

---

## **Customer satisfaction and price acceptance in the case of electricity supply**

---

**Gábor Rekettye\* and József Pintér**

Faculty of Business and Economics,

University of Pécs,

7622 Pécs, Rákóczi út 80, Hungary

E-mail: rekettye@ktk.pte.hu

E-mail: pinter@ktk.pte.hu

\*Corresponding author

**Abstract:** The paper reports empirical research exploring the relationship between satisfaction and price acceptance in the case of a basic utility. The research is based on a face-to-face questionnaire survey of a representative sample of randomly selected 1384 residential consumers in Hungary. The respondents were asked about their satisfaction with electricity supply and at the same time they were requested to evaluate the prices compared to the perceived value of the service they received. The statistical model developed for the analysis of this relationship proved to be reliable and significant. It proved the existence of the basic hypothesis that satisfied customers have higher price acceptance.

**Keywords:** customer satisfaction; price acceptance; electricity supply; statistical model with limited dependent variables.

**Reference** to this paper should be made as follows: Rekettye, G. and Pintér, J. (xxxx) 'Customer satisfaction and price acceptance in the case of electricity supply', *Int. J. Process Management and Benchmarking*, Vol. x, No. x, pp.xxx-xxx.

**Biographical notes:** Gábor Rekettye is a Professor of Marketing and Head of the Marketing Department at the University of Pécs. He is the author of several textbooks and journal papers. The third edition of his book about pricing was published in 2004. In his carrier he has worked in industry, in foreign trade and for five years he served as commercial counsellor in Tokyo. Between 1993 and 1996 he was the Dean of the Business School. In 2006 he was elected for Chairman of the Committee of Marketing Science at the Hungarian Academy of Sciences.

József Pintér works as an Associated Professor at the Department of Statistics and Demographics, University of Pécs. He teaches Statistics and Econometrics at the Faculty of Business and Economics. He is co-author of several textbooks and journal papers. His field of research is model building and econometrics. In the last ten years he has been working together with Professor Rekettye for the Hungarian electricity industry in creating and implementing a reliable methodology for measuring customer satisfaction.

## 1 Introduction

The objective of this paper is to analyse the relationship between customer satisfaction and customer price acceptance. To do so, it starts out from the notions of service quality, satisfaction and loyalty. Service quality has received much attention in the marketing literature, particularly since Parasuraman et al. (1985) proposed their conceptual model of perceived service quality. One of the salient issues relating to service quality is the development of different measurement tools such as Parasuraman et al.'s (1988) SERVQUAL model. Although SERVQUAL has evoked contradicting theories (Carman, 1990; Cronin and Taylor, 1992; Brown et al., 1993), it has remained as the starting point of almost all theories about service quality. Customer satisfaction with services and its association with service quality is again a much discussed subject, and at the same time a rather contradictory issue in the marketing literature (a good summary of the contradicting theories can be found in Lee et al. (2000)). Less attention has been devoted however to the investigation of the relationship between customer satisfaction and price acceptance in the case of services. Some of the exceptions are the writings of Zeithaml (1988), Injazz et al. (1994) and Huber et al. (2001). Basic utilities offer another challenge to researchers because their inherent characteristics distinguish them from other regular services. The objective of the paper is to examine the hypothesis that satisfied customers have higher price acceptance, in the context of a basic utility.

## 2 The special circumstances of the empirical research

The public utilities sector has undergone widespread change in Hungary. The present research was conducted among residential users of the electricity supply. Privatisation and reorganisation of the electricity industry from a traditionally centrally owned and operated system towards a market-based, decentralised, system has become an important issue in Hungary (Terszttyászky, 1996). The six electricity distributor companies were privatised in 1995. Each operates now in an assigned region, and as a result most of the consumers cannot choose among the service providers. The Hungarian parliament, following the guidelines of the European Union, decided to open up the market. This started in 2003 with the opening of the market for the biggest industrial users, and it will finish in 2007, thus making the market totally liberalised for residential customers as well. Today, in this 'quasi' monopoly environment, the residential consumers cannot switch, so the level of their satisfaction has little impact on the profit or market share of the distributor companies, as would be the case for a regular product or service in a non-monopolistic market. Therefore, the need has emerged on the part of the market regulator (the Hungarian Energy Office) to require, at regular intervals, consumer satisfaction surveys in order to protect consumer interest as well as to control and supervise the quality of service provided by the distributor companies. Regular surveying of customer satisfaction started in 1996, however the methodology had to be modernised in 2003, after the partial liberalisation.

