An Empirical Study On Willingness To Pay of the Electricity in Taiwan

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Motivation

Motivation: What factors will influence the willingness to pay of the electricity

For the questionnaire:
- One question → One Variable → Too many variables
- The importance ratio of variables unknown
- The relationship between the variables unknown

On This Study:
- Hope to find few factors to explain the result of Questionnaire to reduce the cost of survey
- Find out the relationships of factors
The Questionnaire

- 1200 qualified respondents in the study of willingness to pay in Taiwan.
- 41 items (variable) in 5-point Likert-type scales analyzed
- 41 observed variables are too many => Explain one by one
- Smaller number of unobserved variables => Factors => Linear Regression

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree Nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I understand the issue of Taiwan's nuclear energy security and various types of power generation waste disposal</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>I understand what renewable energy I can use</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>The price of Taiwan's energy is relatively cheap</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>41</td>
<td>I'll post energy articles in Blog, FB or Line.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
## The analyzing Flow

<table>
<thead>
<tr>
<th>No.</th>
<th>Method</th>
<th>Purpose</th>
<th>Criteria</th>
<th>Result</th>
</tr>
</thead>
</table>
| 1   | Cronbach’s alpha               | 1. Internal Consistency  
2. Cronbach’s alpha if item deleted | > 0.7                                        | Delete 0 items           |
| 2-1 | Bartlett's test of sphericity  | If the data are suitable to apply Factor Analysis                       | < 5%                                          |                         |
| 2-2 | The KMO Measure of Sampling Adequacy | 1. If the data are suitable to apply Factor Analysis  
2. Delete the items with small communality value | 1. > 0.5  
2. < 0.5                                        | Delete 6 items           |
| 3   | Factor Analysis                | 1. Extract the factors  
2. Rotated Component Matrix | 1. Eigenvalue >1 ; Varimax Rotation  
2. Correlation > 0.5 | 1. Delete 0 items  
2. 6 latent factors |
| 4   | Linear Regression              | Find out the relationship of latent factors                             | P value < 5%                                  | G4 <= G1 & G2           |
The analyzing processes (1/3)

- Reliability Test:
  Cronbach’s alpha is a measure to assess the reliability, or internal consistency

- The Cronbach’s Alpha is 0.938 in our questionnaire.
  The value of “Cronbach’s alpha if item deleted” of each item is smaller than 0.938. => All the items are kept.
• **Bartlett's test of sphericity**
  Small values (less than 0.05) of the significance level indicate that a factor analysis may be useful with the data.

• The **KMO Measure of Sampling Adequacy:**
  The proportion of variance in the variables that might be caused by underlying factors. (higher than 0.50)
  
  *Items can be deleted:*

  (1) *The value of KMO: 0.944*

  (2) *Communality value of Item No. 18: 0.449 < 0.5  ➡ The item can be deleted.*
The analyzing processes (3/3)

- **Factor Analysis:** The eigenvalue >1, Varimax Rotation
  Getting 6 factors (components) and cumulative of extraction sums of square loading is 66.42%.

- **Linear Regression:**
  
  G4 as the dependent factor and the rest as independent factors

<table>
<thead>
<tr>
<th>Content (Item No.)</th>
<th>Dimension Name/ Characteristics</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>27, 28, 29, 30, 37, 38, 39, 40, 41</td>
<td>The perception of renewable energy</td>
<td>G1 (Renewable)</td>
</tr>
<tr>
<td>10, 13, 14, 15, 16, 17, 26</td>
<td>Perception of the risk of ecological environment</td>
<td>G2 (Ecological)</td>
</tr>
<tr>
<td>6, 19, 20, 21, 23, 24, 34, 35,</td>
<td>The risk of nuclear energy</td>
<td>G3 (Nuclear)</td>
</tr>
<tr>
<td>7, 8, 9, 11, 12</td>
<td>The behavior of electricity consumption</td>
<td>G4 (Consumption)</td>
</tr>
<tr>
<td>31, 32, 33</td>
<td>Public trust to government</td>
<td>G5 (Trust)</td>
</tr>
<tr>
<td>3, 4, 5</td>
<td>Understanding to energy issues</td>
<td>G6 (Understanding)</td>
</tr>
</tbody>
</table>
The Empirical Result

G4 = 0.293 + 0.506 G1 + 0.330 G2 + 0.050 G3 + 0.019 G5 + 0.062 G6
   (0.000)   (0.000)   (0.004)   (0.341)   (0.008)

(G5, not significant ; G3 & G6 small influence)

G4: The behavior of electricity Consumption
   (ex. I know exactly how much the electricity is paid each time)

G1: The perception of renewable energy
   (ex. I have already purchased and used alternative energy)

G2: Perception of the risk of ecological environment
   (ex. I know carbon emissions will accelerate the climate warming)

G3: The risk of nuclear energy
   (ex. I trust the safety of nuclear power generation)

G5: Public trust to government
   (ex. I think Taiwan has full use and good planning of energy)

G6: Understanding to energy issues
   (ex. The price of Taiwan's energy is relatively cheap)
Conclusion

• Describe the result easily by lower number of factors:
  Extract 6 latent factors from 35 items. 5 latent factors to compose the factor “The behavior of electricity consumption”.

• Understanding the relationship of latent factors:
  Besides the policy formulation, the finding could be the reference of questionnaire design in the future

• Result:
  The promotion of The perception of renewable energy and Perception of the risk of ecological environment will influence The behavior of electricity Consumption
Thank you for your attention!