significant effects disappear totally under low quality conditions.

4.4   CONCLUSIONS AND DISCUSSION

Despite the consumers' experience with multiple quality cues in the marketplace, the

previous research in understanding how various types of cues are integrated in

consumers' product quality perceptions has been scarce and produced few generalizable

conclusions. The purpose of this study is to understand how consumers make use of

multiple cues to evaluate product quality when there is information asymmetry and

uncertainty about the purchase. Unless cues are presented individually, it is hard to

overlook the relationships among them. Therefore, the motivation is to examine how the

simultaneous appearance of cues affects consumers' perception of quality. Based on cue

utilization and cue diagnosticity frameworks, a conceptual framework is developed and

hypotheses regarding the effects of third party quality ratings, brand reputation, price, and

warranty are built and empirically tested in two experimental studies.

The objective of the first study is to understand how brand reputation (i.e., high-

scope cue) influences the impact of price and warranty (i.e., low-scope cues) on

perceived quality. The cue diagnosticity framework discusses that the use of a specific

cue in evaluating quality is contingent on the other cues' existence and valence.

According to this framework, it is argued that cues that strongly suggest one category

over alternative categories are considered as diagnostic cues. These highly diagnostic

cues are also known as high-scope cues, which are relatively stable. There are also low-

scope cues, which are transient in nature so that their value can be changed with relative

ease and lower costs. In particular, the cue diagnosticity framework suggests that the

diagnosticity of the low-scope cues depends on the existence and valence of the high-

scope cues since the likelihood of a product's quality categorization is much higher with

a high-scope cue.

The results of Study 1 provide support for the cue diagnosticity framework

(Purohit and Srivastava 2001). Specifically, brand reputation as a high-scope cue is used

in assessing quality to a greater extent than the low-scope cues of price and warranty. Furthermore, it is used by the participants regardless of the value of other cues. Not only directly, but also indirectly brand reputation is used in evaluating price and warranty signals. It is found that both warranty and price are used in product quality judgments when the valence of the brand reputation is high. In planned contrasts, when brand reputation is high, participants tend to perceive product quality to be higher with better warranty and higher price level. This, however, does not occur in low reputation condition. The negative image of brand reputation reduces the diagnosticity of both warranty and price. So, overall, these findings lend support to cue diagnosticity framework and the direct and indirect impacts of brand reputation on perceptions of quality.

The objective of the second study is to understand how third-party quality rating influences the impact of price and warranty on perceived quality. Cue utilization theory is the foundation of cue diagnosticity theory and it classifies the cues as intrinsic and extrinsic cues. The theory suggests that products consist of an array of intrinsic and extrinsic cues and intrinsic attribute information usually dominates extrinsic cues in consumers' information processing. However, intrinsic information is either scarce or ambiguous in information asymmetric and uncertain purchase situations; and therefore consumers tend to use extrinsic cues to evaluate the product quality. The emergence of third-party reviews is related to attenuate the product evaluation uncertainty through providing independent product related information as a substitute to the inadequate intrinsic cues. According to the cue utilization theory, the substitute role of third party reviews (e.g., quality ratings) predicts that they not only have a direct impact on

consumers' perception of product quality but also have indirect impacts through extrinsic cues such as price and warranty. Similar to the relationship between high-scope and low-scope cues, the impact of extrinsic cues on perceived quality depend on the valence of intrinsic cue such that consumers are more likely to use price and warranty when presented with high third-party ratings.

The results of Study 2 provide support for the cue utilization framework. As such, the third party actual quality ratings are used more than any other cues by the participants. Warranty is insignificant and price is less influential than quality ratings on perceived quality. Moreover, the results indicate that participants perceive high quality with better warranty and higher price only when presented with high third party ratings. Similar to Study 1, when third party quality ratings exist but are low, consumers do not tend to perceive warranty and price cues as diagnostic in product quality perception. Also, third party quality information is so dominant in subjects' evaluations that the significant interaction between price and warranty under high brand reputation disappears when presented with high quality ratings. Overall, these results support the substitutive role of third party quality ratings for the scarce or ambiguous intrinsic attribute information. They also demonstrate that the effect of intrinsic cues on perceptions of quality is dominant both in a direct and indirect way.

Study 1 and Study 2 provide other theoretical implications than cue diagnosticity and cue utilization. Results of both studies have implications for consumer-side signaling framework. Consumer-side signaling suggests that individual marketing signals (i.e., price, advertising, and warranty) can cause a pooling equilibrium between high and low quality products under conditions of adverse selection and moral hazard. However,

consumer responses to better warranties or higher prices are more compatible with separating equilibrium under conditions of high bond credibility. Specifically, high quality or high reputation sellers have higher incentives to offer better warranty or higher prices since they are more likely to recoup the benefits in the future relative than a low quality firm. Also, the "bonding" component in being a reputable or high-quality seller is high. Consumers perceive the signals from such buyers more credible, because, if the signal is false, the firm does not only incur the costs of signals but also risks its reputation or consumers' future purchases. The results of Study 1 and Study 2 are consistent with the bonding component of high reputation and high quality brands. It is observed that high price and better warranty strategies are more beneficial to the high-credibility firm. However, these results are not sufficient to prove the existence of separating equilibrium (Boulding and Kirmani 1993).

The findings of Study 1 and Study 2 also lend support to cue consistency and negativity bias in traditional information integration approaches (Anderson 1981). The cue consistency theory suggests that multiple sources of information are more beneficial when they provide supportive information rather than contradictory information (Maheswaran and Chaiken 1991). Cue consistency provides a mechanism to manipulate the importance of information such that when two sources of information are consistent, they receive similar attention, but when they are inconsistent, the more negative source becomes more prominent in consumer's information integration (Miyazaki et al. 2005). The term that explains this mechanism is negativity bias. Specifically, it proposes that when multiple cues are present, if one of them is more negative than the other, the negative cue receives more weight causing other cues to have smaller weights in

information processing (Purohit and Srivatava 2001). The findings that price and warranty are used in consumers' quality perceptions when the brand has a high reputation (in Study 1) and when it has high quality ratings (in Study 2), but not when it has low reputation and low quality ratings, is consistent with cue consistency and negativity bias.