### **3 The methodology for measuring customer satisfaction and price acceptance**

Selecting the appropriate methodology to measure customer satisfaction was a crucial point because it was planned to carry out the survey annually, with the requirement of high reliability and the possibility of facilitating longitudinal analyses. As such, careful review of the international service quality literature, and of customer satisfaction and the measurement of these constructs was undertaken. The special requirements of the local conditions and the regulating body (The Hungarian Energy Office) also had to be taken into account. The following models influenced the method adopted in this survey:

- the sc. ‘Nordic’ model of Grönroos (1984) which identifies two service quality dimensions: the functional quality and the interactions’ quality
- the most widely used model, the SERVQUAL (Parasuraman et al., 1988), where the perceived service quality derives from the difference between expected and perceived performance
- the model of Rust and Oliver (1994)
- the multilevel model of Dabholkar et al. (1996)
- the performance-importance analysis (Martilla and James, 1977; Duke and Mount, 1996).

While preparing the modernised model for the satisfaction survey the researchers identified three important areas that constitute the quality of the ‘electricity package’ offered by the distributors. Firstly, the satisfaction with the core service: the delivered electricity and its different attributes; secondly satisfaction with the clients’ contacts; and thirdly satisfaction with communication of the service provider towards customers. The researchers also decided to use a multilevel model, that is, they divided each of these areas into different attributes to be rated by the respondents. The mathematical addition of the ratings gives a comprehensive satisfaction index on a scale of 1–100, that could be created for every supplier. The satisfaction index was built up from 57 items comprising the different elements of the service package. A multilevel model, together with the Performance-Importance (PI) analysis, was then used for plotting the most critical areas of satisfaction or dissatisfaction.

Considering the three components of the service package identified above, it can be observed that the evaluation of prices (actual tariffs) was not part of the satisfaction index. The reason for this was that the research introduced the ‘value-concept’ into the investigation. The “Value is the utility that I get for the price I pay” concept has been used in prior research by Zeithaml (1988) and Caruana et al. (2000). Accordingly, the price acceptance of the residential customers was obtained with a Likert scale of 1–5, where 1 meant that the price they pay was absolutely not in line with the utility they received, and 5 meant that price perfectly corresponded to the utility they received.

#### 4 Specification of the model and estimation

Since the satisfaction index was constructed from a large number of items it can be considered as a quasi continuous variable, while the price acceptance is a discrete variable. In spite of the different scales the intensity of their relationship could be measured well, and consequently it was appropriate to construct a model for it.

The continuous nature of the independent variable and the discrete nature of the dependent variable justify the use of the probit ordered response model (Green, 1993; Verbeek, 2002). It has to be taken into account however, that the values of the dependent variable (PA) were measured on an ordinal scale. The price acceptance is indicated with 'PA', while the individual satisfaction index is denoted by 'SAT'.

The general formula of this model is:

$$y_i^* = \mathbf{x}_i^T \boldsymbol{\beta} + \varepsilon_i$$

$$y_i = j \text{ if } \gamma_{j-1} < y_i^* \leq \gamma_j$$

where

- $y_i$ : observed ordinal values of dependent variable (1, 2, 3, ...,  $N$ )
- $y_i^*$ : latent variable, the so called utility index
- $\mathbf{x}_i^T$ : vector containing the independent variables
- $\boldsymbol{\beta}$ : vector of the regression coefficients
- $\gamma_j$ : limit on point  $j$
- $\varepsilon_i$ : residual variable.

