

人々の食に関する嗜好の時代変化を把握するためのデータマイニング手法の提案 (年齢・時代・環境モデルの導入)

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1. Introduction

Age-period-cohort analysis is a method of research developed primarily by demographers and it has been adapted to the study of various attitudinal and behavioral phenomena (Glenn 1977). Though the age-period-cohort model has been successfully fitted to those data, there exists an exact linear dependency among those three factors, hence even the first-order differences of age, period or cohort effects are not estimable (Scheffé, 1959) in the most likelihood estimation for the model. So far several researchers have been suggested measures for addressing the problem which include a measure focusing estimable functions (Holford, 1983) and nonlinear models (Hanayama, 2007). Our aim in this study is to introduce an alternative model to those models for analyzing (age, period)-tabulated data on consumer culinary preference.

2. Age-period-environment model

Consider groups of N_{ij} people who are in the $[A_{i-1}, A_i)$ age group at the time (year) P_j , where $i = 1, \dots, I$; $j = 1, \dots, J$ and $A_i - A_{i-1} = P_j - P_{j-1} = \tau$. Let $Y_{ij}^{(n)}$ ($n = 1, \dots, N_{ij}$) be a random variable which indicates whether the n_{ij} th member of N_{ij} people has a certain property ($Y_{ij}^{(n)} = 1$) or not ($Y_{ij}^{(n)} = 0$), where “a certain property” means, for example, being alive, having a certain attitudinal or behavioral feature, or saying “yes” on questionnaire. The response variables $Y_{ij}^{(n)}$ are illustrated on the Lexis diagram (Keiding, 1990) in Figure 1.

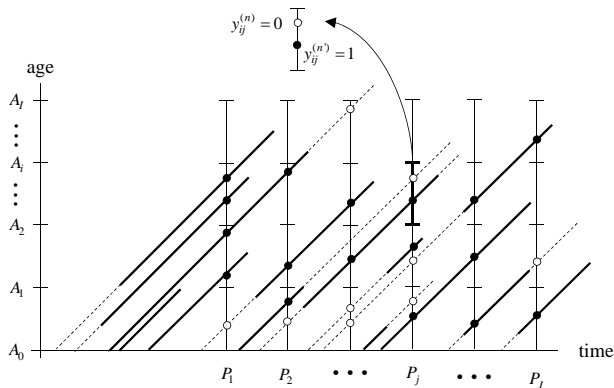


Figure 1. Response variables

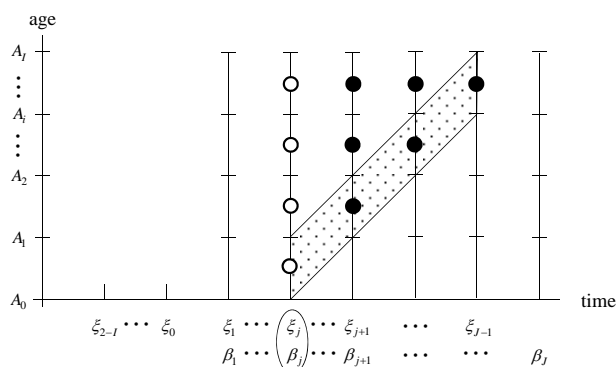


Figure 2. Environmental, period effect

Under the those assumptions, for projecting factors associated with environment, we introduce the following age-period-environment model:

$$\eta_{ij} = \mu + \alpha_i + \beta_j + \sum_{k=j-i+1}^{j-1} \xi_k, \quad (2.1)$$

where μ , α_i and β_j are common with ones in the original age-period-cohort model and ξ_k indicates the effect associated with the environment at the year P_k ($k = 2 - I, \dots, J$) which comes out τ years after exposure to it. The idea of environmental effect and the deference form the period effect are illustrated in Figure 2.

3. Result

In this section the results of fitting the age-period-environment model to the data on consumer

preference obtained from JNN Data Bank (<http://www.tbs.co.jp/research/index-j.html>) conducted by Japanese 28 TV stations including Tokyo Broadcasting System, Inc. (TBS) as their key station are shown. Figure 3, 4 and 5 indicate estimates of age, period and environmental effects obtained by fitting the model to the data on rates of numbers of people who reply “yes” to the question “do you like pizza?” given in every 5-year by 5-year age group (Table 1).

Year \ Age group	1977	1982	1987	1992	1997	2002	2007
16-19	56.95	64.3	75.25	69.9	68.55	67.4	69.85
20-24	56.3	53.1	55	50.7	59.3	62.6	64.8
25-29	36.4	45.4	56.7	55	49.3	54	59.6
30-34	23.7	35.3	47.9	52.2	54.7	55.7	53.7
35-39	19.4	25.7	38	51.2	54.8	52.4	50.8
40-44	14.2	17.8	33.2	36.2	42.1	52.5	47.1
45-49	15.3	16.8	18.8	26.4	32.4	49.4	48.2
50-54	17.8	14.7	19.6	13.9	21.2	36.8	49
55-59	11.4	13.1	13.8	19.2	18.4	24.4	39.9

Table 1. Rates of numbers of people who reply “yes” to the question “do you like pizza?” in percent

Age effect

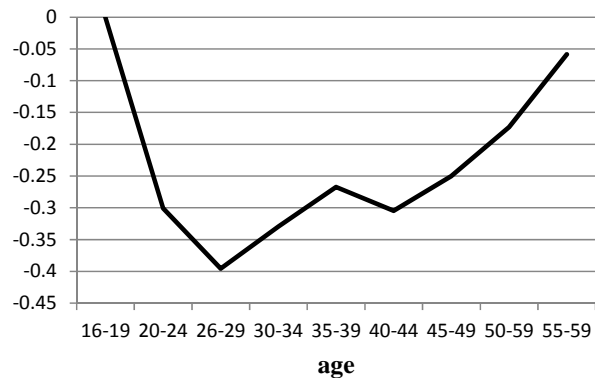


Figure 3. Estimates of age effect

Period effect

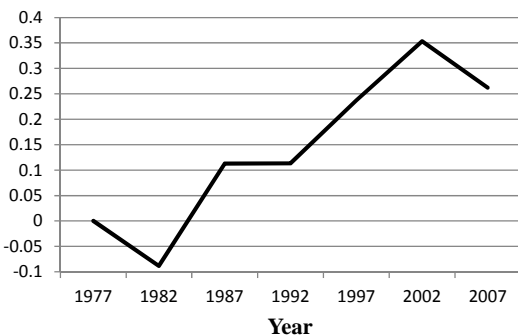


Figure 4. Estimates of period effect

Environmental effect

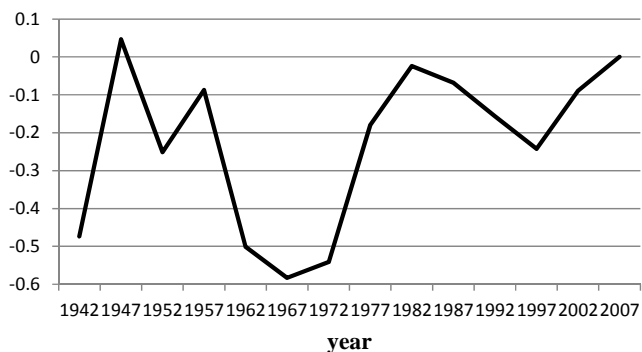


Figure 5. Estimates of the environment effect

4. Conclusion

In this study the age-period-environment model has been introduced as one alternative to the age-period cohort model and fitted to data on consumer preference for pizza in Japan.

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A discussion of method for analyzing data on consumer culinary preference for marketing research
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