Not only from a theoretical perspective, but also from a managerial perspective, these findings have specific implications. In Study 1 and Study 2, it is shown that brand reputation and quality ratings of a brand have the most significant impact on consumers' quality perceptions. The importance of brand name has been an issue of one of the GM's research on Saturn brand. In BusinessWeek's March 2009 issue, the damage in Saturn's brand image is explained via an experiment that the company conducted. When the automaker showed buyers the Aura family sedan model of Saturn with the nameplate removed, the car got a score of 3.4 out of 4.0; whereas with the Saturn badge put on the hood, the same car scored only 2.0 (BusinessWeek, March 2009). Consumer's confidence on the brand and quality of the cars has been a great issue with most of the automakers. As an example, in order to erase consumers' bad memories about the quality of its Excel model back in 1990s, Hyundai is still trying hard on its marketing to convince consumers about its quality (BusinessWeek, February 2009).

Consistent with the previous literature, it is found that perceptions of quality are not affected by warranty offerings when the reputation or the quality rating of the manufacturer is low. Therefore, without investing in brand reputation or actual quality, provision of an above industry average warranty should be expected to backfire. The same is true for pricing strategy as well. Increasing the price tags of new model cars replacing the old ones (e.g., Buick Enclave versus Buick Rendezvous) or increasing the

prices to compete in the luxury segment (e.g., Hyundai Genesis) should be initially

supported by the overall reputation of the brand name or the quality image of the

manufacturer. Considering the individual signaling roles of price and warranty, it is found

that price has a more consistent signaling role than warranty since in both studies price is

found to be significantly affecting perceived quality. However, the credibility of warranty

varies from context to context. When presented with actual quality rating information,

consumers are likely to trust quality information more than warranty and this undermines

the credibility of warranty signal. When presented with brand reputation, consumers still

tend to rely on warranties as a signal of the quality of a product. Therefore, companies

should pay attention to the presence of multiple signals at the same time. When there is a

strong signal implying the intrinsic attributes of a product like third party quality ratings,

sending a strong warranty signal can be redundant for the consumer's evaluations. It is

found that warranty signal can be perceived diagnostic when the actual quality ratings are

high. But they are not diagnostic by themselves or when presented with low quality

ratings.

4.4.1 Limitations and Future Research

In summary, this study examines how consumers combine multiple cues in their

product quality assessments. As with any study, it has some limitations, which provide

avenues for future research. First, it has simple stimuli and an artificial setting. To serve

the objectives with clarity, the manipulations were kept at an unrealistically simple level

compared to an actual car purchase. Second, the experiments were conducted with

student participants and the product category of cars was chosen as corresponding to the

first two studies in this dissertation. However, for college student subjects, car buying might not be the most relevant context. Still, it is observed that the results showed a great similarity to the high-involvement purchase scenario (i.e., laptop purchase) results in the pretest.

Overall, the results of the study provide the theoretical conjectures with strong support. In future studies, for generalization purposes, other product categories and more complex stimuli might be chosen to test the implications of cue utilization and cue diagnosticity frameworks. Besides perceived quality, other components of consumer's decision making such as perceived risk, anticipated satisfaction, and purchase intention can be worthwhile dependent measures to examine the proposed theoretical frameworks.

CHAPTER 5: DISSERTATION CONCLUSIONS AND FUTURE RESEARCH

This dissertation scrutinizes the relationship between objective and perceived quality via broad theoretical backgrounds and a variety of methodologies using real industry and consumer data. Adopting both a firm's and consumer's standpoint, the three studies take distinctive yet complementary perspectives to uncover various aspects of this relationship. The first two studies take a firm's perspective. Specifically, in the first study, the motivation is to uncover the longitudinal effects of objective quality, market signaling, and their interactions on the perceived quality. In the second study, the key objectives are to measure the potential gap between perceived and objective quality with a new construct coined as quality perception gap and to understand the market signaling antecedents and brand performance consequences of this gap. Both of these studies adopt market-focused economic theories and conducted econometric estimation techniques with a brand level, archival data in the U.S. automobile industry. The third changes the firm's perspective into the consumer's perspective. The main purpose of the third study is to investigate how consumers make use of quality and marketing-related cues to evaluate product quality under pre-purchase information asymmetry and uncertainty. A conceptual framework is developed based on behavioral theories such as cue utilization and diagnosticity, and tested via data collected in two separate lab experiments. The specific findings and further research avenues of each study are as follows.

Study #1: The results of this study imply that an increase in objective quality affects perceived quality positively. Regarding the simultaneous effects of objective quality and marketing-mix signals, it is observed that price level and the amount of advertising expenditures create negative interactions with objective quality on perceived quality,

whereas warranty has a significant and positive interaction with objective quality on perceived quality. An empirical testing of the theoretical conjectures regarding the interaction effects between marketing-signals is also provided. The findings imply that the negative interaction between substitutive signals and the positive interaction between complementary signals do not necessarily hold in the U.S. automotive industry. It is found that price and advertising produce a negative interaction on the perceived quality. When advertising and warranty are presented together, they do not produce a significant influence on the perceived quality. Similarly, the interaction between price and warranty is also found insignificant. However, brand reputation, as being a richer signal than the individual marketing-mix signals, when presented together with the individual marketing signals, provides positive effects on perceived quality. Table 5.1a depicts a summary of the Study #1 findings.