It is to assume that  $\varepsilon_i$  variable will show a standard normal distribution. The parameters of the model ( $\boldsymbol{\beta}$  and  $\gamma$ ) are estimated jointly by the maximum likelihood method. The model can be formulated as follows:

$$PA_i^* = \boldsymbol{\beta} \times SAT_i + \varepsilon_i.$$

The characteristic values connected to the latent variable can be modelled as follows:

$$PA_i = 1 \text{ if } PA_i^* \leq \gamma_1$$

$$PA_i = 2 \text{ if } \gamma_1 < PA_i^* \leq \gamma_2$$

$$PA_i = 3 \text{ if } \gamma_2 < PA_i^* \leq \gamma_3$$

$$PA_i = 4 \text{ if } \gamma_3 < PA_i^* \leq \gamma_4$$

$$PA_i = 5 \text{ if } PA_i^* > \gamma_4.$$

where

- $PA$ : price acceptance (1, 2, 3, 4, 5)
- $PA^*$ : latent variable
- $SAT$ : customer satisfaction.

The parameters of the model cannot be evaluated directly. For the evaluation the estimated distribution of the residual variable can be of help.  $\phi$  should indicate the density function of the residual variable. With the help of the residual variable, the marginal

effects of the regression coefficient can be estimated. The maximum value of the marginal effect is 1, while 0 indicates the statistical undependability. The algorithm of calculation of the marginal effects is:<sup>1</sup>

$$\begin{aligned} \frac{\partial \Pr(PA=1)}{\partial SAT} &= -\phi(SAT_i^T \beta) \beta \\ \frac{\partial \Pr(PA=2)}{\partial SAT} &= [\phi(-SAT_i^T \beta) - \phi(\gamma_2 - SAT_i^T \beta)] \beta \\ \frac{\partial \Pr(PA=3)}{\partial SAT} &= [\phi(\gamma_2 - SAT_i^T \beta) - \phi(\gamma_3 - SAT_i^T \beta)] \beta \\ \frac{\partial \Pr(PA=4)}{\partial SAT} &= [\phi(\gamma_3 - SAT_i^T \beta) - \phi(\gamma_4 - SAT_i^T \beta)] \beta \\ \frac{\partial \Pr(PA=5)}{\partial SAT} &= \phi(\gamma_4 - SAT_i^T \beta) \beta. \end{aligned}$$

If the cumulative distribution function of the residual variable is indicated with  $\Phi$ , the estimated probabilities of PA are:

$$\begin{aligned} \Pr(PA=1|SAT_i) &= \Pr(PA^* \leq \gamma_1) = \Phi(-SAT_i^T \beta) \\ \Pr(PA=2|SAT_i) &= \Phi(\gamma_2 - SAT_i^T \beta) - \Phi(-SAT_i^T \beta) \\ \Pr(PA=3|SAT_i) &= \Phi(\gamma_3 - SAT_i^T \beta) - \Phi(\gamma_2 - SAT_i^T \beta) \\ \Pr(PA=4|SAT_i) &= \Phi(\gamma_4 - SAT_i^T \beta) - \Phi(\gamma_3 - SAT_i^T \beta) \\ \Pr(PA=5|SAT_i) &= 1 - \Phi(\gamma_4 - SAT_i^T \beta). \end{aligned}$$

## 5 Results of the empirical research

The model was tested in 2004 on a representative sample of one electricity supplier operating in the North-Western region of Hungary. 1384 residential consumers were interviewed with a structured questionnaire. This sample represented 0.16% of the approximately 900,000 residential customers of the selected region. For selecting the respondents the random sampling technique was used, with the combination of the stratified random sampling, and the cluster sampling methods. With the use of these techniques the sampling error was less than 2.5%. The basic statistics are presented in Table 1.

