

# The effect of rotation sampling in household survey based on pilot survey

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## 1. Introduction

For the monthly household surveys, of economically active population survey and household income survey, carried out by Korea National Statistical Office, a fixed sample method is currently used. Once a household is selected for the sample, the household is surveyed for five years without change. Fixed samples require high burden on respondent and make it difficult to reflect the change of the populations. With such reasons, we conducted pilot survey since May 2000 to see whether rotation-sampling system can be applied to household survey of KNSO. Two models, 4-8-4 and 6-6-6, are applied to the pilot survey for economically active population survey. In this paper, we discuss the effect of rotation samples based on pilot survey and compare with the fixed samples.

## 2. Rotation Scheme

4-8-4 rotation model represents a household selected for the sample is interviewed for four consecutive months, rotated out of the sample for eight months, and then interviewed for another four months before being retired from the sample. 6-6-6 rotation model is the similar pattern of 4-8-4 rotation model, i.e. six month sample in, six month out, and another six month in. For pilot survey, 320 households for 4-8-4 and 240 households for 6-6-6 are interviewed each month. Under 4-8-4 rotation system, approximately 75% of the samples are common from month-to-month and 50% from year-to-year for the same month. Under 6-6-6 rotation system, approximately 83% of the samples are common from month-to-month and 50% from year-to-year for the same month.

### 3. Time-in-sample bias and correlations

Under 4-8-4 rotation system, sample consists of eight rotation groups: the households in the survey for the first time, for the second time, ..., for the eighth time. The rotation group in sample for a given month can be considered time-in-sample(TIS) groups. The TIS represents the number of months a rotation group is in the sample. 6-6-6 rotation system can also be defined similarly.

The direct survey estimate at time  $h$  can be modeled as  $x_{h,i} = X_h + u_{h,i}$  where  $x_{h,i}$  is the estimate from a rotation group which is in its  $i$ -th time in sample at time  $h$ ,  $X_h$  is the population characteristic of interest at time  $h$  and  $u_{h,i}$  is an error due to sampling.

The TIS bias index is defined as(Mansur 1999, Bailar 1975, Lent 1996)

$$I_{h,i} = \left( \frac{E(X_{h,i})}{E(\sum_{j=1}^m X_{h,j}/m)} \right) \times 100 \quad i = 1, 2, \dots, m(4-8-4 : m = 8, \quad 6-6-6 : m = 12) \quad (1)$$

so that an index greater than 100 implies an overestimate in that group relative to the other groups. For two major characteristics, employed and unemployed, TIS bias indices are computed. The result shows that there is no specific patterns depending on the number of times in sample.

To consider optimal value of coefficients in composite estimate, correlation structure of the major characteristics are examined. The correlations of pilot survey is similar to those of fixed sample survey.

### 4. Conclusion

To reduce the response burden and reflect the population change better, KNSO is considering rotation sampling. Pilot survey was conducted to the household survey since May 2000 to see whether rotation sampling can be applied without any problems. Pilot survey shows there is no significant differences between the number of times in sample, i.e. no significant differences between fixed and rotation sampling system. Correlations between month-in-sample also shows similar result between fixed and rotation sampling system.

### REFERENCES

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