This study examines the hypothesized relationships with brand-level data. However, as a future research avenue decomposing the brands into car models and analyzing similar relationships at the model level can be worthwhile. Also, any sort of competition effects are not considered in the empirical model. Yet, the issue of how the brands' marketing and quality strategy are affected by the changes in the competitors' moves might constitute a valuable future research question.

Study #2: The results suggest that for both the over-appreciated and under-appreciated brands, an increase in the quality perception gap deteriorates the brand sales and market share. Regarding the residual value of the brand, it is found that for the over-appreciated brands, an increase in the quality perception gap leads to an increase the residual value, whereas for the under-appreciated brands, this relationship turns out to be insignificant.

Table 5.1a: Summary of the Dissertation Findings – Study #1

Study #1 Hypotheses	Result
H1a: The objective quality of a brand affects its perceived quality positively.	Supported
H1b: The impact of the brand's earlier objective quality on its current perceived quality is positive and greater than the impact of the brand's current objective quality.	Supported
H2a: The interaction effect between marketing-mix signals and objective quality on perceived quality is negative.	Partially Supported (for price and advertising)
H2b: The interaction effect between marketing-mix signals and objective quality on perceived quality is positive.	Partially Supported (for warranty)
H3a: The interaction effect of two similar type marketing-mix signals on perceived quality is negative.	Not Supported
H3b: The interaction effect of two different type marketing-mix signals on perceived quality is positive.	Not Supported
H3c: The interaction effect between brand reputation and each of the marketing-mix signals on perceived quality is positive.	Supported

Furthermore, it is observed that marketing-mix signals operate as remedies of information asymmetry for the over-appreciated brands. In other words, at higher levels of marketing signals, the gap between perceived and objective quality is likely to reduce. However, the same relationship is not observed for the under-appreciated brands. Except price, no other marketing-mix signal is found effective in increasing perceived quality to objective quality levels when the perceived quality is lower than the objective quality. Table 5.1b depicts a summary of the Study #2 findings.

This study provides interesting future research opportunities as follows. First, other performance measures such as profitability, brand choice can be used to investigate

Table 5.1b: Summary of the Dissertation Findings – Study #2

Study #2 Hypotheses	Result
H1: An increase in the quality perception gap of a brand is expected to result in inferior brand performance in the long-term.	Partially Supported (for sales and market share)
H2: As the levels of marketing-mix signals increase, the quality perception gap is expected to decrease in the long-term.	Partially Supported (for over-appreciated brands)

the consistency of the findings. Second, especially in evaluating the marketing interfaces

of the perceived and objective quality relationship, segment of the car can be an

important variable. It is not very intuitive to classify the brands into segments however

the models can be easily categorized. Thus, a future research avenue controlling for the

segment of the car in understanding the antecedents and consequences of the gap can be

worthwhile. Finally, besides the theoretical and managerial implications, this study can

have possible marketing policy implications with respect to deceptive pricing,

advertising, etc.

Study #3: The findings indicate that brand reputation and third party quality ratings have

a higher impact on consumers' quality perceptions than the price and warranty cues.

Besides their direct effects, they indirectly affect consumers' quality perceptions through

accentuating the effects of price and warranty signals. It is observed that both warranty

and price are used in brand quality evaluations when the valence of the brand reputation

and third party actual quality ratings is high. However, similar effects are not observed

with low reputation and quality rating conditions. Overall, the results of experiments lend

support for the cue utilization and diagnosticity frameworks.

Table 5.1c: Summary of the Dissertation Findings – Study #3

Study #3 Hypotheses	Result
H1a: When brand reputation is high, consumers are likely to perceive a higher quality with a better warranty than a poorer warranty.	Supported
H1b: When brand reputation is low, consumers are not likely to perceive a higher quality with a better warranty than a poorer warranty.	Supported
H2a: When brand reputation is high, consumers are likely to perceive a higher quality with a higher price level than a lower price level.	Supported
H2b: When brand reputation is low, consumers are not likely to perceive a higher quality with a higher price level than a lower price level.	Supported
H3: When brand reputation is high, the interaction of price and warranty leads to a higher perceived quality than when brand reputation is low.	Not Supported
H4a: In the presence of high third party quality ratings, consumers are likely to perceive a higher quality with a better warranty than a poorer warranty.	Supported
H4b: In the presence of low third party quality ratings, consumers are not likely to perceive a higher quality with a better warranty than a poorer warranty.	Supported
H5a: In the presence of high third party quality ratings, consumers are likely to perceive a higher quality with a higher price level than a lower price level.	Supported
H5b: In the presence of high third party quality ratings, consumers are not likely to perceive a higher quality with a higher price level than a lower price level.	Supported
H6: In the presence of high third party quality ratings, the interaction of price and warranty leads to a higher perceived quality than in the presence of low third party quality ratings.	Not Supported

Moreover, they provide researchers with implications for consumer-side signaling, cue consistency, and negativity bias arguments. Table 5.1c depicts a summary of the Study #3 findings.

As further research avenues, more realistic stimuli and field work with participants who are more related to car purchase than college students can be conducted.

Also, other components of the consumers' information integration processes (e.g., perceived risk, anticipated satisfaction) and different product categories than cars can be considered for generalization purposes.

All in all, this dissertation derives intriguing findings for both scholars and managers and provides researches with new research avenues. Each study has its own limitations, yet still contributes individually and collectively to the marketing literature on quality.