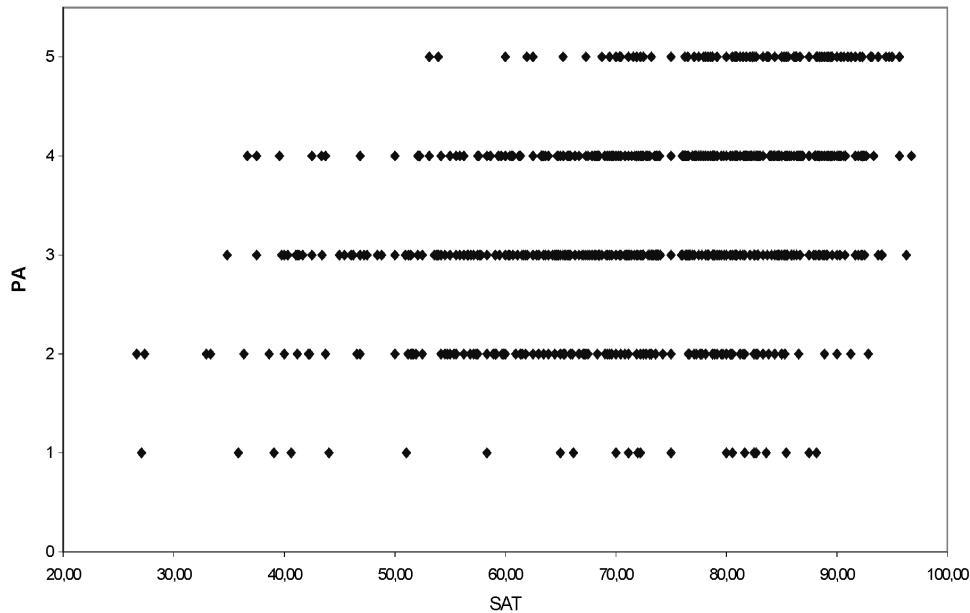
**Table 1** Basis statistics

Indicators	PA variable	SAT variable
Average	3,476	74.237
Median	4,000	75.00
Maximum	5,000	96.74
Minimum	1,000	26.67
Standard deviation	0,906	11.88

The basic indicators of price acceptance can be compared more appropriately through recalculation of the average and the standard deviation of the price acceptance measure (on a 1–5 Likert scale) to a scale of 0–100 used in measuring the satisfaction. The average value of price acceptance on the 0–100 scale is 61.9 and the standard deviation is 22.65. The lower value of the price acceptance supports the recognised fact that residential customers tend to believe that availability of the basic utilities such as electricity and water on a rather low rate is a natural symptom or obligation of an advanced society. This belief is the rationale behind the lower values of the price acceptance.

The relationship between the price acceptance and customer satisfaction is shown in the scatter diagram represented in Figure 1. This figure illustrates clearly the stochastic relationship that the price acceptance of satisfied customers is generally higher than that of the less satisfied consumers.

**Figure 1** The relationship between the price acceptance and customer satisfaction



Correlation between the variables was 0.353.

The following model could be formulated for performing the estimations:

$$PA_i^* = 0,0339 \times SAT_i$$

$$(\gamma_1 = 0,233; \gamma_2 = 1,339; \gamma_3 = 2,476; \gamma_4 = 3,814.)$$

The model proved to be significant and the value of sc. pseudo  $R^2$  was relatively strong: 0.0513. The distribution of the residual variable was nearly normal. The model showed that the parameter SAT's effect on the latent variable was fairly strong. Analysis of the regression coefficient ( $\beta$ ) showed that a unit increase of the independent variable, that is a one point increase in satisfaction, would result in an increase of price acceptance especially in the upper regions. The marginal effects are shown in Table 2.

**Table 2** Marginal effects

<i>(PA)</i>	<i>Value of the marginal effects</i>
1 (price is not corresponding to the provided service at all)	-0.0010
2 (price is mostly not corresponding to the provided service)	-0.0058
3 (neutral)	-0.0068
4 (price is mostly corresponding to the provided service)	0.0077
5 (price is perfectly corresponding to the provided service)	0.0058