APPENDIX

SUPPORTING DOCUMENTS (CHAPTER 3)

Trends of Perceived and Objective Quality in the U.S. Automobile Industry between 1990 and 2007

Acura

Audi

BMW

Buick

Cadillac

Chevrolet

Chrysler

Dodge

Ford

GMC

Honda

Hyundai

Infiniti

Isuzu

144

Jaguar

Jeep

Kia

Lexus

146

Lincoln

Mazda

Mercedes-Benz

Mercury

Mini Cooper

Legend: PQ, OQ

Mitsubishi

Legend: PQ, OQ

Nissan

Pontiac

Porsche

Saab

Saturn

Subaru

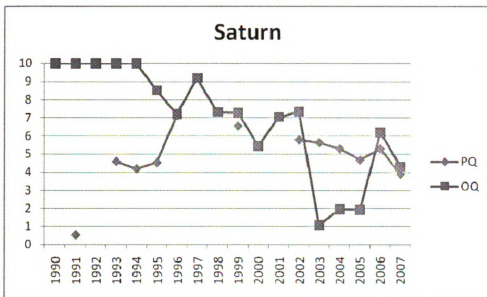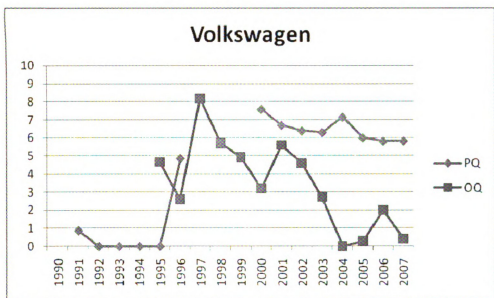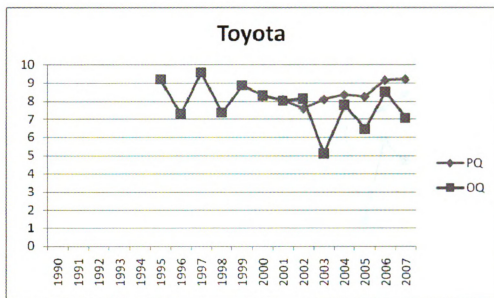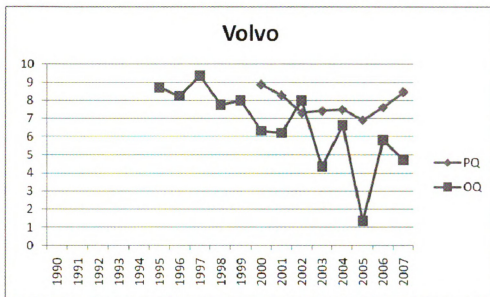**Toyota**