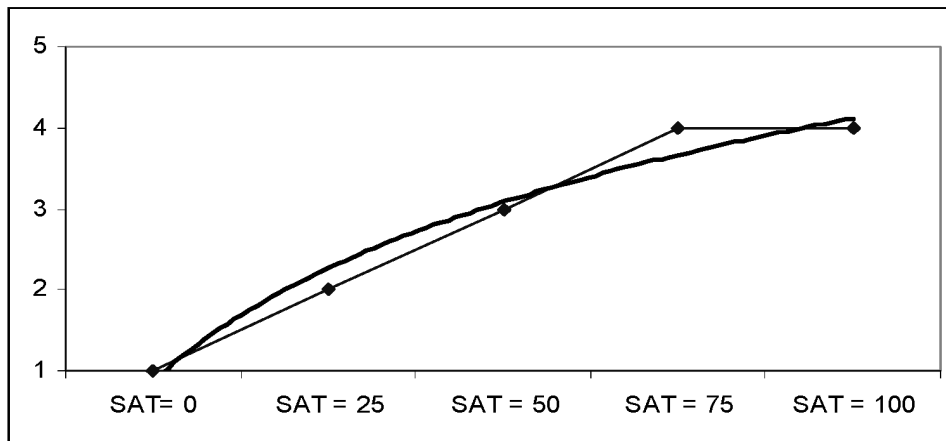
The estimated probabilities are presented in Table 3.

**Table 3** The estimated probabilities

<i>PA</i>	<i>SAT</i>					<i>Average: 74.24</i>
	<i>0</i>	<i>25</i>	<i>50</i>	<i>75</i>	<i>100</i>	
1	0.5920	0.2692	0.0717	0.0104	0.0008	0.0112
2	0.3176	0.4190	0.2888	0.1037	0.0193	0.1081
3	0.0837	0.2600	0.4218	0.3589	0.1599	0.3642
4	0.0066	0.0502	0.2006	0.4251	0.4839	0.4193
5	0.0001	0.0015	0.0171	0.1019	0.3362	0.0974

Using the maximum probabilities of PAs belonging to the different satisfaction values, the graph shown in Figure 2 can be plotted.

**Figure 2** The curve of estimated largest probabilities of price acceptance



From the data presented in Table 3 and Figure 2, the tendency that less satisfied customers have a lower level of price acceptance, while even the perfectly satisfied customers will not have a maximum price acceptance, is clear.

Using the real data of the questionnaire survey compared with estimation of the maximum likelihood method, the size of mistakes is shown in Table 4.

**Table 4** Classification of customers

<i>PA variable</i>	<i>Actual frequency</i>	<i>Estimated frequency with maximum probabilities</i>	<i>Error</i>
1	23	0	23
2	167	12	155
3	481	448	33
4	554	924	-370
5	159	0	159

Minimum deviation from the actual values was found in the case of  $PA = 3$ . It is interesting to note that according to the model, neither the smallest and or the largest price acceptance was without an estimated value. Most probably, this effect is rooted in the fact that consumers knew that pricing was regulated and centralised, rather than the decision of the supplier. It is also possible that consumers were fairly critical in terms of the quality level of service and the tariffs they paid for it.

## 6 Further results

It is natural to raise the question of whether the model is applicable for the prediction of price acceptance of customers belonging to different segments. The survey made it possible to investigate the respondents according to the following characteristics:

- the age of the respondents
- the education level of the respondents
- their location (large cities, small cities, rural areas)
- the income groups
- the sex of the respondents.

A detailed analysis of variance was performed in the case of two factors – age groups, and education level of the respondents. In both cases the estimated probabilities delivered important information. In the case of age groups, respondents were divided into two parts:

- respondents younger than 50 years
- respondents older than 50 years.

Satisfaction of the younger respondents averaged at 72.96, while the latter had an average satisfaction index of 75.14. An estimated probability of price acceptance is given in Table 5.

While there is no significant difference at the low and high values of the price evaluation, it can be seen that younger people, who on average have a lower level of satisfaction, would accept prices with a higher probability than the older persons who on average were found to be less satisfied with the service they receive.



**Table 5** Estimated probabilities according to age groups

<i>PA</i>	<i>Age</i>	
	<i>Younger than 50 years</i>	<i>Older than 50 years</i>
1	0.0109	0.0108
2	0.0840	0.1239
3	0.3378	0.3834
4	0.4688	0.3872
5	0.0984	0.0947

The other factor investigated was the education level of the respondents. The comprehensive satisfaction indices for respondent with different level of education were as follows:

- Elementary school graduates = 76.0
- Vocational school graduates = 74.8
- High school graduates = 73.7
- College or university graduates = 70.8.

The data shows that there is a negative correlation between the education level and the satisfaction. The probabilities calculated with the model are presented in Table 6.

**Table 6** Estimated probabilities according to the education levels

<i>PA</i>	<i>Education levels</i>			
	<i>Elementary school</i>	<i>Vocational school</i>	<i>High school</i>	<i>College or university</i>
1	0.0107	0.0060	0.0144	0.0137
2	0.1154	0.1185	0.0840	0.1288
3	0.3432	0.3584	0.3820	0.3806
4	0.4102	0.4155	0.4416	0.3929
5	0.1205	0.1015	0.0780	0.0840

In all the four groups the value 4 has the largest chance, although with decreasing probability. Also, the possibility of the perfect correspondence (value 5) is seen to continuously decrease as the educational level of the respondent increases.

## 7 Summary

The aim of the empirical research presented in this paper was to examine the relationship between satisfaction and price acceptance in the context of the Hungarian electricity utility sector. The statistical model used proved to be reliable and significant. The results confirmed the existence of the basic hypothesis, that satisfied customers have higher price acceptance. The use of the model has a lot of advantages in formulating the future marketing activity of the electricity providers.

From the experience of the West European and North American countries it is observed that liberalised electricity markets introduce competition, which generally leads to lower prices. It is safe to say that the opening of a monopolised industrial market to competition in Hungary will result also in unique marketing problems for the incumbents and entrants as they try to position themselves in a market that supplies a relatively homogeneous commodity. A survey carried out in Australia by Stanton et al. (2001) reported that price was ranked as the most important marketing variable, followed by people, promotion, and distribution. There is a strong belief that the retailing of electricity is a business trading solely on price (Kalkman and Peters, 2002). Competing only on price however is rather dangerous in a basic utility such as electricity because its characteristics do not give the organisations much room for manoeuvre. The market is saturated and has low or even negative growth. Furthermore, the product is not easy to differentiate, usually has a low margin, and for most customers electricity is perceived as a grudge purchase (Thurlby, 1998).

These observations indicate that understanding the factors that influence customers' price acceptance is of utmost importance for the suppliers. The paper confirmed the relationship between customer satisfaction and price acceptance, and indicated the different segmentation possibilities in that respect. Although Hungarian residential customers of electricity seem to be rather price sensitive at the moment, there is however a tendency that increased satisfaction, and the fear of poor service from the low-cost providers may result in customers staying with the original supplier instead of switching to a new inexperienced low cost distributor.

In summary, the paper suggests that understanding the concept of customer satisfaction and its relationship to price acceptance may help the regulating bodies and the private suppliers to plan ahead in regard to how to behave in a competitive environment, how to compete with the new entrants, and how to maintain their present customers.

## **8 Limitation of the study and further research**

The biggest limitation of the study can be found in the timing of the empirical research. The survey was conducted in 2004, when the electricity market had been open to competition in only a partial sense. The residential customers will have the opportunity to switch among suppliers only by 2007. At the same time however, the nature of the results indicate directions for further research. The survey should be repeated at regular intervals to facilitate longitudinal comparisons, and to understand any changes in the purchasing behaviour of customers due to the increasing competition.

A second direction for further research would be to investigate the different components of customer satisfaction with the electricity supply from the viewpoint of their contribution to any observed increase of price acceptance. This would provide suppliers with meaningful information that could be used as the basis of decisions on how to structure their marketing activity in the future.