Volkswagen

Volvo
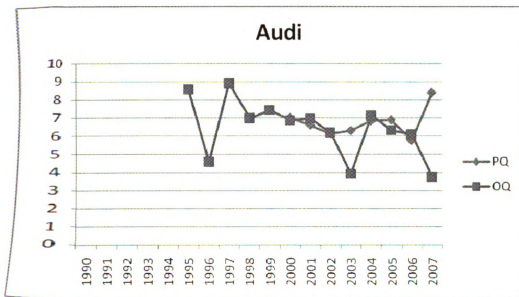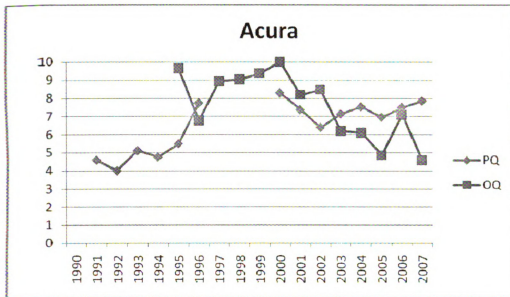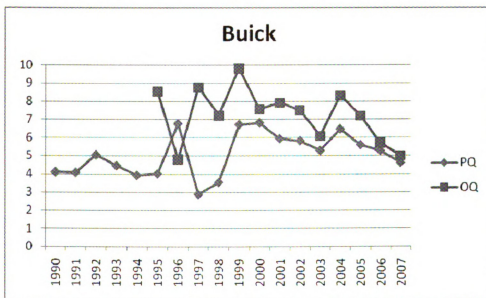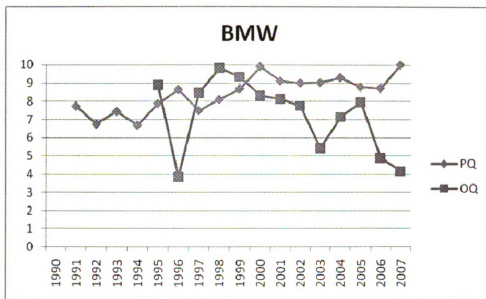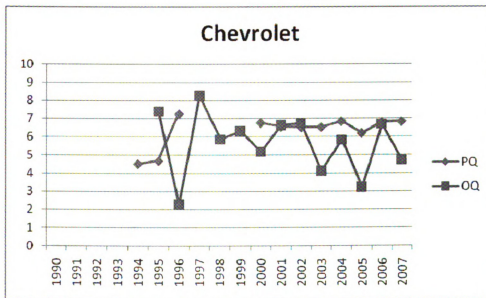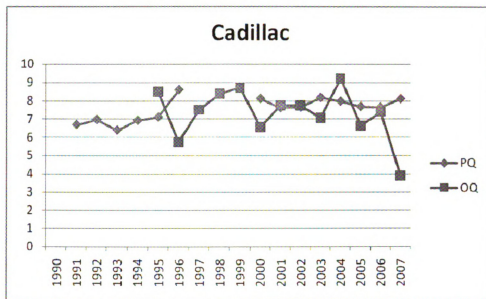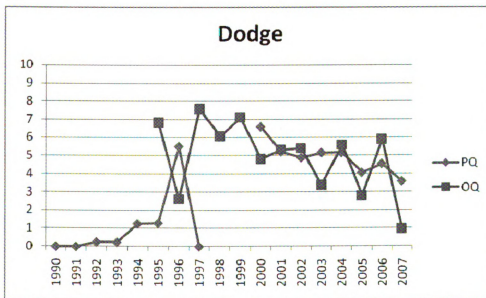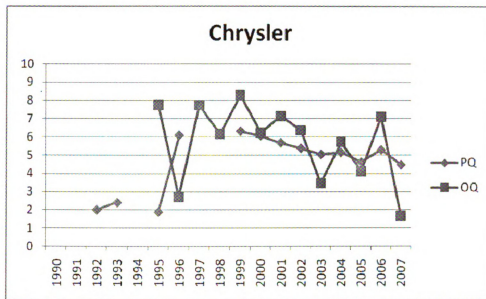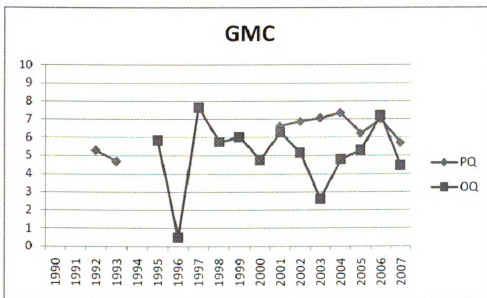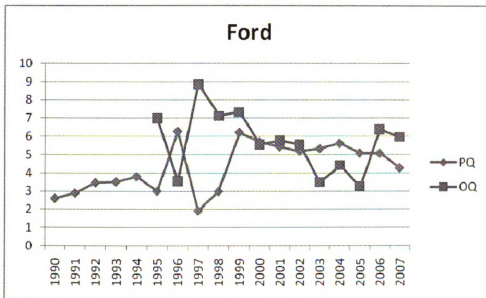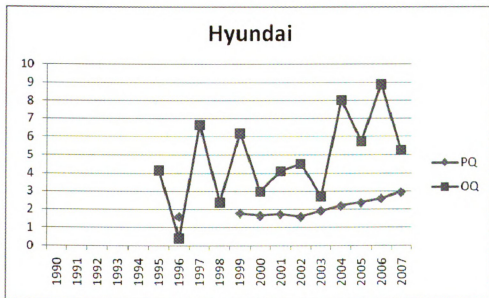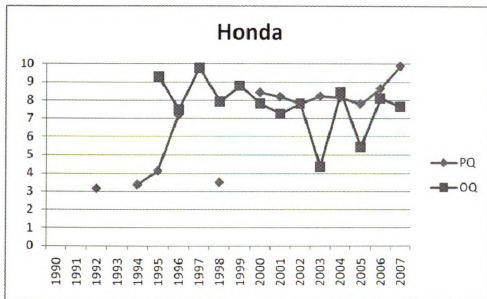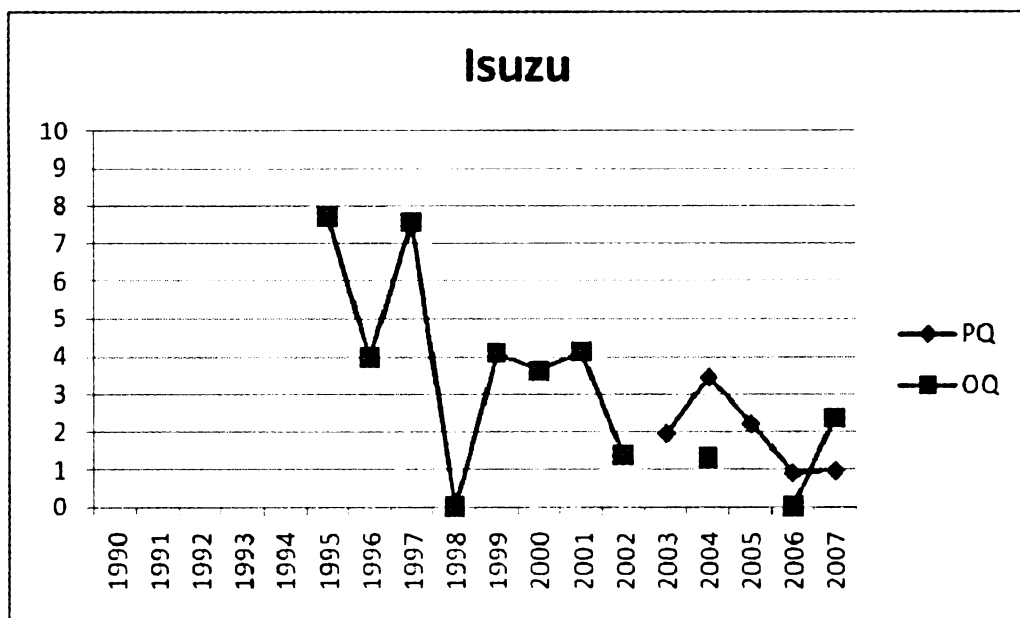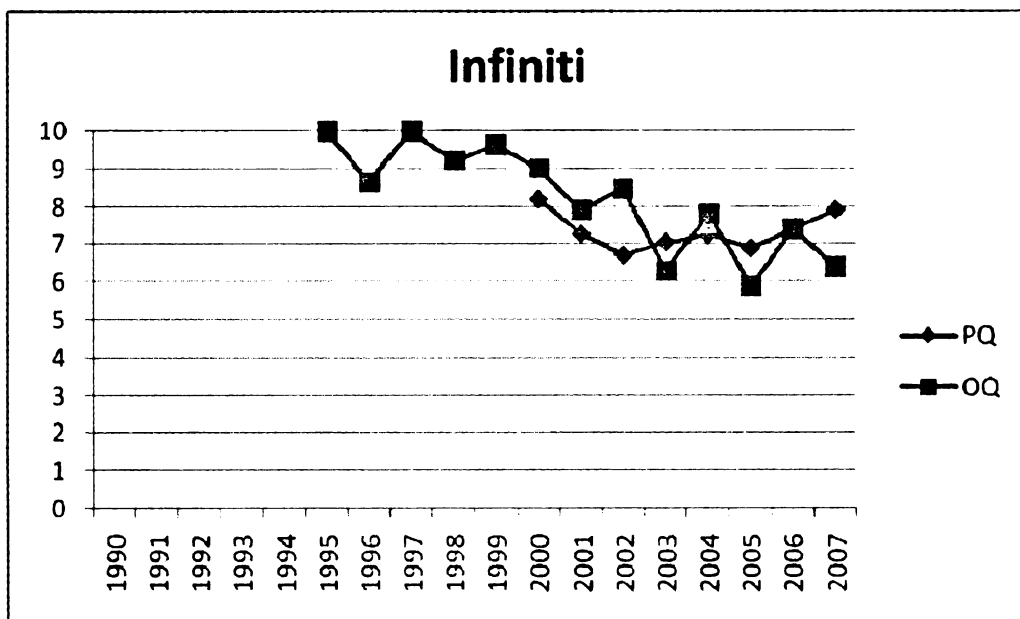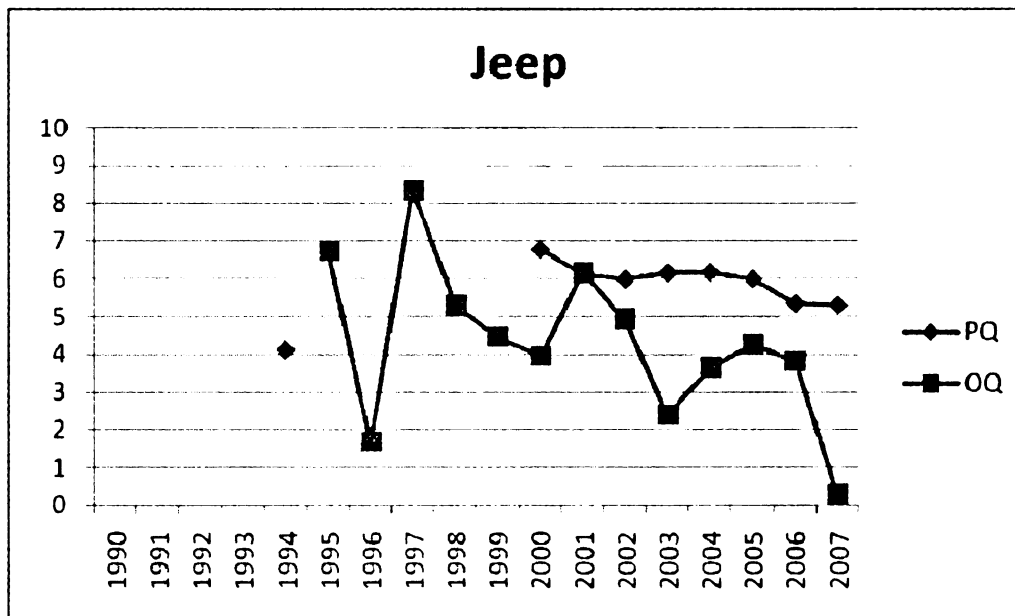