## References

- Brown, T.J., Churchill Jr., G.A. and Peter, J.P. (1993) 'Improving the measurement of service quality', *Journal of Retailing*, Vol. 69, No. 1, pp.127–139.
- Carman, J.M. (1990) 'Consumer perceptions of service quality: an assessment of the SERVQUAL dimensions', *Journal of Retailing*, Vol. 65, Spring, pp.33–55.
- Caruana *et al.* (2000) **AUTHOR PLEASE PROVIDE FULL DETAILS.**
- Cronin Jr., J.J. and Taylor, S.A. (1992) 'Measuring service quality: a reexamination and extension', *Journal of Marketing*, Vol. 56, July, pp.55–68.
- Dalbholkar**, Thorpe, D.I. and Renz, J.O. (1996) 'A measure of service quality for retail stores', *Journal of the Academy of the Marketing Science*, No. 24, pp.3–16. **AUTHOR PLEASE CHECK WHETHER THE AUTHOR NAME IS 'Dalbholkar' OR 'Dabholkar' AND PROVIDE VOLUME NUMBER AND INITIAL FOR THE HIGHLIGHTED AUTHOR.**
- Duke, C.R. and Mount, A.S. (1996) 'Rediscovering performance-importance analysis of products', *Journal of Product and Brand Management*, Vol. 5, No. 2, pp.43–54.
- Green (1993) **AUTHOR PLEASE PROVIDE FULL DETAILS.**
- Greene, W.H. (1997) *Econometric Analysis*, 3rd ed., Prentice-Hall International, Inc., New Jersey. **AUTHOR PLEASE PROVIDE CITATION FOR THIS REFERENCE.**
- Grönroos, Ch. (1984) 'A service quality model and its marketing implications', *European Journal of Marketing*, Vol. 18, No. 4, pp.36–44.
- Huber, F., Hermann, A. and Wricke, M. (2001) 'Customer satisfaction as an antecedent of price acceptance: results of an empirical study', *Journal of Product and Brand Management*, Vol. 10, No. 3. **AUTHOR PLEASE PROVIDE PAGE RANGE.**
- Injazz, J., Chen, A.G. and Walter, R. (1994) 'A study of price and quality in service operations', *International Journal of Service Industry Management*, Vol. 5, No. 2, pp.23–33.
- Kalkman, J.B. and Peters, M. (2002) 'Branding electrons', *The McKinsey Quarterly*, No. 1. **AUTHOR PLEASE PROVIDE VOLUME NUMBER AND PAGE RANGE.**
- Lee, H., Lee, Y. and Yoo, D. (2000) 'The determinants of perceived service quality and its relationship with satisfaction', *Journal of Services Marketing*, Vol. 14, No. 3, pp.217–231.
- Martilla, J.A. and James, J.C. (1977) 'Importance-performance analysis', *Journal of Marketing*, Vol. 41, January, pp.77–89.
- Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985) 'A conceptual model of service quality and its implications for future research', *Journal of Marketing*, Vol. 49, Fall, pp.41–50.
- Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1988) 'SERVQUAL: a multiple-item scale for measuring consumer perceptions of service quality', *Journal of Retailing*, Vol. 64, Spring, pp.12–40.
- Rust and Oliver (1994) **AUTHOR PLEASE PROVIDE FULL DETAILS.**
- Stanton, P.J., Cummings, S., Molesworth, J. and Sewell, T. (2001) 'Marketing strategies of Australian electricity distributors in an opening market', *Journal of Business and Industrial Marketing*, Vol. 16, No. 2, pp.81–93.
- Tersztzyanszky, T. (1996) 'Restructuring and market opening tendency in the electric supply industry in Hungary', *Unipede, 2nd Conference on the Development of Interconnected Power System*, Report 3.12. **AUTHOR PLEASE CHECK WHETHER THE AUTHOR NAME IS 'Tersztzyászky' OR 'Tersztzyanszky'.**
- Thurlby, B. (1998) 'Competitive forces are also subject to change', *Management Decision*, Vol. 36, No. 1, pp.19–24.
- Tse, A.C.B. (2001) 'How much more are consumers willing to pay for a higher level of service?', *Journal of Services Marketing*, Vol. 15, No. 1, pp.11–17. **AUTHOR PLEASE PROVIDE CITATION FOR THIS REFERENCE.**

Verbeek, M. (2002) *A Guide to Modern Econometrics*, John Wiley & Sons, New York.

Zeithaml, V.A. (1988) 'Consumer perceptions of price, quality and value: a means-end model and synthesis of evidence', *Journal of Marketing*, Vol. 52, No. 3, pp.2–22.

### **Note**

<sup>1</sup>It has to be stated the sum of the marginal effects is zero.