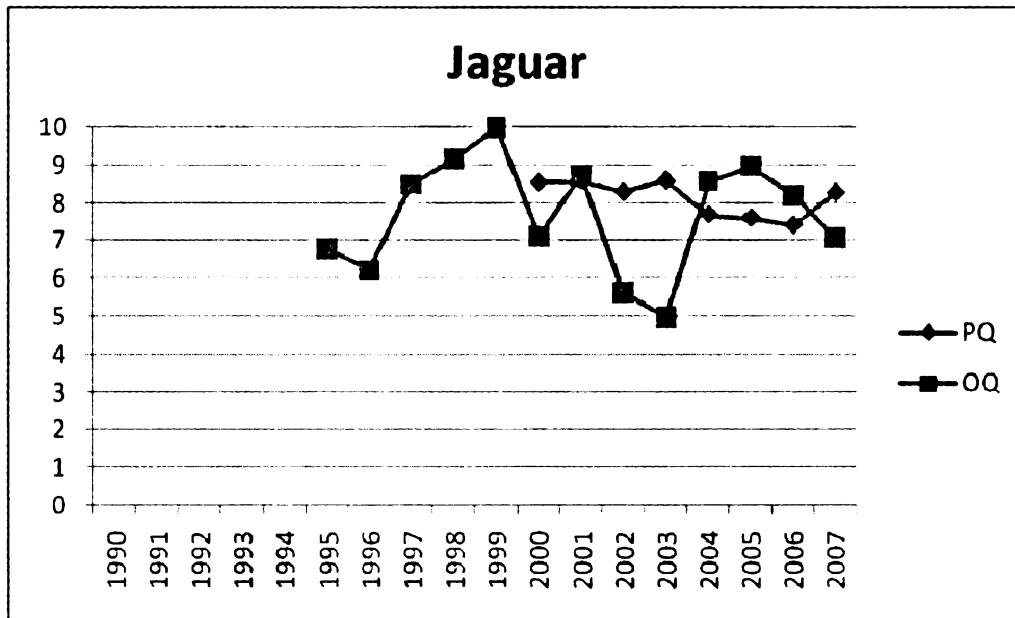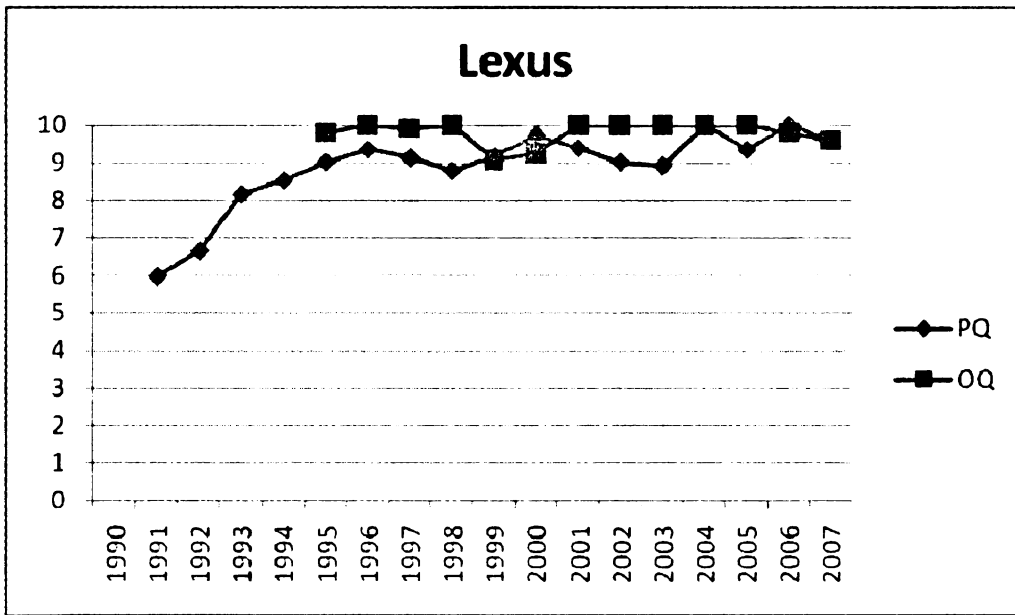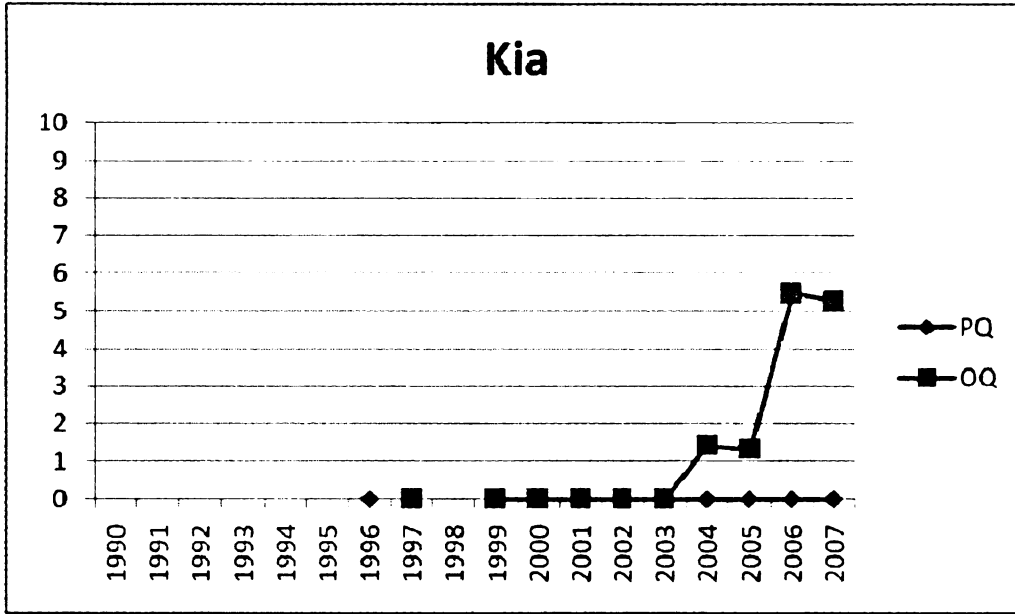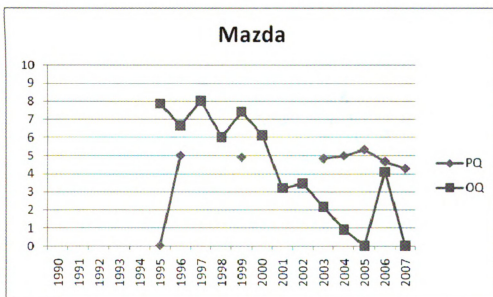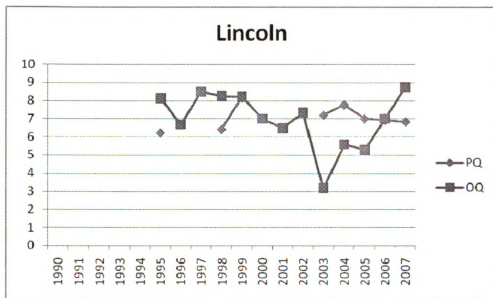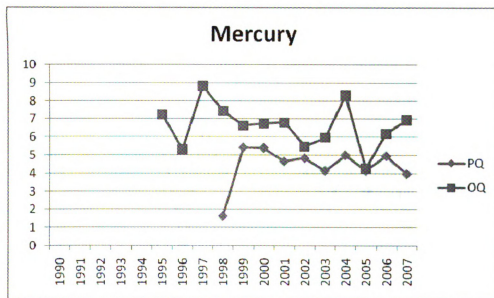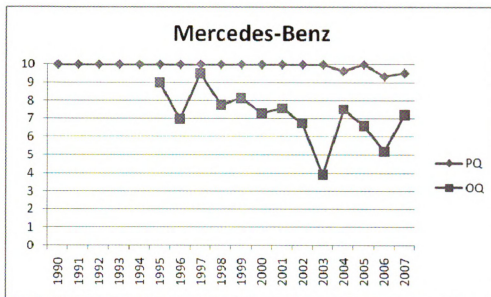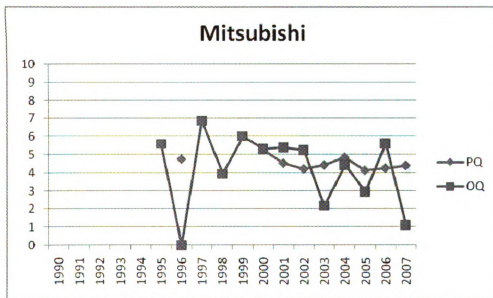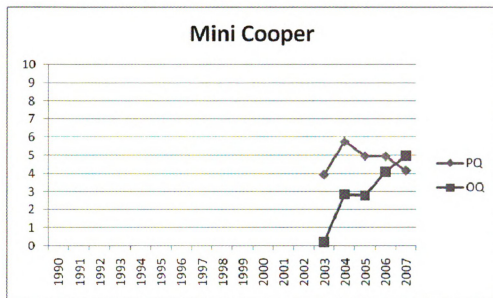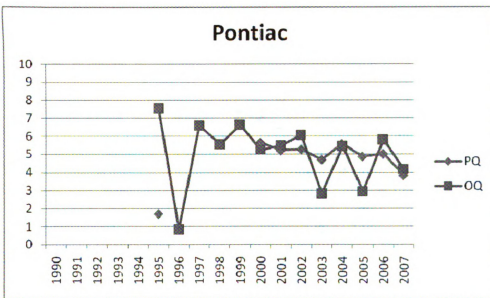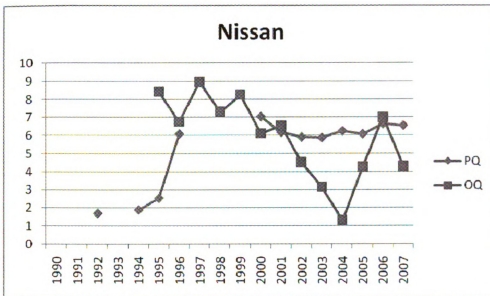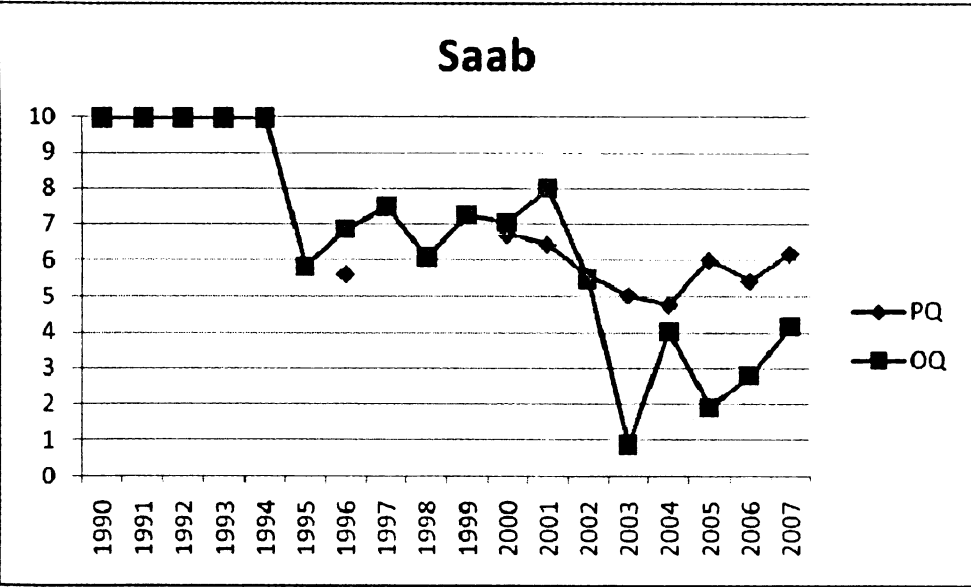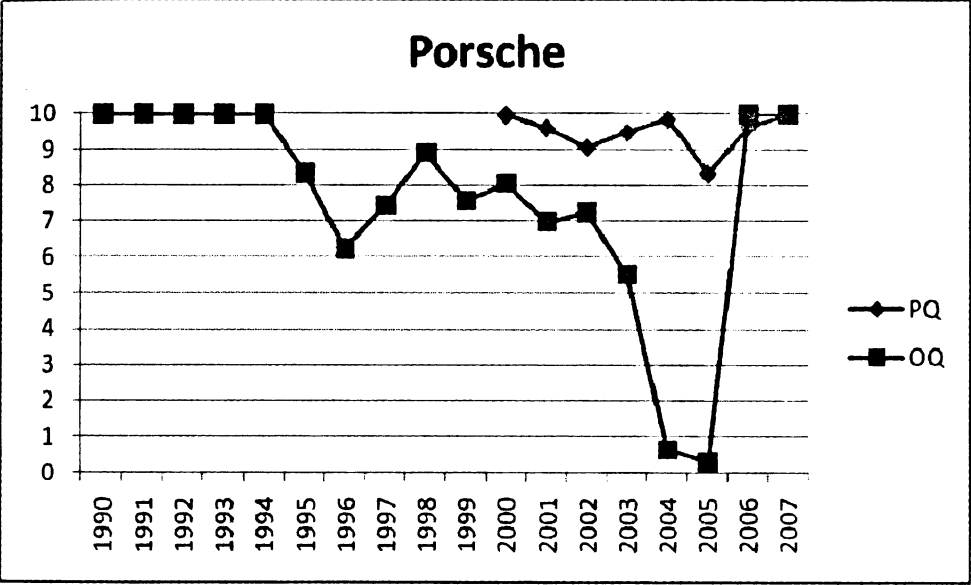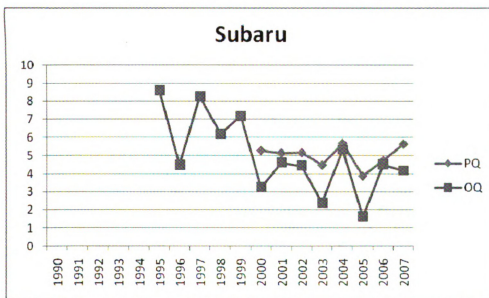
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